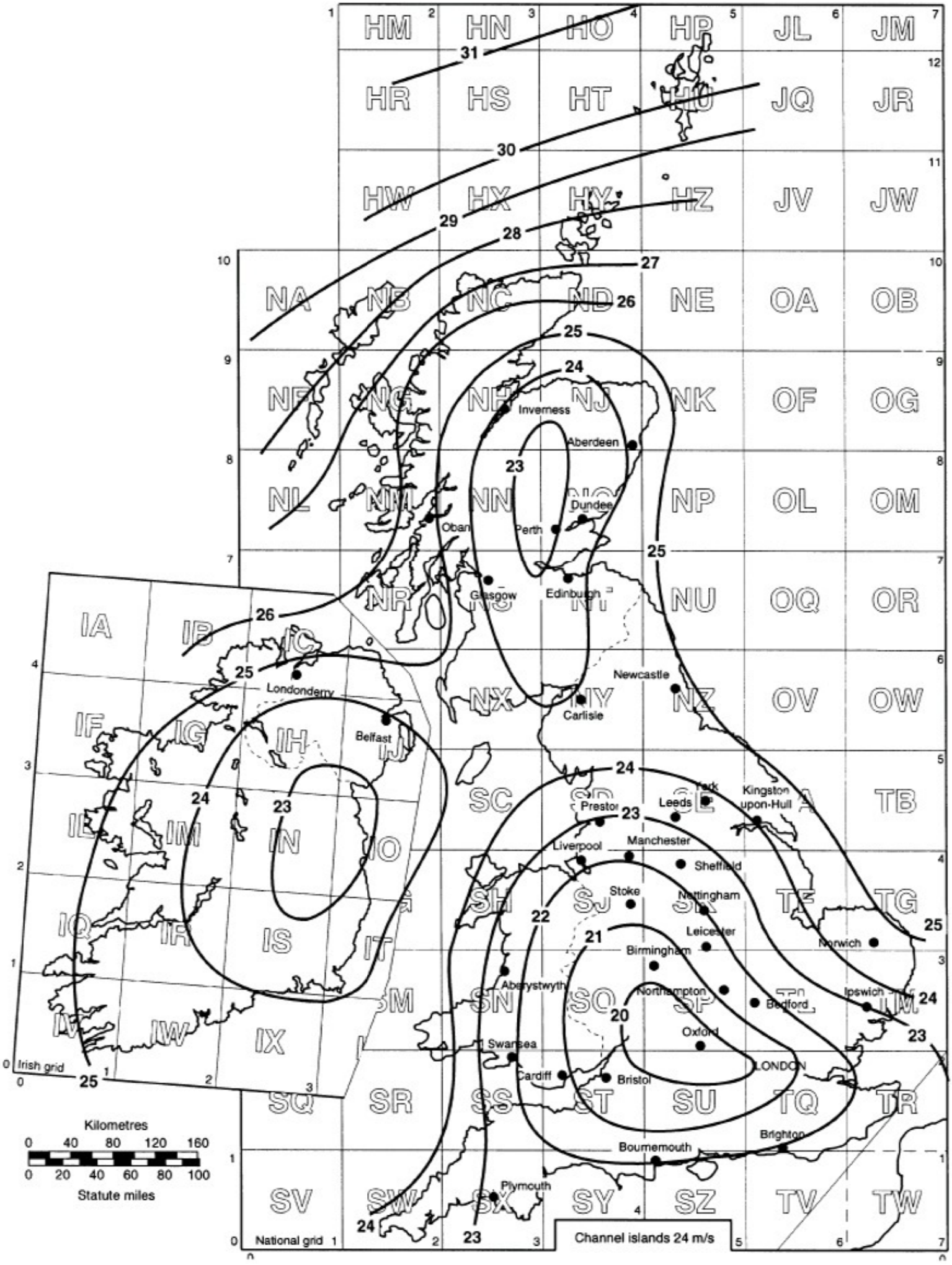
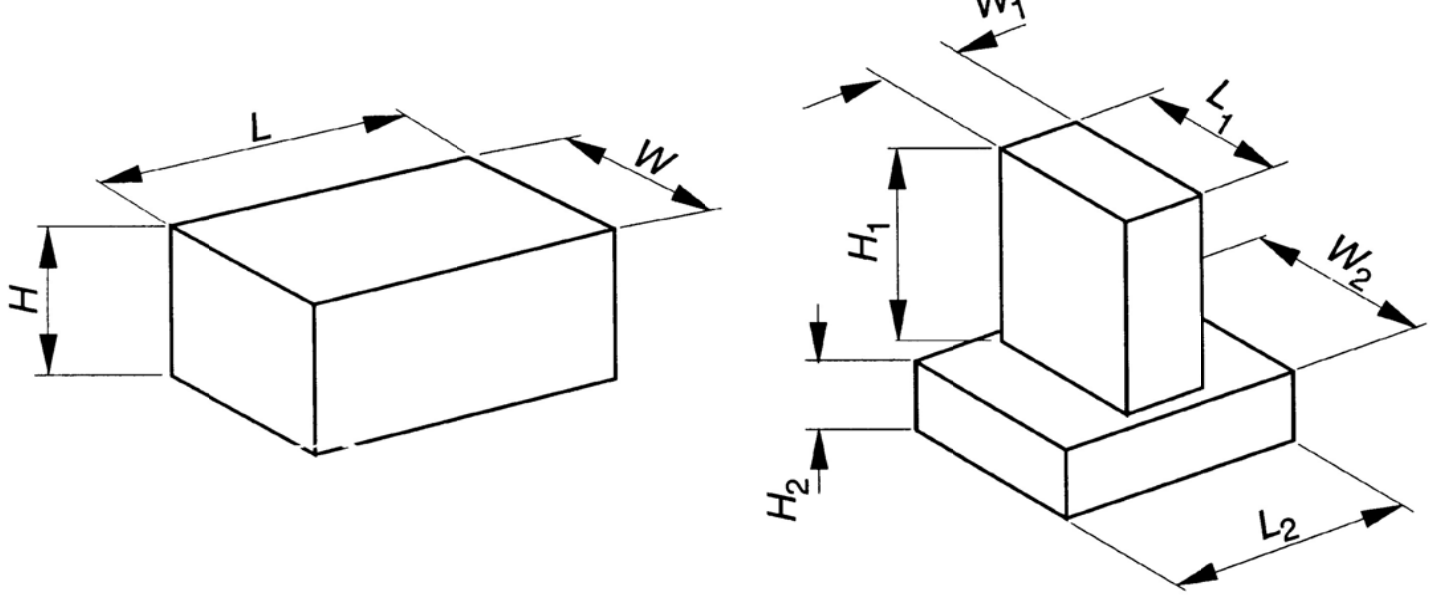
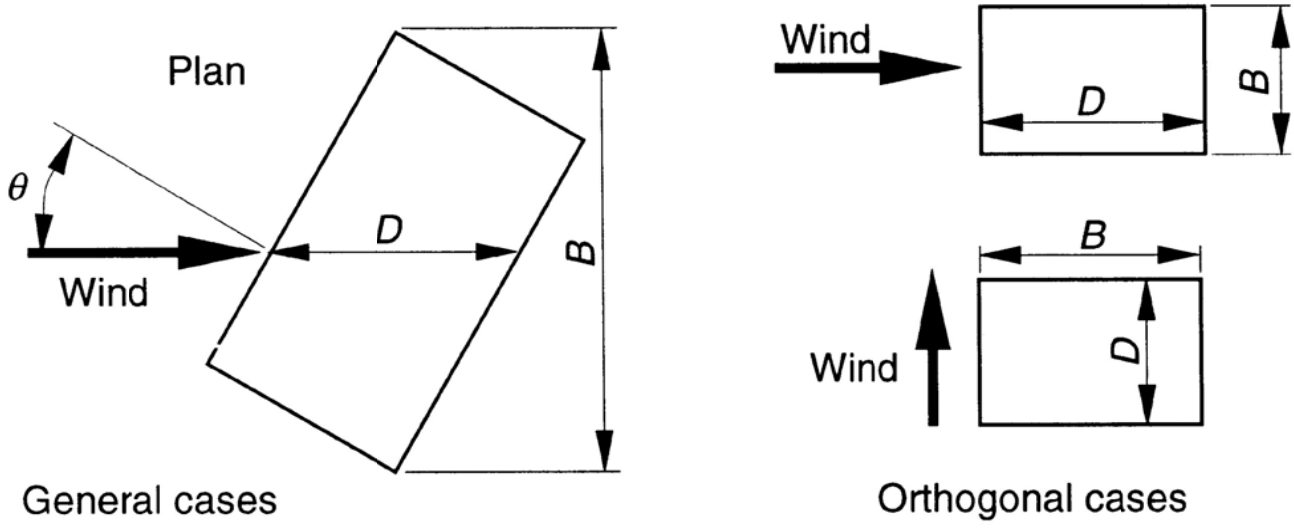


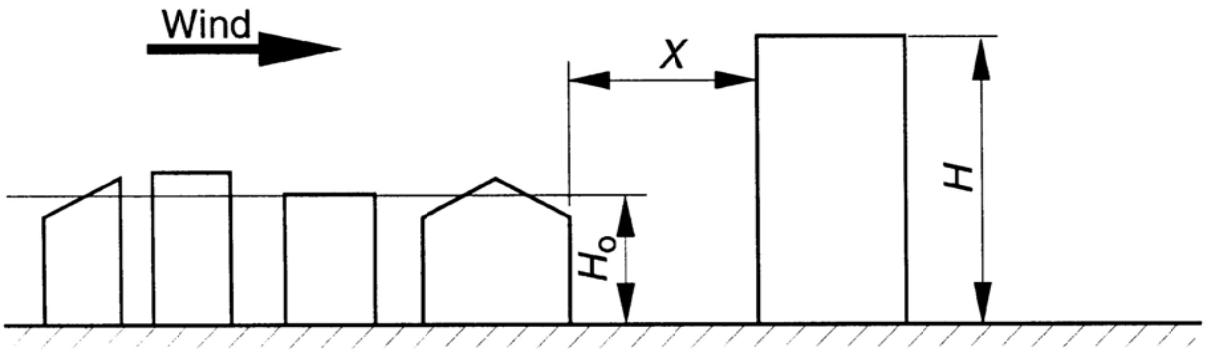
Figure 6 — Basic wind speed V_b (in m/s)



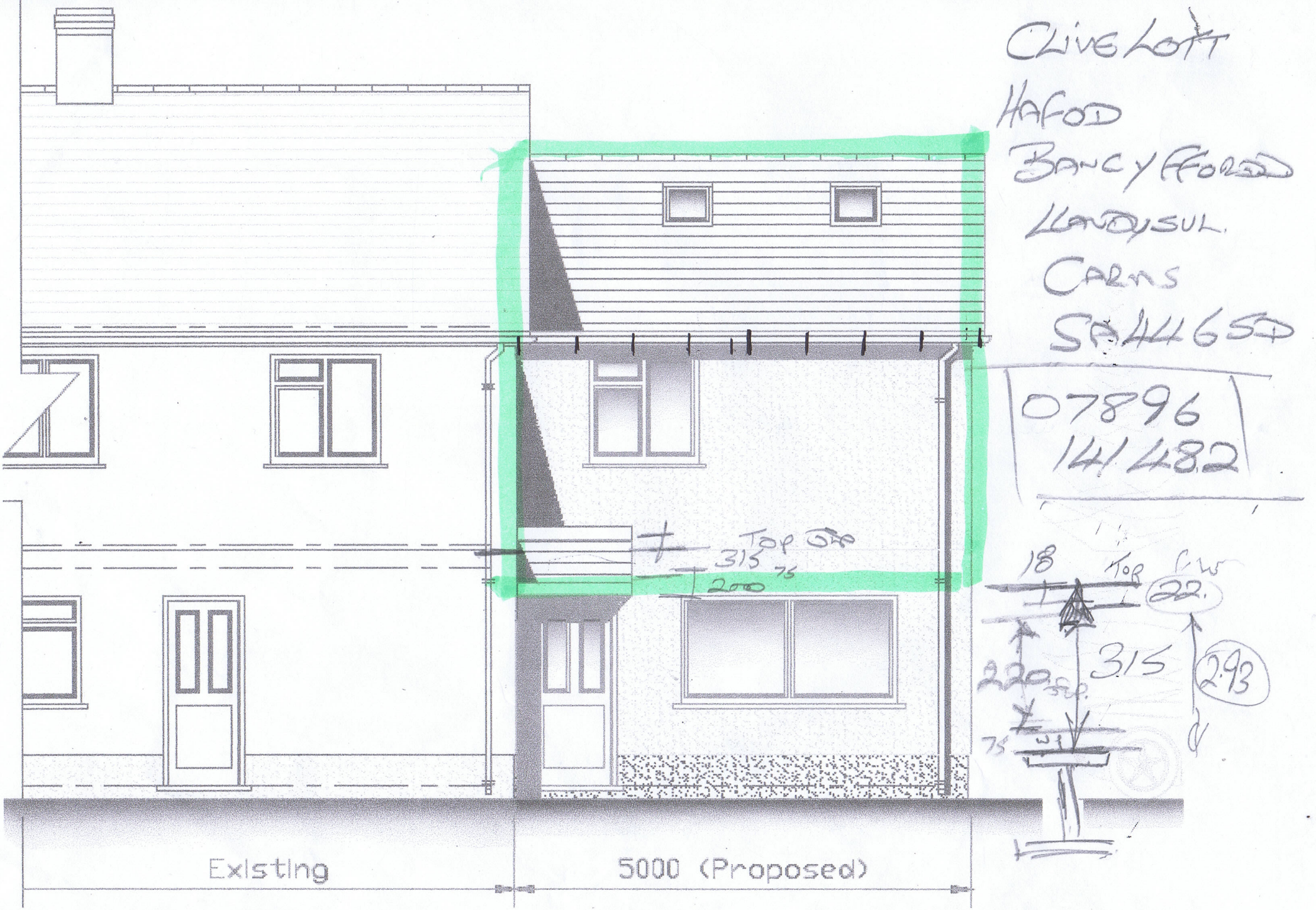
a) Fixed dimensions: length, width, height



b) Variable dimensions: crosswind breadth, inwind depth, wide angle



PROPOSED GROUND FLOOR PLAN / LLAWR GWAELOD



PROPOSED SOUTH WEST ELEVATION / EDRYCHIAD DE GOI

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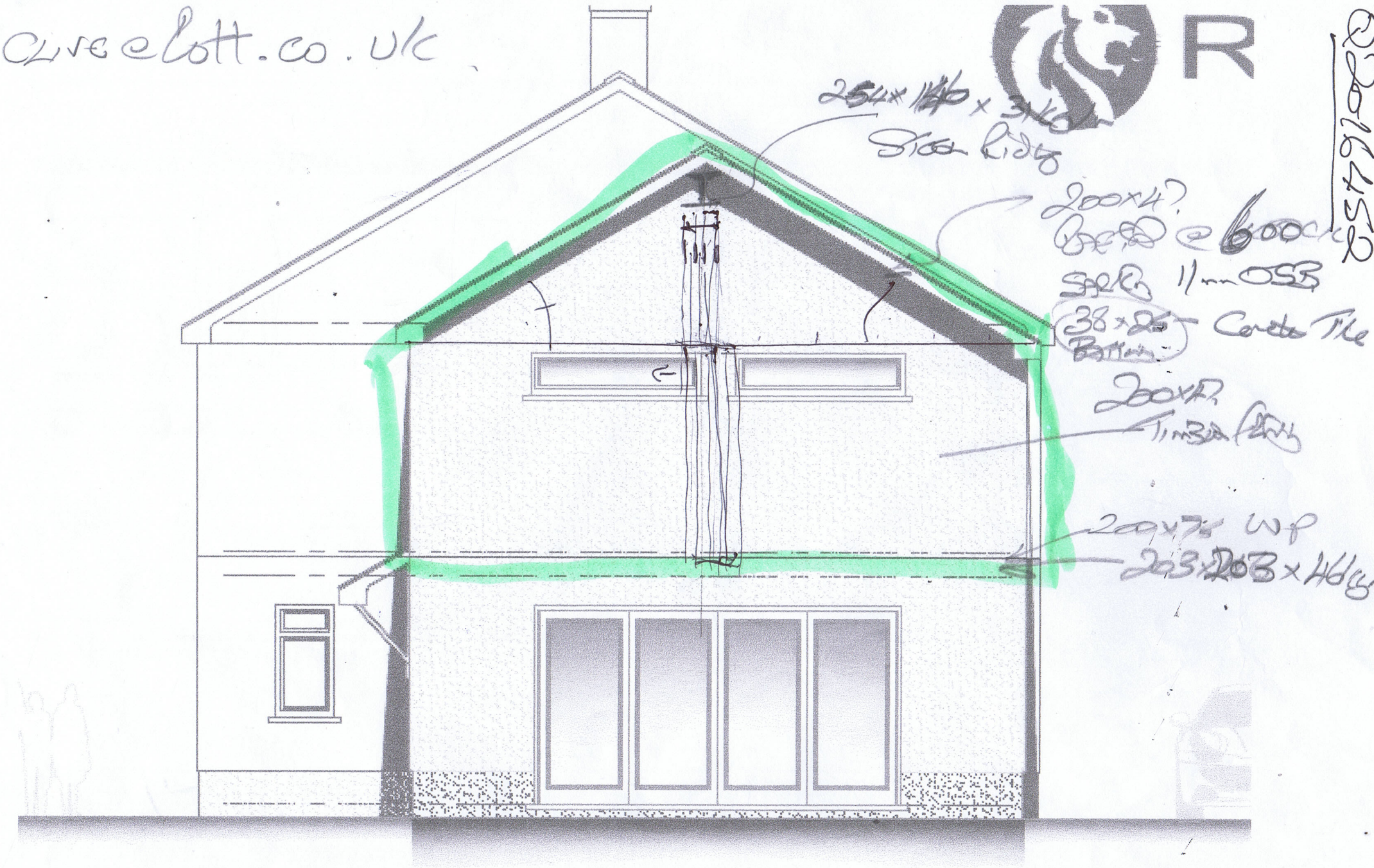
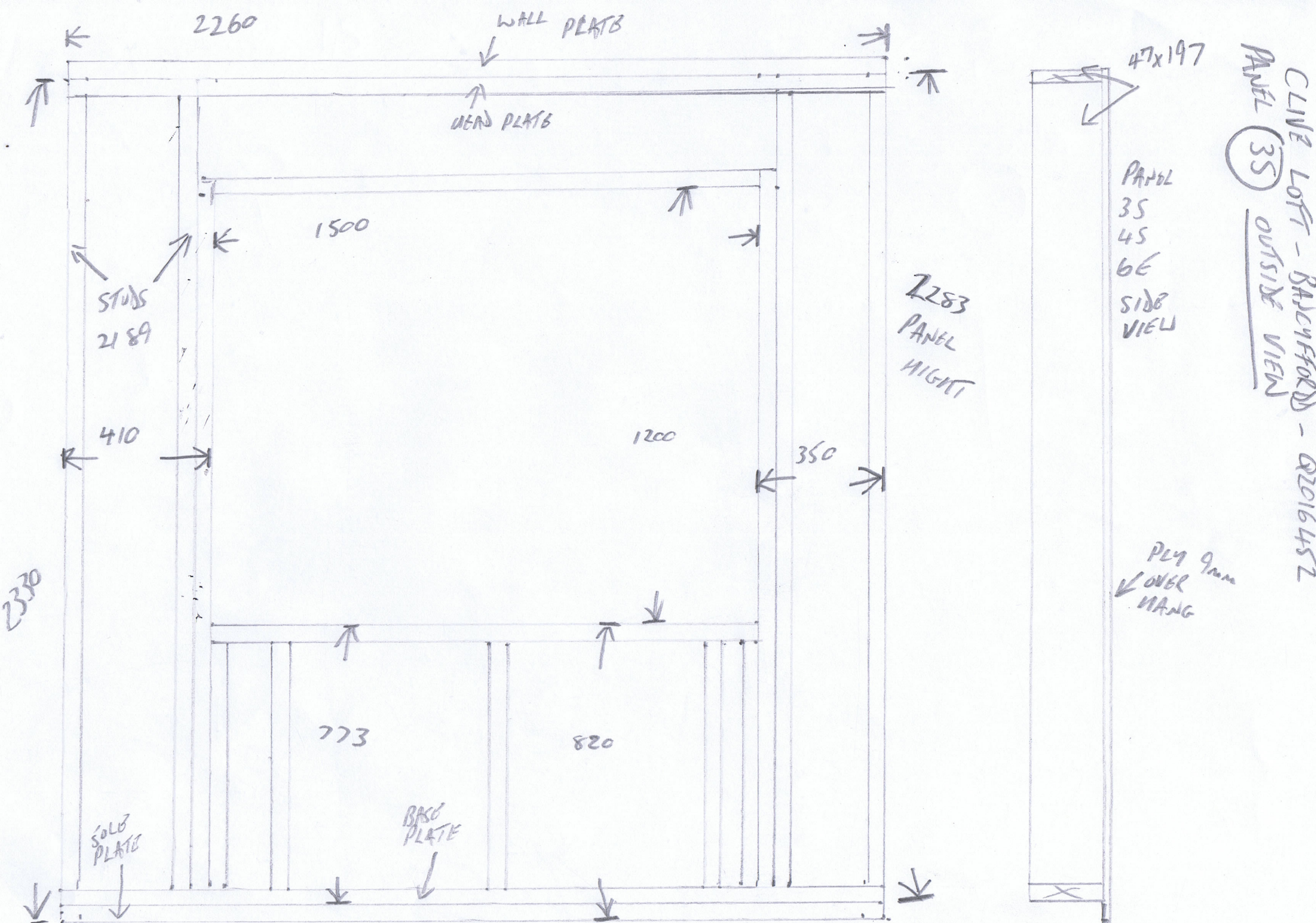


PROPOSED SOUTH EAST ELEVATION / EDRYCHIAD

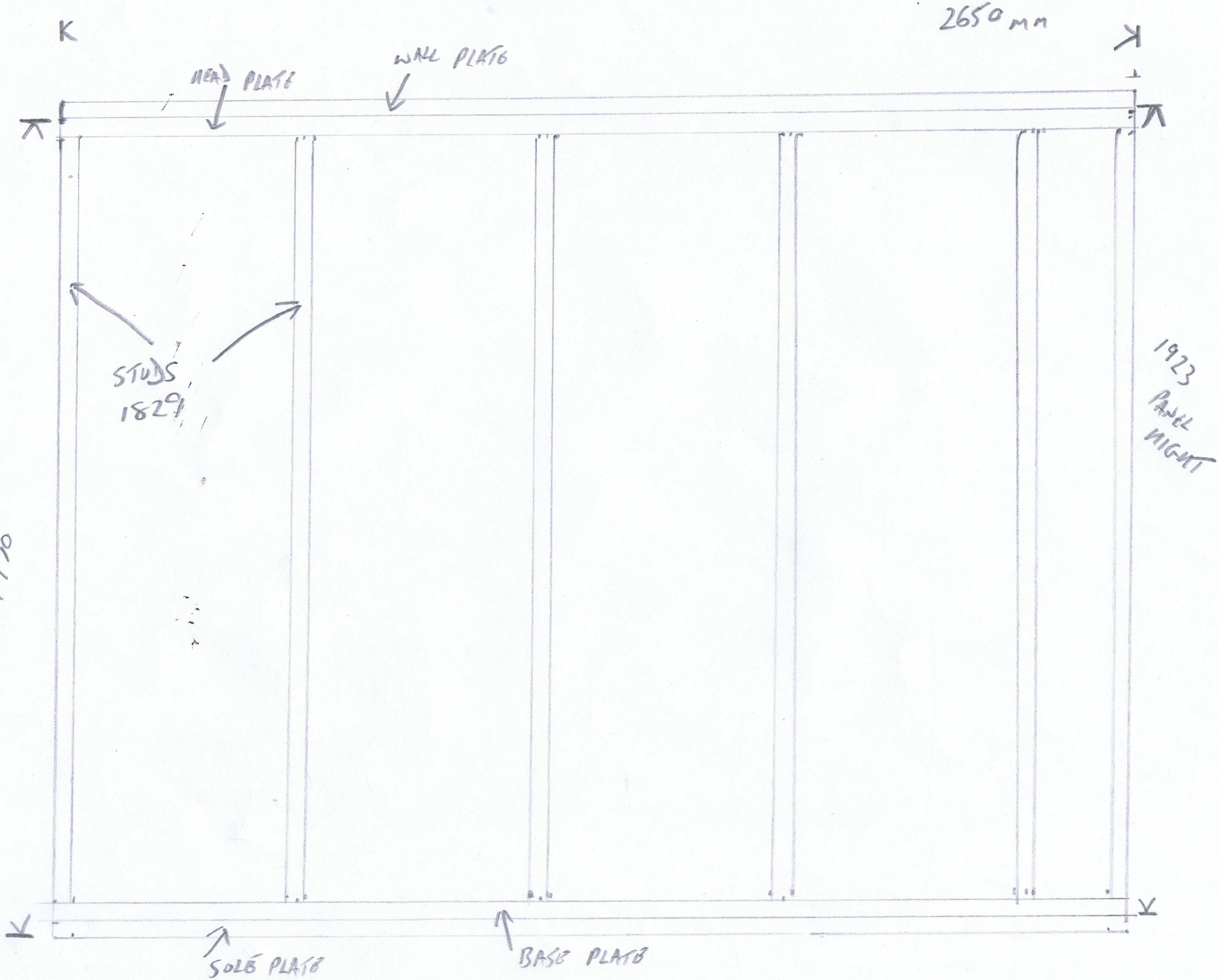


CLIVE LOFT - BANCHFORD - Q2016452

PANEL (35) OUTSIDE VIEW

OUTSIDE VIEW

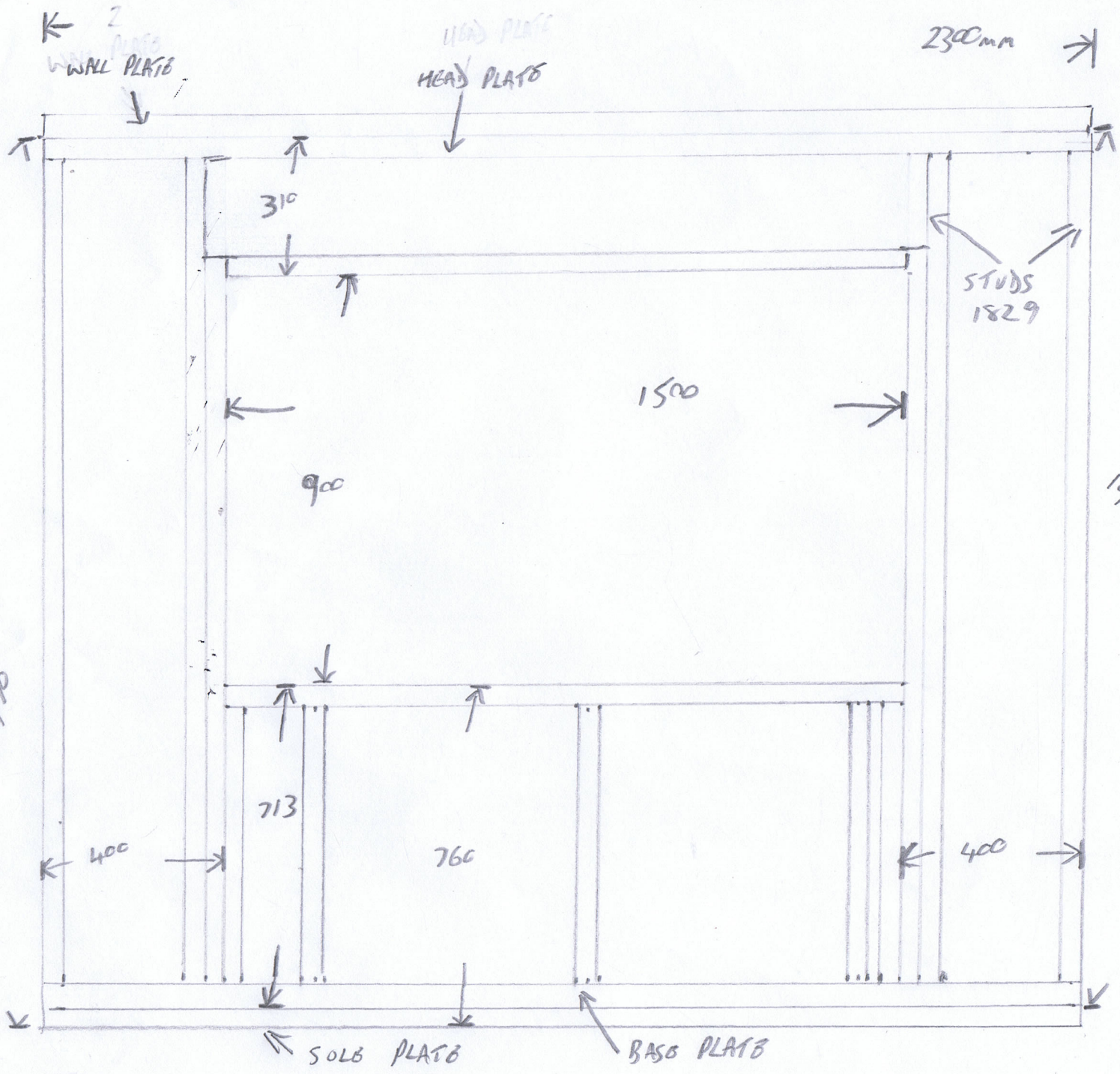
PANEL (2N) 2650mm

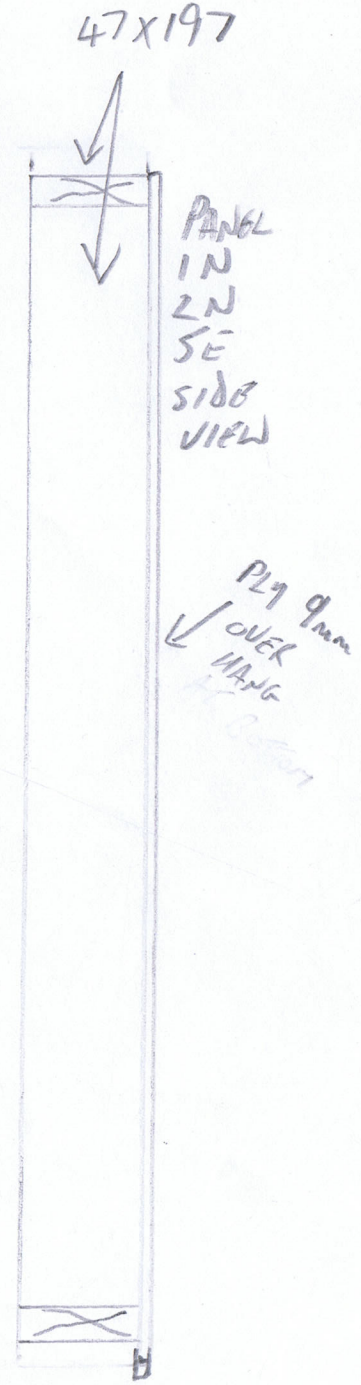


CLIVE LOFT - BANCHORD Q206452

OUTSIDE VIEW

PANEL (1N) 2300mm

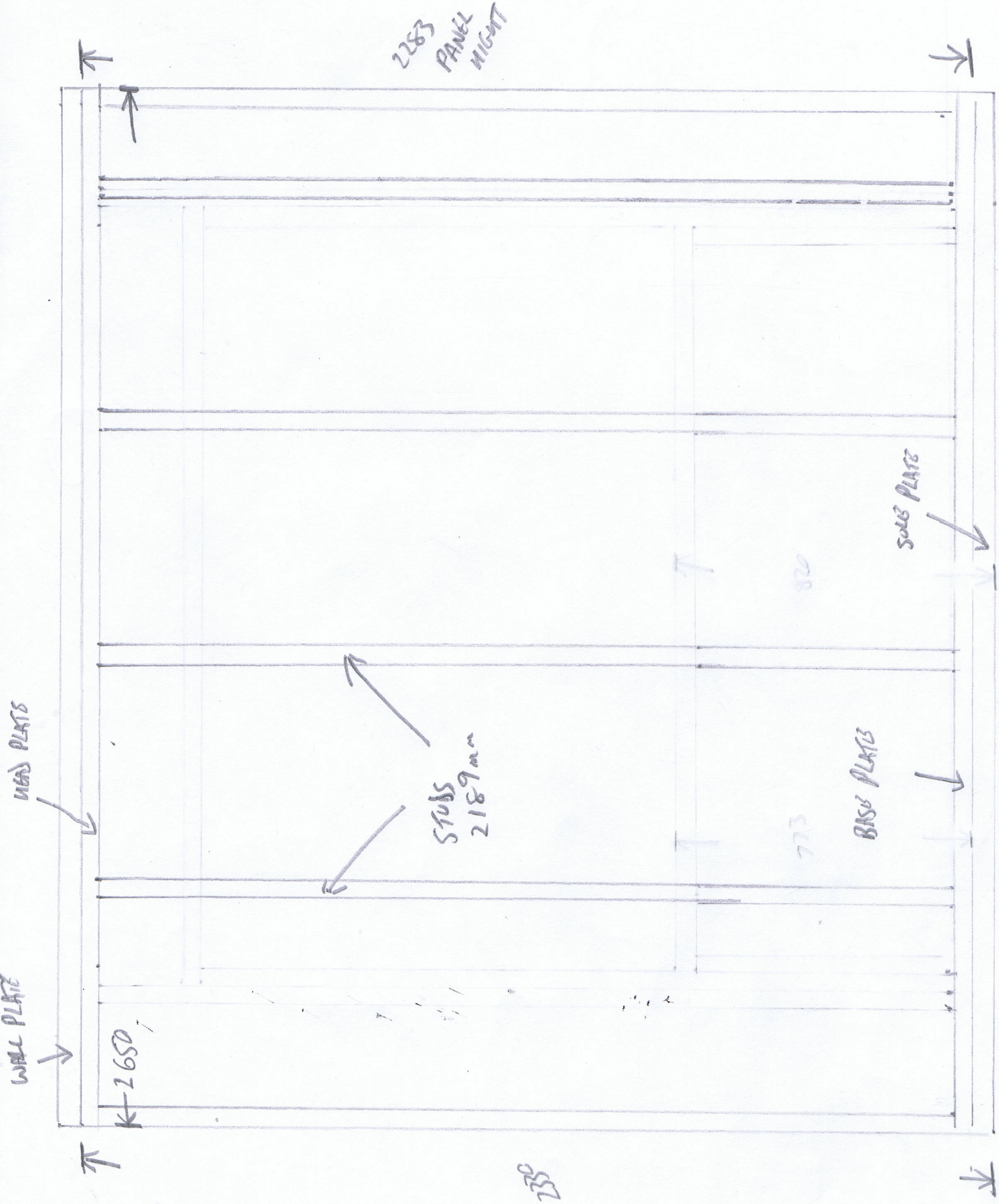




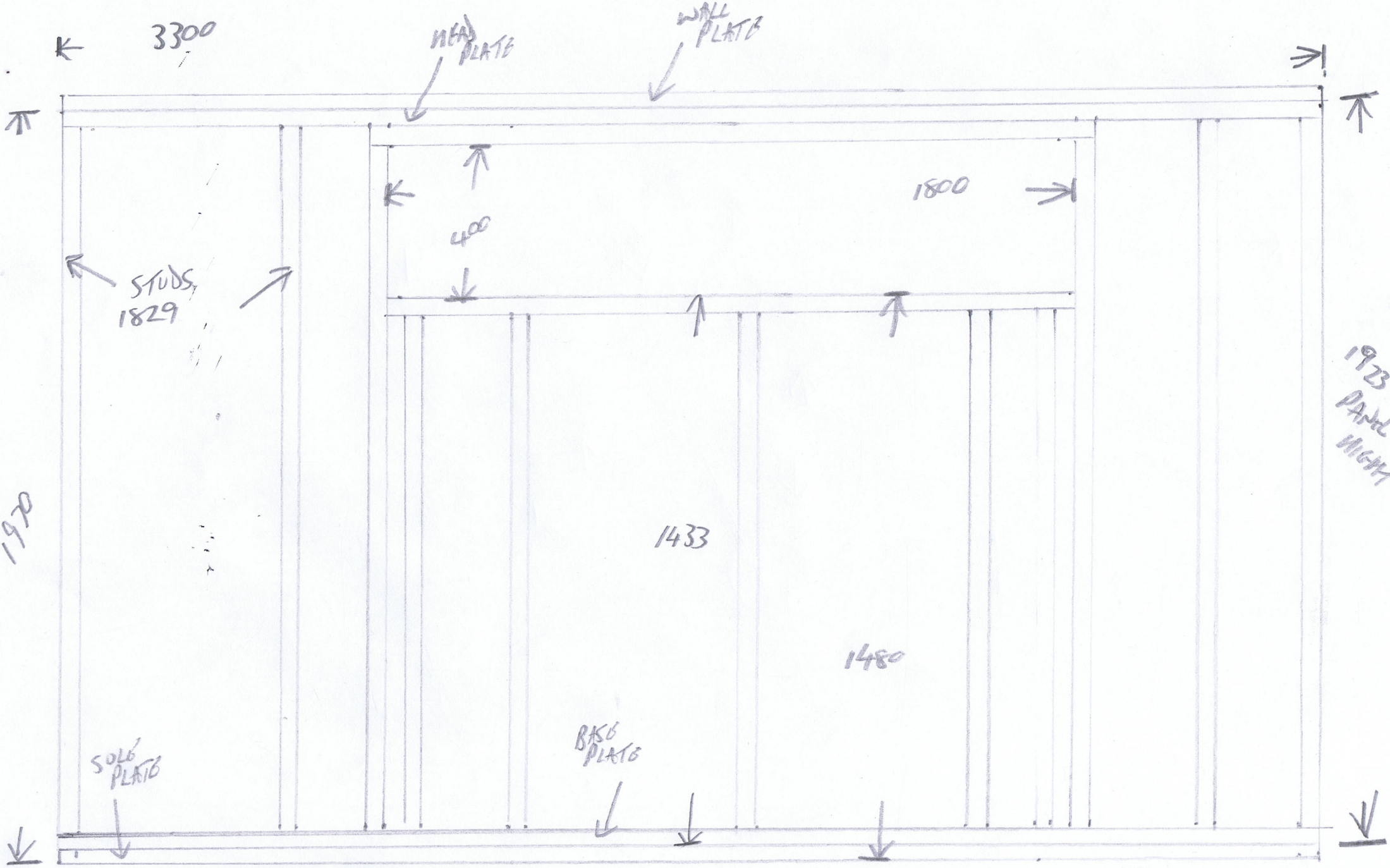
CLIVE LOFT - BANCHFORD Q2016452

CLIVE LOTT - BANCHFORD - Q2016452

PANEL (45) OUTSIDE VIEW

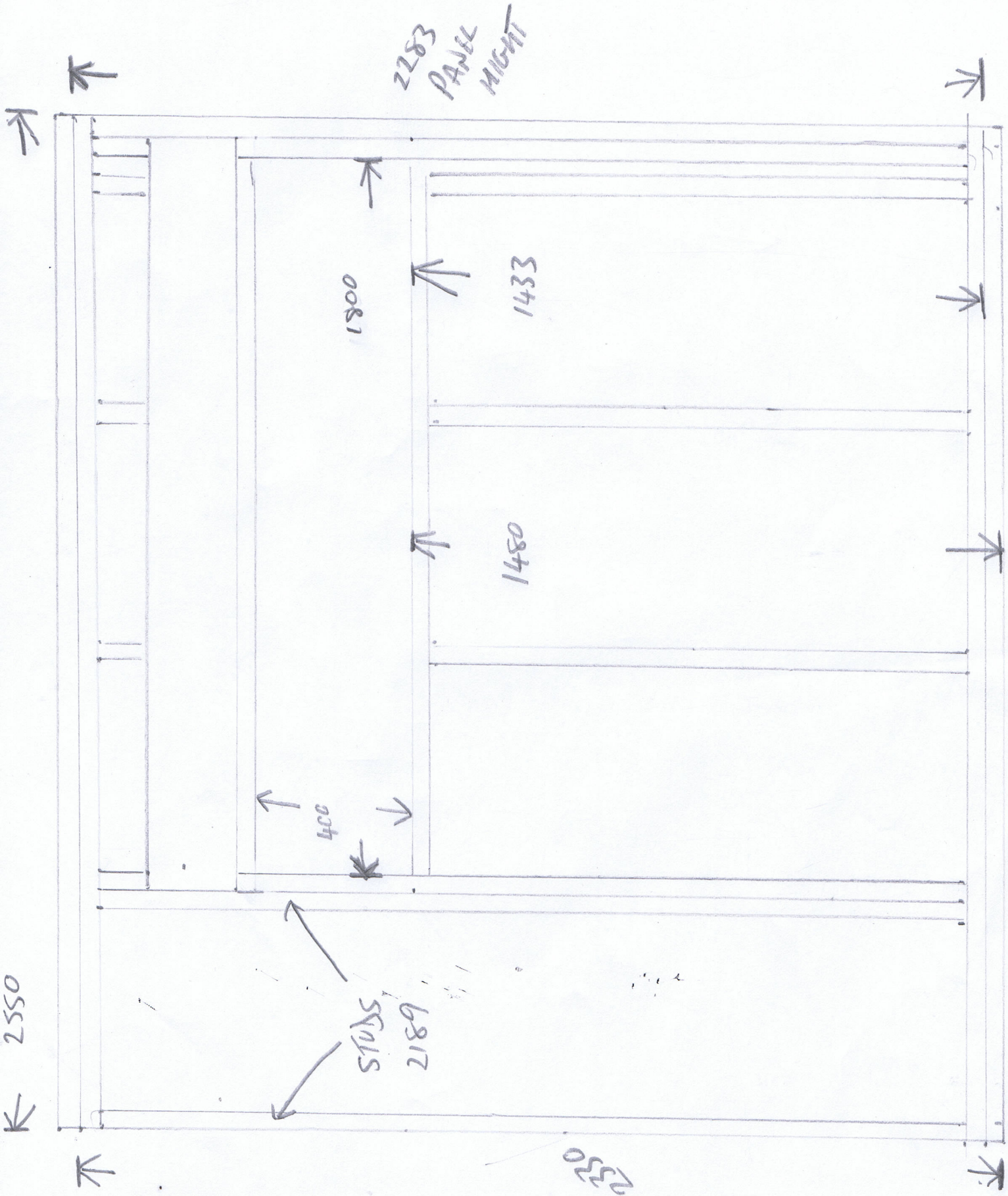


CLIVE LOFT - STRETFORDS - Q2016452 PANEL (5E) OUTSIDE VIEW



CLUB LOTT - BANCYFFORDD - Q2016452

PANEL (6E) OUTSIDE VIEW



SOUTH

W 16.4

150

2.26M

2.65M

5A

3E

6E

2.55M

3.64M LONG (3.62)
BEAM SUPPORT
150MM WIDE
2x 75x200MM TIMBERS
BOLTED TOGETHER

5E

6M

3.3M

2N

1N

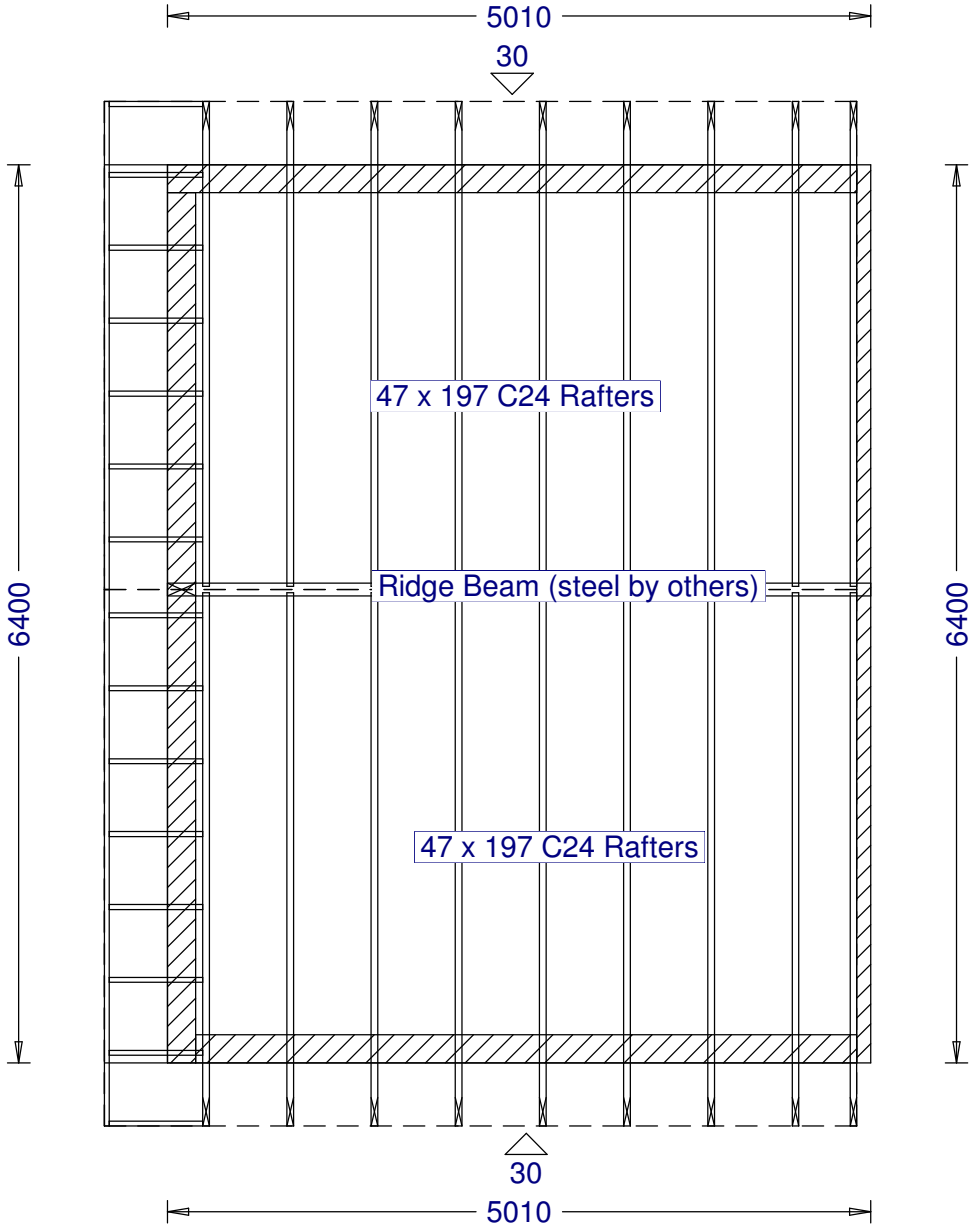
2.65M

2.3M

4.95M

NORTH

LOTT HAFOD BANCYFFORDD



Q2016329 - Clive Lott
Site: Hafod, Bancyffordd, Hafod, Llandysul, Carms SA44 6SD
Site Elevation: 210m
Site Exposure: Country
Construction: 200mm Timberframe

Cut-roof rafters @ 600 centres
Tile Loading: Standard (Concrete tile - to 0.575kn?m2)

Roof covering dead load: 0.685kN/m2

Scale: 1:53 Do not scale - if in doubt ask.

ITW ALPINE
Melingoed Ltd
TIMBER MERCHANTS
STATION ROAD - NEWCASTLE EMLYN - CARMS. - SA38 9BX
☎ Tel 01239 711070 Fax 01239 711645

Clive Lott
Site: Bancyffordd
Address:

Truss centres: 600
Date: 26/01/2017

Project No. Q2016329
Delivery/Works Order No.: 8590

DRAWING REGISTER & ISSUE SHEET

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Chepstow NP16 5UH
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E-mail: info@adeptco.co.uk

Job No.	3072	Sheet No.	1

Project Title:	**First Floor Extension, Hafod, Bancyffordd, Llandysul SA44 4SD**

Drawing Description	Number	Size	Date of Issue D	15	M	2	Y	17
Line & Point Loads	001	A4		X				
Structural Mark-Ups	002	A4		X				
Structural Calculations	1x	A4		X				

Distribution	Number of copies
Mark - Melingoed Ltd	X

P - Paper N - Negative CD - CD disk E - E-mail	Media	E
B - Billing T - Tender A - Approval P - Preliminary I - Information C - Construction	Status	C
	Issued By	RG

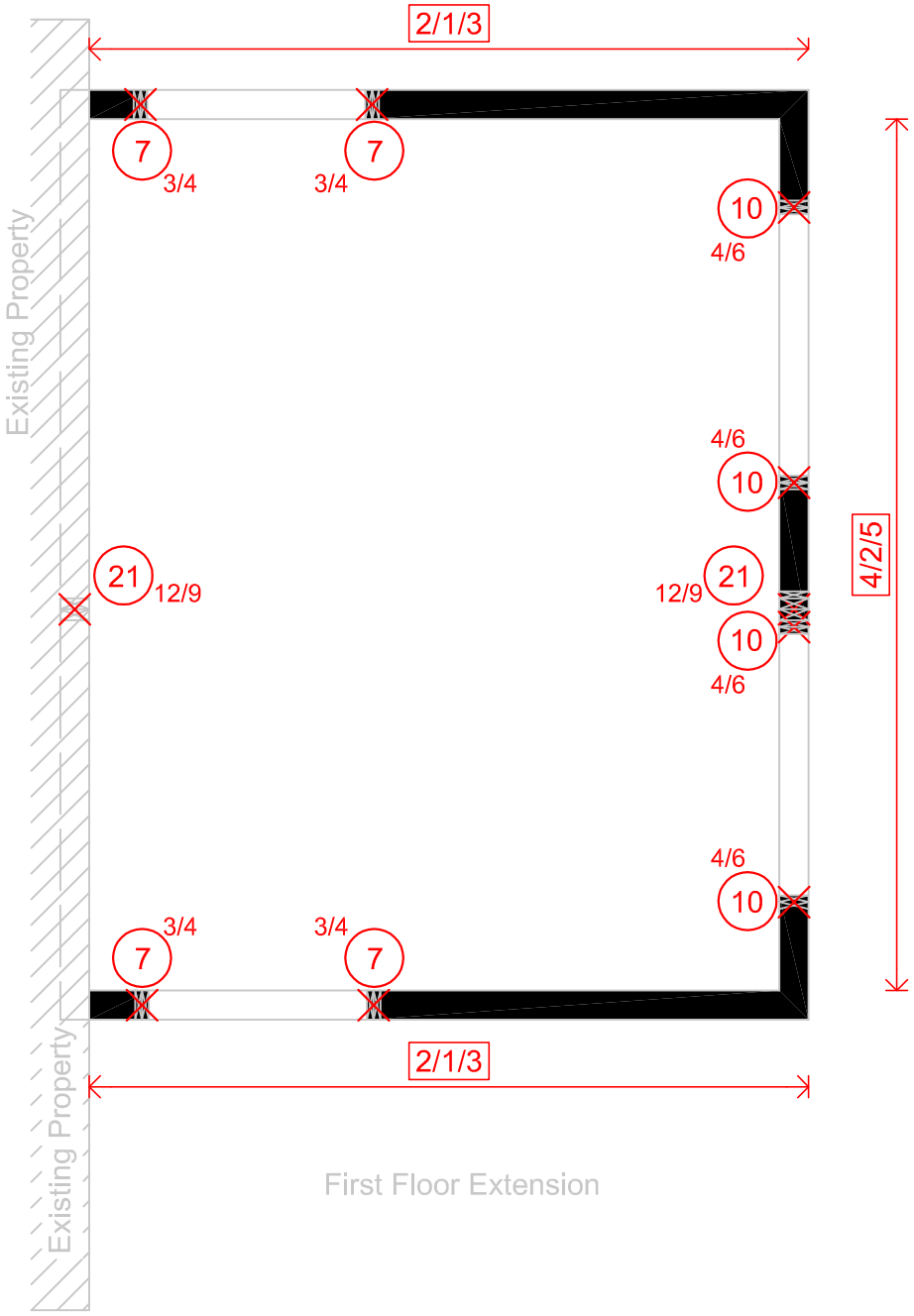
This sheet indicates the latest issue of registered drawings&calculations. Previous issues should be removed from circulation.

NOTES:

5/2/1 Denotes (UNFACTORED DEAD/IMPOSED/WIND) Line Loads IN kN/m run. Minimum loads of 5kN/m Ommited for Clarity.
The wind load gives a reversible triangular load distribution of max.positive to max.negative.

25 9/16 Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads in kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight cladding, if present is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 3kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings in both the internal and external loadbearing wall (refer to architects layouts for extent of all openings). these should be calculated from UDL and allowed for in the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR Inner leafs. if masonry is included it will be denoted : M -
Ground floor loads are excluded. If a timber ground floor floor is included it will be denoted : GF -



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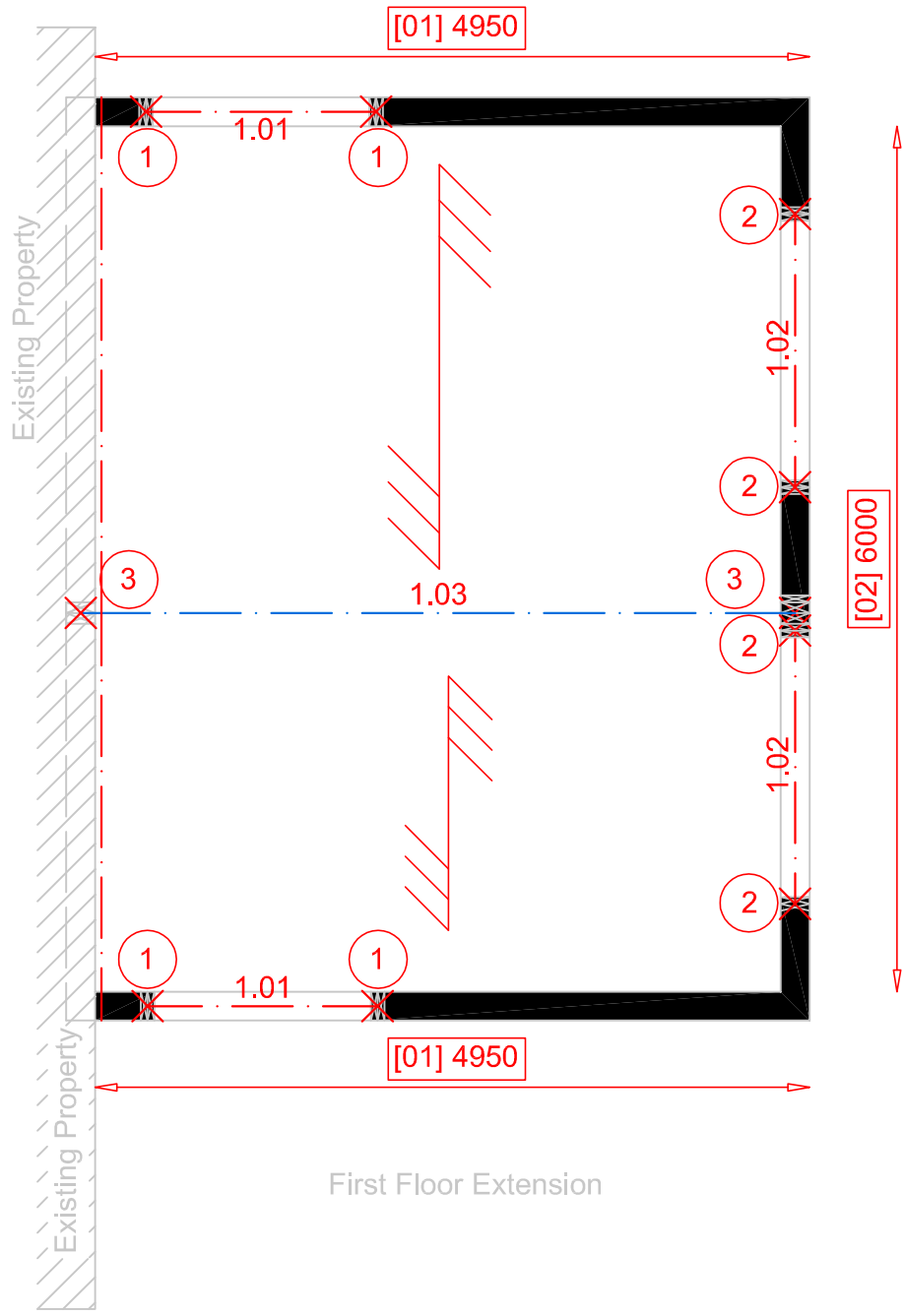
PROJECT: First Floor Extension, Clive Lott, Hafod, Bancyffordd, Llandysul SA44 4SD		Drawing title: LINE & POINT LOADS	Drawing Number: 001
CLIENT: Melingoed Ltd		Date: 15/02/2017	Project Number: 3072



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PROJECT First Floor Extension Clive Lott, Hafod, Bancyffordd, Llandysul SA44 4SD		Drawing title REFERENCES	Drawing Number SK1
CLIENT Melingoed Ltd		Date 15/02/2017	Project Number 3072

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Chepstow, Monmouthshire NP16 5UH
Tel: 01291 635522

landysul SA44 4SD

Structural Calculations

For

Timber Frame Superstructure

On

First Floor Extension

Clive Lott, Hafod, Bancyffordd, Llandysul SA44 4SD

-

These calculations have been prepared specifically for Melingoed Ltd, and for the project refered to above.
No liability will be accpeted to any third party for the use of these calculations unless by prior agreement in writing.
Where repeat house types occur liability will only be accepted for the plots for which an agreed repeat fee has been paid.

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.

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Date: Feb-17

Project Reference: 3072
Project Engineer: RG
Checked By: MK
Date: 15/02/17

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Project	Project no	**CALCULATION SHEET**
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: Index 1

Design philosophy

These calculations have been produced broadly in line with the recommendations made in the TRADA publication Timber Frame Housing – Structural Recommendations and the Structural Timber Association (previously UKTFA) publication STRUCTURAL GUIDANCE for Platform Timber Frame. The full texts of these documents are available on the www. Where reference is made to British Standards, this also include the appropriate section of the Eurocodes.

1 Loading on structural elements

1.1 Structural duties of timber frame elements

1.1.1 Timber frame wall panels

Timber frame panels used in house construction have three major structural duties to perform: support of vertical loading, resistance to deformations caused by horizontal loading in their plane and resistance to wind loading perpendicular to their plane.
Resistance to vertical loads is checked according to normal engineering principles, bearing in mind that in timber design the duration of each load (long-, medium-, short- or very short-term) has to be considered because the strength of the timber members depends on the duration of the loads. The racking or shear resistance of wall panels to horizontal load is calculated according to procedures set out in BS 5268-6.1 Structural use of timber –
Code of practice for timber frame walls – Dwellings not exceeding four storeys, which are based on data from tests on typical timber frame wall panels. Where there are insufficient racking walls, sway frames may be added and the derivation of forces applied in the 2D plane frame analysis is shown in the relevant sections of the calculations.

1.1.2 Horizontal diaphragms

The horizontal diaphragms formed by floor, ceiling and roof systems are usually required to take loads in their own plane. The illustration shows a floor and roof diaphragm resisting wind load on a gable wall. The ends of the gable wall are supported directly by the front and rear walls of the building, and the bottom edge by the foundation. The load on the rest of the wall is transferred via the horizontal diaphragms into the front and rear walls where their shear resistance can transfer it to the foundations. The first floor diaphragm takes half the net load on the ground floor walls plus half the net load on the first floor walls. The roof diaphragm takes half the net load on the first floor walls plus load from the roof. For wind parallel to the ridge it is usual to assume that half the net horizontal wind load on the spandrels or roof is transferred to the roof diaphragm; for wind perpendicular to the ridge all the net horizontal roof load is transferred to it. Where adjacent panel edges are fastened with nails or screws to the same timber members such as joists or blocking, the resulting connection between the panels enables shear forces to be transferred from one panel to the next. This is an essential part of the diaphragm action. It may be assumed that conventional floors and flat roofs, in which a wood based panel product is fastened to timber joists, have adequate strength and stiffness as horizontal diaphragms, provided that:
• the diaphragm span : depth ratio does not exceed 2:1 in either wind direction (BS 5268-6-2 Clause 6.5)
• the span does not exceed 12 m between supporting walls (BS 5268-6-2 Clause 6.5)
• the fixing around the edges of the panels complies with standard recommendations (eg 3.00 mm diameter ringed shank nails at 150 mm centres for plywood or 3.35 mm ringed shank nails at 300 mm

for wood particleboard and OSB, with a length equal to 2.5 times the board thickness)
• the perimeter of the diaphragm is attached to the walls with fastenings of equivalent strength.

Plasterboard ceilings in roofs that comply with BS 5268-3 Annex A may also be assumed to provide adequate diaphragm action provided that truss clips are used to secure every truss to a head binder and the fixing around the edges complies with standard recommendations (3.5 mm diameter plasterboard nails or screws 40 mm long at 150 centres). It is recommended that in areas of high wind load (eg with a dynamic wind pressure > 1500 N/m²), and always for horizontal diaphragms outside the range given above, the required fastener spacing should be calculated.

6 Multi-storey buildings

6.1 General design considerations

The Timber Frame 2000 project, begun in 1995, was carried out by the Building Research Establishment and TRADA Technology Ltd in collaboration with the British Government and the timber frame industry. It demonstrated beyond doubt that conventional timber frame construction can be used to build economical, safe and serviceable multi-storey dwelling units. The report Multi-storey timber frame buildings – a design guide concluded that the use of BS 5268-6 can be extended to the design of platform frame buildings up to eight storeys without excessive deflection.

Particular attention should be given to the following issues:
• each storey should have sufficient strength and stiffness to resist a horizontal long-term force of 2.5% of the vertical load + live load
• overturning forces should be carefully checked
• where party walls separate the structure into separate units, the engineer should ensure that horizontal forces can be taken by each unit independently or be transferred across the party walls
• where additional stiffness has to be provided, eg by the introduction of portal frames, the deflection limit should be appropriate for the structure and finishes, but may be no more than height/500
• resistance to disproportionate collapse should be checked.

6.2 Construction

The stability of the building during construction, ie before vertical loads are applied and plasterboard is fixed, must be considered as part of the design process. It is acceptable to reduce the wind load in accordance with BS 6399-2 for the construction process. Particular attention should be given to the buckling resistance of studs in party walls, which may have neither plasterboard nor sheathing attached during construction. Significant vertical loads can result from the storage of construction materials such as plasterboard packs, so normally it will be necessary to specify requirements for temporary bracing (see BS 5268-6.1).

6.3 Disproportionate collapse

While the Timber Frame 2000 project demonstrated that timber frame construction is remarkably resilient to disproportionate collapse, specific design checks against this possibility may be required under the Building Regulations. Guidance is expected in a planned revision to BS 5268-2: 2002. Meanwhile, guidance has been published in the UK Timber Frame Association Technical Bulletin 3 Design guidance for disproportionate collapse. This specifies minimum nailing between the lower rails of wall panels through the interfaces to the upper rails of the panels beneath as follows:
3.1 mm diameter nails at 300 mm centres for Class 1 and Class 2A buildings
3.1 mm diameter nails at 200 mm centres for Class 2B buildings.

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072.00	

Drawing no	Calculation by	Checked by	Date
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Roof Constructions - continued

Pitched / Curved Roof *Applicable* Slope / Average Slope: 30.0 degrees

Dead (on slope area)	**Density**	**Thickness**			**KN/m2** (on slope area)	
Tiles	2000	35			0.700	
Battens & Felt	530	25	30	100	0.040	
Truss Rafters / Rafters	530	47	450	600	0.187	
Insulation	50	200			0.100	
Plasterboard	850	15			0.128	
Chipboard deck					0.000	
Bottom chord				600	0.000	
Plasterboard					0.000	
				On Slope	1.154	1.154
				On Plan - Attic	0.000	**0.000**
Imposed **Roof area**	31.68 m^2			On Plan - Other	1.333	**1.333**
External roof slope					0.750	
Internal Truss type:					0.250	

For attic trusses only: *Truss span:* *m*
Dim'n between verticals: *m*
Average imposed load: *kN/m²*

Total - Attic	**0.00 KN/m²**
Total -Other	**2.33 KN/m²**

External Balcony *Not applicable*

Dead	**Density**	**Thickness**		**KN/m2**
	3000	25		
	750	4		
	150	85		
	530	18		
	530	25	50	
	20	150		
	850	25		
	850	25		
	530	235	38	

Imposed
all

Total	**0.00 KN/m²**

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Project	Project no	**CALCULATION SHEET**
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: L4

Wall Constructions

Party Wall *Not applicable*

	Density	Thickness	width	centres	KN/m2

Value for 1 Leaf **0.000 KN/m²**

Ht= 2.4 m gives **Total** **0.00 KN/m run**

Load-bearing Internal walls

			width	centres	KN/m2
Plasterboard *(optional)*					0.000
Plasterboard					0.000
Studs			38	400	0.000
OSB	750				0.000
Insulation					0.000
Plasterboard					0.000
Plasterboard *(optional)*					0.000

0.000 KN/m2

Non Load-bearing Internal walls *(Partitions)*

Build up as Load Bearing walls but with only 1 layer 12.5mm plasterboard e.f.

Ht= 3.65 m, this is: **0.00 KN/m run** over 1.6m **0.00 KN/m²**

If this value is deemed inappropriate use, enter new value: **0.27** **0.27 KN/m²**

External Wall	Density	Thickness	width	centres	KN/m2	Eccentricity *(If applicable)*	
Plasterboard	850	12.5			0.106		
					0.000		
Studs	530	200	38	600	0.067		
OSB	750	11			0.083		
Insulation	20	200			0.040		
					0.000		mm
					0.000		mm
					0.000		mm

Note: the eccentricities are from face of stud NOT the sheathing. **0.296 KN/m²**

Ht= 3.65 m gives 1.08 KN/m run

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: WL1

Summary of Design Wind Loads

	Wind on long elevation	Wind on short gable
For Building Stability Checks Use Wind Pressure:	**1.17** kN/m²	**1.17** kN/m²
Wind Uplift:	**-0.58** kN/m²	

	General Condition	Zone A
For Panel Design Checks Use Wind Presssure / Suction:	**1.27** kN/m²	**2.03** kN/m²
Wind Uplift:	**-0.77** kN/m²	

In order to avoid confusion on panel design use a common design wind pressure for all panels of:
1.27 kN/m² for General conditions and
2.03 kN/m² for Zone A

Refer to overall stability sheets for applicable k100 factors.

Site Location Map

National Grid Reference:

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: WL2

Wind Loading - Building Parameters

Permanent Condition

This calculation is based upon the guidelines of BS 6399: Part 2: 1997

Standard Method or Hybrid Method *as noted below*

Dynamic Classification

Building Height, Hr:	Ridge:	4.17	m	Eaves: 2.65	m
Building Type Factor, Kb		0.5	*(Timber Framed Buildings)*		
Dynamic Augmentation Factor, Cr		0.006			

Standard Method Calculation

Location	Llandysul		
Basic Wind Speed,Vb	23.0	m/s	*(see fig. 6)*
Site Altitude	210.00	m	*(Base Altitude for Hybrid Method - - refer to cl. 3.2.3.4.10)*
Altitude Factor, Sa	1.21		
Direction Factor, Sd	1.00		
Season Factor, Ss	1.00		
Probability Factor, Sp	1.00		

Effective Height

Reference Height, Hr	4.17	m	
Terrain	Country		*(see Note 1 below)*
Average Roof Top Height, Ho		m	
Building Upwind Spacing, Xo		m	
Effective Height, He	4.17	m	

Effective Wind Speed

Closest Distance to Sea	20.5	km	*(see Note 1 below)*
Site Wind Speed, Vs	27.83	m/s	*(see table 4 for Standard Method)*
Terrain Factor, Sb	1.557		***Sb is taken from table 4 without interpolation.***
Effective Wind Speed, Ve	43.32	m/s	
Interpolated Value of Sb (*if reqd*.)			***Enter interpolated value if reqd.***

Dynamic Pressure - No wind angle **1.150** **kN/m²**

Wind at 0⁰ **1.150** **kN/m**

Building reference angle

Wind at 90⁰ **1.150** **kN/m**

Additional Details to BS 6399: Part 2: 1997 - ***Hybrid Method -*** *(Cl. 1.8.4 option b)*

Direction Factor, Sd for angle		(*Worst case*)	**Hybrid method:** **No**
Gust Peak Factor, g_t			*(see page WL5 for topographical data used.)*
Fetch Factor, S_c (*Table 22*)			
Fetch Adjustment Factor, T_c (*Table 23*)			
Turbulance Factor, S_t (*Table 22*)			
Fetch Adjustment Factor, T_t (*Table 23*)			
Distance to edge of town at worst case direction		km	*(see Note 1 below)*
Distance to sea at worst case direction		km	
Topographic Increment, S_h (*Table25*)		*(clause 3.2.3.4.10)*	

Note 1: If using the Hybrid Method, the Terrain and Closest Distance to the sea should be in the direction being considered.

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First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
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Wind Loading - Pressure Co-efficients for Overall Stability

Size Effect Factors

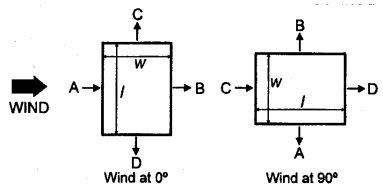
Surface	Dimn a		Ca *(see fig 4, Graph Line)*	B
Gable	6.35		0.99	
Elevation	5.5		0.99	
Roof	8		0.97	
Int Vol of 1 Apt.(m^3)	75.0	42.17	0.84	

External Pressure Coefficients - Walls

Dimn to between bldgs: 5.0
Adjacent faces: L
Result: ***Funnelling***

Building Width, W (*Gable*)	6.00	m
Building Length, L (*Elevation*)	4.95	m
Building Height, H	4.17	m
Exposure Case	Funnelling	

(see table 5)



Wind @ 0
D/H (*W/H*): 1.44
Wind @ 90
D/H (*L/H*): 1.19

Cpe Values

		Wind at 0^0			Wind at 90^0	
Surface A		0.85	Surfaces	Zone A	-1.60	*(see table 5 and fig 12)*
Surface B		-0.50	A & B	Zone B	-0.90	
Surfaces	Zone A	-1.30		Zone C	-0.90	
C & D	Zone B	-0.80	Surface C		0.85	
	Zone C	-0.50	Surface D		-0.50	

External Pressure Coefficients - Roof (*assuming equal pitches*) *(see tables 8-11incl. and figs. 12, 20 & 21)*

Roof Type / Pitch	Gable end	30
Wind Normal to Eaves	***Case 1***	***Case 2***
Zone C	-0.20	0.40
Zone G	-0.50	-0.50
Wind Normal to Gable		
Zone C (*Zone B if hip roof*)	-0.60	-0.60
Zone D (*Zone E if hip roof*)	-0.50	-0.50

Component forces (*kN/m*)

Horizontal	***Vertical***	
1.793	0.604	Max
	-1.467	Min
-0.199	-3.79657583	Max
	-3.80	Min

Wind Pressure For Building Stability
(by observation stability against overturning will be critical with wind on the longest face) as cl 2.1.3.6

Wind at 0^0 on Elevation **1.17 kN/m²**

Wind at 90^0 on Gable **1.17 kN/m²**

Wind Suction On Roof For Building Stability **-0.58 kN/m²**
Max downward pressure for roof designs: 0.39 kN/m²

For these two cases the effects of internal conditions can be ignored.

Use wind pressure based on eaves level for long elevation based on BRE Digest 436 Part 1

No

Also applies to hip end buildings

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Calculation sheet/revision no: WL4

Wind Loading - Pressure Co-efficients for Panel Design

Internal Pressure Coefficients

Cpi	0.2	(int pressure)	Cpi x Ca:	0.17
Cpi	-0.3	(int suction)	Cpi x Ca:	-0.25

Size Effect Factor Ca taken as 1.0 for a max diagonal 'a' of 5m.

Analysis Results for Cpi + 0.2 in kN/m^2

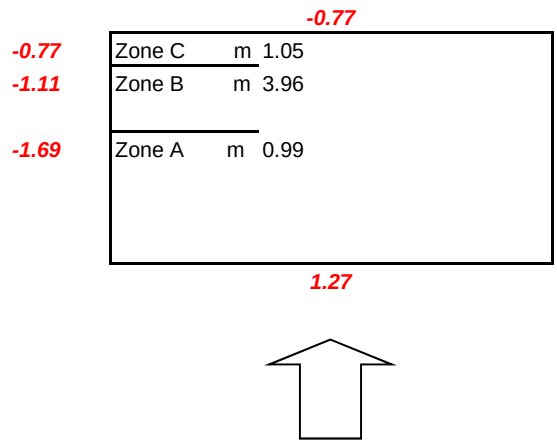
		Wind at 0^0			Wind at 90^0
Surface A		0.78	Surfaces	Zone A	-2.03
Surface B		-0.77	A & B	Zone B	-1.23
Surfaces	Zone A	-1.69		Zone C	-1.23
C & D	Zone B	-1.11	Surface C		0.78
	Zone C	-0.77	Surface D		-0.77

Analysis Results for Cpi - 0.3 in kN/m2

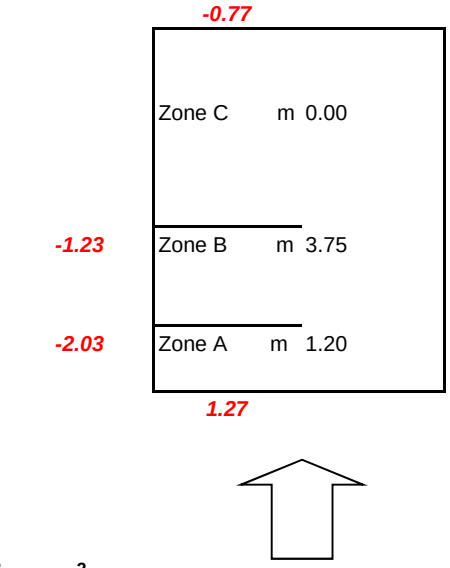
		Wind at 0^0			Wind at 90^0
Surface A		1.27	Surfaces	Zone A	-1.55
Surface B		-0.29	A & B	Zone B	-0.75
Surfaces	Zone A	-1.21		Zone C	-0.75
C & D	Zone B	-0.63	Surface C		1.27
	Zone C	-0.29	Surface D		-0.29

Diagramtic Summary of Wind Loads

Wind at 0^0



Wind at 90^0



Results Summary

General Condition	**1.27**	**kN/m^2**
Zone A	**2.03**	**kN/m^2**
Wind Uplift For Roof Design	**-0.77**	**kN/m^2**

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Calculation sheet/revision no: WL5

Wind Loading - Building Parameters

Temporary Condition - During Erection

This calculation is based upon the guidelines of BS 6399: Part 2: 1997

Dynamic Classification			
Building Height	4.17	m	
Building Type Factor, Kb	0.5		*(Timber Framed Buildings)*
Dynamic Augmentation Factor, Cr	0.006		
Standard Method Calculation			
Location	Llandysul		
Basic Wind Speed,Vb	23.00	m/s	*(see fig. 6)*
Site Altitude	210.00	m	
Altitude Factor, Sa	1.21		
Direction Factor, Sd	1.00		
Season Factor, Ss	0.98		*(see Annex D, cl D.2 & table D.1)*
Probability Factor, Sp	0.749		*(see Annex D, cl D.1)*
Effective Height			
Reference Height, Hr	4.17	m	
Terrain	Country		
Average Roof Top Height, Ho	0.00	m	
Building Upwind Spacing, Xo	0.00	m	
Effective Height, He	4.17	m	
Effective Wind Speed			
Closest Distance to Sea	20.5	km	
Site Wind Speed, Vs	20.43	m/s	
Terrain Factor, Sb	1.557		*(see table 4)*
Effective Wind Speed, Ve	31.80	m/s	
Dynamic Pressure	**0.62**	**kN/m²**	

Topograhical data used

Wind Direction	Distance to Sea (km)	Dist. to edge of town (km)	Obstruction height H_o(m)	Obstruction spacing X_o(m)	Dyn. Press. q (kN/m²)
0	0	0.00	0	0	
30	0	0.00	0	0	
60	0	0.00	0	0	
90	0	0.00	0	0	
120	0	0.00	0	0	
150	0	0.00	0	0	
180	0	0.00	0	0	
210	0	0.00	0	0	
240	0	0.00	0	0	
270	0	0.00	0	0	
300	0	0.00	0	0	
330	0	0.00	0	0	

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Calculation sheet/revision no: OS 1

Overall Stability:

Finished & lined

K_{100} from BS 5268-6.1:1996

	Eaves elevation	Gable elevation
Grnd to 3rd	1.00	1.00
4th flr & above	1.00	1.00

Min brick buttress dimensions
Up to 3 storeys min 550mm
Up to 4 storeys min 950mm
Above 4 storeys min 1200mm

Design Wind Load for O/A Stability:

	Wind on long elevation	Wind on short gable
Grnd to 3rd	1.169 kN/m²	1.169 kN/m²
4th flr & above	1.169	1.169

	General Condition	Zone A
Design Wind Load for Stud Design:	1.268 kN/m²	2.034 kN/m²

Calcluate Total Dead Load

	Construction	*Area*	
Roof Area	Pitched / Curved Roof - Other	31.68	m²
5th Floor Area	N.A.		m²
4th Floor Area	N.A.		m²
3rd Floor Area	N.A.		m²
2nd Floor Area	N.A.		m²
1st Floor Area	N.A.		m²

5th Floor Length of Int. Walls		m
4th Floor Length of Int. Walls		m
3rd Floor Length of Int. Walls		m
2nd Floor Length of Int. Walls		m
1st Floor Length of Int. Walls		m
Gnd Floor Length of Int. Walls		m
5th Floor Length of Party Walls		m
4th Floor Length of Party Walls		m
3rd Floor Length of Party Walls		m
2nd Floor Length of Party Walls		m
1st Floor Length of Party Walls		m
Gnd Floor Length of Party Walls		m
5th Floor Length of Ext. Walls		m
4th Floor Length of Ext Walls		m
3rd Floor Length of Ext Walls		m
2nd Floor Length of Ext Walls		m
1st Floor Length of Ext Walls		m
Gnd Floor Length of Ext Walls	15.90	m

Total Roof Load	42.22	kN
Total Floor Loads	0.00	kN
Total Int. Wall loads	0.00	kN
Total Party Wall Load	0.00	kN
Total Ext. Wall Load	12.47	kN
Total Dead Load	**54.68**	**kN**

Loads (kN/m2)

Flat Roof	0.000
Pitched / Curved Roof - Attic	1.333
Pitched / Curved Roof - Other	1.333
Compartment Floor	0.000
Intermediate Floor	-0.270
Perimeter Wall	0.296
Compartment Wall	0.000
Load-bearing Internal Wall	0.000

5th Floor Storey Ht		m
4th Floor Storey Ht		m
3rd Floor Storey Ht		m
2nd Floor Storey Ht		m
1st Floor Storey Ht		m
Grnd Floor Storey Ht	2.65	m

Note 1 : Non-loadbearing stud walls are to be excluded from the length of internal walls. Reference to ground floor is the lowest level of timber frame which may not be the literal ground floor.

Note 2 : External walls are calculated on the basis that that the cladding weight is excluded. To increase the building weight to account for the cladding attched to the timber frame make the following adjustment.

Gross external wall area with cladding:
m²
0.000 kN/m²

0.00 kN additional dead load due to cladding.
(*Included in the value for Ext walls* .)

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Building Dimensions

Roof Type: Gable end

O/A Length (*Eaves*) (m)	2.50	Eaves Height (m)	2.65	(*this value is to be the same as the overall height if it is a flat roof*)
O/A Width (*Gable*) (m)	6.00	Roof Slope Length (m)	3.040	(*includes 0.5m eaves o/h*)
O/A Height (*Ridge*) (m)	4.17	Top storey inset (m)		

Wind Forces Acting on Building (*including the reduction for wind shielding*)

Total wind on the gable of building:	24.99 kN	*when building considered as a complete unit*	*(1)*
Total wind on the gable of building:	20.33 kN	*when building considered as an end of terrace unit*	*(2)*
Total wind on the elevation of bldg.:	11.74 kN	***Use option:***	***(2)***

Racking Forces Acting on Ground Floor Walls

Total racking force on the gable of building:	12.43 kN	*(Wind on gable Elevation)*
Total racking force on the elevation of building:	7.87 kN	*(Wind on Elevation)*

Sliding Check

Sliding Force	24.99 kN	**Sliding O.K.**
Co-efficient of friction taken as :	0.4	*(with a DPC)*
Resistance to sliding: *from frictional resistance*	12.08 kN	
Resistance to sliding: *from additional fixings*	36.49 nails	
Factor of Safety against sliding:	1.94	
Required:	1.4	

Overturning Check

Ref BS 5268 - 6.1 cl. 4.4.2.2 - based on total dead load acting at half the building **dim'n**

Values displayed for all buildings, but refer to page OS5 for a more rigorous analysis

	Front / Rear	***Left / Right***	
Overturning Moment:	89.04	73.01	kNm
Resistance to overturning: *dead load*	164.05	68.36	kNm
Height of masonry mobilised:			m
Resistance to overturning: *masonry*	0.00	0.00	kNm
Factor of Safety against overturning:	1.84	0.94	
Required:	1.4		
Masonry HD straps required:	N.A.	N.A.	

Based on Cullen HD straps with a SWL of 3kN

Overturning Failed
Additional anchorage force reqd: 33.86 kNm
Equates to: 2.26 kN/m

Additional anchorage reqd by adequate strapping.

Uplift Check

External Roof Uplift:	-0.77	kN/m^2
Total Uplift Force	-24.49	kN
Resistance to uplift:	54.68	kN
Factor of Safety against uplift:	2.23	
Required:	1.4	

Uplift O.K.

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Calculation sheet/revision no: OS 3

Top Storey Stability:

K100 applicable to top storey: No

Applicable to all buildings irrespective of number of storeys and assumes cl 4.4.2.2. principles

For this check the values are based upon the data for the top storey height entered above.

Sliding Check

Sliding Force	11.74	kN
Co-efficient of friction taken as :	0.4	
Resistance to sliding: *from frictional resistance*	12.08	kN
Resistance to sliding: *from additional fixings*		nails
Factor of Safety against sliding: Required:	1.4	

Overturning Check

Ref BS 5268 - 6.1 cl. 4.4.2.2 - based on total dead load acting at half the building **width**

	Front / Rear	
Overturning Moment:	89.04	**Overturning O.K.**
Resistance to overturning: *from dead load*	164.05	
Resistance to overturning: *from strapping*	0.00	
Factor of Safety against overturning: *no strapping*	1.84	
Factor of Safety against overturning: *with strapping*	1.84	
Required:	1.4	

Uplift Check

Roof type: Pitched / Curved Roof - Other

External Roof Uplift:	-0.77	kN/m^2	
Roof Dead Load:	1.333	kN/m^2	**Roof Uplift O.K.**
Required:	1.4		

To maintain a F.o.S specified on overturning and uplift, provide additional strapping to the value of **0.00 kN/m**

This force can be resisted by any of the following strapping arrangements, between the top storey and the adjacent lower storey, with an equal number of nails either side of the floor zone.

at 600 c/c	No. nails either side of floor zone
at 1200 c/c	No. nails either side of floor zone
at 1800 c/c	No. nails either side of floor zone
at 2400 c/c	No. nails either side of floor zone

Using 3.75mm x 30mm long square twist nails.
Basic load = 0.258kN *K 44 = 1.2*
Red.= 30/45=0.66 *k46 = 1.25*
k48=1.25
F = 0.258 x 1.2 x 1.25 x 1.25 x 0.66 = 0.319kN / nail.

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Calculation sheet/revision no: R 1

Racking Resistance With Wind on Gable Elevation

BS 5268: section 6.1 (1996)

Ground floor only

Wall Ref	**01**					
Length (m)	4.95					
Height (m) (MAX 2.7m)	2.40	2.40	2.40	2.40	2.40	2.40
Agg.area of openings (M^2)	1.80					
UDL (kN/m)	1.24					
Masonry Length (m)	0.00	0.00	0.00	0.00	0.00	0.00
Tie Density (x/M^2)	3.70	None	None	None	None	None
Basic Masonry Resistance	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Primary Board						
Material	OSB (Type 3/4)	None	None	None	None	None
Category	1					
Thickness (mm)	11.00	1.00	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.8					
Perimeter Nail Spacing (mm)	150					
Basic Racking Rest.,Rb	1.68					
K101	0.93					
K102	1.00					
K103	1.13					
Modified Resist., Rb x Km	**1.77**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Secondary Board						
Material	N'd Plasterboard	None	None	None	None	None
Category	4					
Thickness (mm)	12.50	1.00	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.65					
Perimeter Nail Spacing (mm)	150					
Basic Racking Rest.,Rb	0.18					
K101	1.00					
K102	1.00					
K103	1.00					
Modified Resist., Rb x Km	**0.18**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Wall anchorage / nailing	0.19kN / 1					
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	1.00	1.00	1.00	1.00	1.00	1.00
K105	1.32	0.00	0.00	0.00	0.00	0.00
K106	0.64					
K107	1.08	1.00	1.00	1.00	1.00	1.00
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	8.87					
Secondary	0.90					
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	8.87	0.00	0.00	0.00	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	0.90	0.00	0.00	0.00	0.00	0.00
Masonry (<25%of P+S)	0.00	0.00	0.00	0.00	0.00	0.00
Total Resistance kN	**9.77**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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Racking Resistance With Wind on Eaves Elevation

BS 5268: section 6.1 (1996)

Ground floor only

Wall Ref	**02**					
Length (m)	6.00					
Height (m) (MAX 2.7m)	2.70	2.70	2.70	2.70	2.70	2.70
Agg.area of openings (M^2)	1.44					
UDL (kN/m)	3.02					
Masonry Length (m)	0.00	0.00	0.00	0.00	0.00	0.00
Tie Density (x/M^2)	3.70	None	None	None	None	None
Basic Masonry Resistance	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Primary Board						
Material	OSB (Type 3/4)	None	None	None	None	None
Category	1					
Thickness (mm)	11.00	1.00	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.8					
Perimeter Nail Spacing (mm)	150					
Basic Racking Rest.,Rb	1.68					
K101	0.93					
K102	1.00					
K103	1.13					
Modified Resist., Rb x Km	**1.77**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Secondary Board						
Material	N'd Plasterboard	None	None	None	None	None
Category	4					
Thickness (mm)	12.50	1.00	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.65					
Perimeter Nail Spacing (mm)	150					
Basic Racking Rest.,Rb	0.18					
K101	1.00					
K102	1.00					
K103	1.00					
Modified Resist., Rb x Km	**0.18**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Wall anchorage / nailing	**No**					
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	0.89	0.89	0.89	0.89	0.89	0.89
K105	1.32	0.00	0.00	0.00	0.00	0.00
K106	0.78					
K107	1.18	1.00	1.00	1.00	1.00	1.00
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	12.64					
Secondary	1.29					
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	12.64	0.00	0.00	0.00	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	1.29	0.00	0.00	0.00	0.00	0.00
Masonry (<25%of P+S)	0.00	0.00	0.00	0.00	0.00	0.00
Total Resistance kN	**13.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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Project	Project no	**CALCULATION SHEET**
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Design Summary

Ground floor only

Racking Resistance With Wind on Gable Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
01	2	8.87	0.00	0.90	0.00	19.55	over 72	2.05
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
		0.00	0.00	0.00	0.00	0.00		
Total Resistances		17.74	0.00	1.81	0.00	**19.55** kN		
Total Required						12.43 kN		

Proportion of Cat 4 to 1: 10.17%
Proportions Adequate

Adequate Resistance
CSF = 0.64
<1.0 O.K.

Factor of safety required 1

Any shortfall is to be provided by a steel sway frames. Use sway frame/s each with a capacity of: 0 → 0.00 kN

Racking Resistance With Wind on Eaves Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
02	1	12.64	0.00	1.29	0.00	13.92	over 72	1.96
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
		0.00	0.00	0.00	0.00	0.00		
Total Resistances		12.64	0.00	1.29	0.00	**13.92** kN		
Total Required						7.87 kN		

Proportion of Cat 4 to 1: 10.17%
Proportions Adequate

Adequate Resistance
CSF = 0.57
<1.0 O.K.

Factor of safety required 1

Any shortfall is to be provided by a steel sway frames. Use sway frame/s each with a capacity of: 0 → 0.00 kN

Racking Resistance In the Temporary Condition

Ground floor only

Consider the racking resistance of the building in the temporary condition before the plasterboard is fixed, and contributes to the overall resistance. If resistance is inadequte provision of temporary bracing will be required.

In order to establish the temporary racking resistance, only cat 1 materials will be mobilised. The racking forces causing the disturbing effects will be based upon a pro rata of temporary wind load to design wind load and multiplied by the long term resistance required.

Design Wind Pressure:	**1.15**	**kN/m^2**
Temporary Wind Pressure:	**0.62**	**kN/m^2**

So Temporary Resistance to be: 53.88% of Design Resistance.

Racking Resistance With Wind on Gable Elevation

Design Resistance Required:	12.43	kN
Temporary Resistance Required:	6.70	kN
Temporary Resistance Provided:	17.74	kN

Therefore: **Temporary Bracing Is Not Required**

Racking Resistance With Wind on Eaves Elevation

Design Resistance Required:	7.87	kN
Temporary Resistance Required:	4.24	kN
Temporary Resistance Provided:	12.64	kN

Therefore: **Temporary Bracing Is Not Required**

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Project	Project no	**CALCULATION SHEET**
First Floor Extension	3072.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no DS 1

Stud Design Summary

Ground Floor Walls

Wall Ref	Calc Page	Dead kN/m	Total kN/m	Stud Width	Stud Depth	Centres / Grade	Fire Ratio	CSI
1	1	1.24	3.46	47	200	600 / C16 / E	0.39	0.39
2	2	3.02	8.82	47	200	600 / C16 / E	0.18	0.18

Note: 'TB' against the stud centres indicates that temporary bracing is required to prevent the stud buckling during construction

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Cripple Stud Design Summary

Ground Floor Walls

Stud Ref	Calc Page	Dead kN	Total kN	Stud Width	Stud Depth	No. of Studs CS/FH	Grade	CSI
1	1	2.91	6.06	47	200	1 / 1	C16	0.24
2	2	3.37	9.14	47	200	1 / 1	C16	0.37
3	3	10.98	18.65	76	200	2 / 0	C16	0.28

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072	

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Calculation sheet/revision no: SBD 1

Steel Beam Design Ref: 1.03 Span (m): 4.95 m
No. off 1 Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Ecc. (+/- mm)
UDL 1	Pitched / Curve	3.48	2.32	1.74	0
UDL 2	Pitched / Curve	2.73	1.82	1.36	0
UDL 3	Wall 1000 & 10	-	0.31	0.00	0

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	10.98	10.98	D
	7.67	7.67	I
	18.65	18.65	Total
	27.65	**27.65**	**Ult**

Start dim'n	End dim'n
0.00	4.95
0.00	4.95
0.00	4.95

Ultimate Bending Moment: **34.21** **kNm**
Enter bending moment if a more accuarate analysis has been made: 34.21 kNm
Enter max shear force if a more accuarate analysis has been made: kN
Maximum length of unrestrained section: 0.60 m
Effective length factor for the unrestrained length: 1.00
Torsional bending moment: **0.000 kNm/m**
Beam Section Used: **254 x 146 x 31 UB** **Grade:** **S275**
No. of members: **1**

Beam Properties:

Wt	*31.10*	*kg/m*
D	*251.40*	*mm*
B	*146.10*	*mm*
t	*6.00*	*mm*
T	*8.60*	*mm*
Ixx	*4410.00*	*cm4*
Iyy	*448.00*	*cm4*
rxx	*10.50*	*cm*
ryy	*3.36*	*cm*
Zxx	*351.00*	*cm3*
Zyy	*61.30*	*cm3*
Sxx	*393.00*	*cm3*
Syy	*94.10*	*cm3*
A	*39.70*	*cm2*
u	*0.879*	
x	*29.60*	

Deflection Check: Limits: L/x Limit Value:(mm)

Live:	2.62	360	13.75	**Deflection O.K.**
Total:	6.29	250	14.00	**Deflection O.K.**
Limit for Masonry support (mm):			5	**N.A.**

Shear Capacity Check:
Maximum Shear Force: 27.65 kN
Pvx = 0.6 pyAv: 248.89 kN
Utilisation Ratio: 0.11 **Shear O.K.**

Bending Moment Check:
Maximum Bending Moment: 34.21 kNm
Moment Capacity is min of (1.2pyZx) or (pySx) 108.075 kNm

Buckling Moment Capacity (Simplified approach to BS 5950 cl 4.3.7)
Effective Length of Unrestrained section: 0.60 m

Bending Strength (Calculated as per Clause B2): 275 N/mm2
Buckling RM is min of (pbZx) or (pbSx)

D/T	29.23
λ ορ Λε/ρψ	17.86
λΛT	15.63

Buckling Resistance Moment Mb : 96.53 kNm
Buckling Moment O.K.

Cripple Stud Requirements Bearing detail: Panel rail
Panel rail grade: C16 Stud size (w x d): 38 89
Adm Comp p to g on bottom rail: 2.2 N/mm2
Minimum bearing length: 95 mm on 3 38 x 89 studs
or 58 mm bearing based on beam width

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 1

Timber Beam Design

Ref: 1.01 Span (m): 1.59 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Pitched / Curve	3.48	2.32	1.74	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1 & 1000	-	1.33	2.22	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	2.91	2.91	D
	3.16	3.16	I
	6.06	6.06	Total
	0.00	0.00	W
	6.06	**6.06**	**Max**

	Start dim'n	End dim'n
UDL 1	0.00	1.59
UDL 2	0.00	1.59
UDL 3	0.00	1.59

Maximum Bending Moment: **2.42** **kNm**

Enter bending moment if a more accuarate analysis has been made: 2.42 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 200 x 47** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*200*	*mm*
Total B	*94*	*mm*
No. of Timbers	2	
Axis of bending (relative to D & B):	*X-X*	
Service class:	1	
K3	1.00	
Wt	*9.59*	*kg/m*
Ixx	*6266.67*	*cm4*
Zxx	*626.67*	*cm3*
A	*188.00*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.99	360	4.43	**Deflection O.K.**
Total:	1.90	250	6.38	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	6.06	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.48	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	2.42	kNm	*K7*	*1.05*
Basic bending stress:	5.3	N/mm2	*K8*	*1.10*
Adm.bending stress:	6.10	N/mm2	*K9*	*1.14*
Maximum Adm. Bending Moment:	3.82	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	6.06	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	31	mm		
Min.bearing l. for c/s on panel rail:	31	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	29	mm

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First Floor Extension 3072

Drawing no	Calculation by	Checked by	Date
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			Calculation sheet/revision no TBD 2

Timber Beam Design

Ref: 1.02 Span (m): 1.89 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)	Start dim'n	End dim'n
UDL 1	Pitched / Curve	0.60	0.40	0.30	0.00	0.00	1.89
UDL 2	0.00	0.00	0.00	0.00	0.00	0.00	1.89
UDL 3	Wall 2 & 1000	-	3.16	5.79	*(inc. swt)*	0.00	1.89

Floor joists continuous over beam: **No**

Reactions (kN):

LHS	RHS	Ser
3.37	3.37	D
5.77	5.77	I
9.14	9.14	Total
0.00	0.00	W
9.14	**9.14**	**Max**

Maximum Bending Moment: **4.33** **kNm**

Enter bending moment if a more accuarate analysis has been made: 4.32 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 200 x 47** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*200*	*mm*
Total B	*141*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*X-X*	
Service class:	1	
K3	1.00	
Wt	*14.38*	*kg/m*
Ixx	*9400.00*	*cm4*
Zxx	*940.00*	*cm3*
A	*282.00*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	1.81	360	5.26	**Deflection O.K.**
Total:	2.87	250	7.58	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	9.14	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.49	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	4.32	kNm	*K7*	*1.05*
Basic bending stress:	5.3	N/mm2	*K8*	*1.10*
Adm.bending stress:	6.10	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	5.73	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	9.14	kN		Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2			
Minimum bearing length for beam:	47	mm			
Min.bearing l. for c/s on panel rail:	47	mm	on 2	38 x 89 stud/s	

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	29	mm

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Project: First Floor Extension | Project no: ###### | **CALCULATION SHEET**

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: TBDS 1

Trimmer Beam Design Summary

Design Data		Bearing Length (mm)		Unfactored Reactions in kN				*Calc page*
Beam Ref	Section	& No. of Cripple studs	Grade / No. Off	LHS D	LHS I	RHS D	RHS I	*no.*
1.03	1No. 254 x 146 x 31 UB	59 / 3	S275 / 1	10.98	7.67	10.98	7.67	SBD1
1.02	3 / 200 x 47	30 / 2	C16	3.37	5.77	3.37	5.77	TBD2
1.01	2 / 200 x 47	30 / 1	C16	2.91	3.16	2.91	3.16	TBD1

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: PF 1

Horizontal Shear Between Panels & Soleplate or Between Multiple Soleplates

This also satisfies the Disproportionate Collapse requirements of 2A structures

Check there is adequate nailing at these interfaces to transmit the racking forces down through the structure, utilizing a friction coefficient of friction of: 0.40

The **average** dead load taken for this frictional resistance is: Ground floor only 1.25 kN/m; First floor and above kN/m

The following maximums occur based upon racking wall calculations:

Ground floor only	2.05 kN/m	less frict. rest. of:	0.50 kN/m
First floor and above	0.00 kN/m	less frict. rest. of:	0.00 kN/m

Factor of safety required: 1 *(See racking calculations pages R1 Et. Seq.)*

If anchorage is based upon shortfall in sliding capacity (*see page OS1*) then the resulant shear force per m run of load bearing internal, external and party wall is: 0.00 kN/m

Base shear calculation on using: racking wall values

Therefore use the the following values: Ground floor only 1.55 kN/m; First floor and above 0.00 kN/m

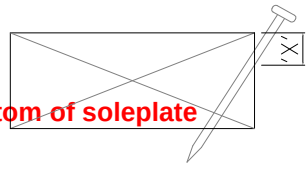
Consider the worst case of panel base or head for material build up:

Panel rail thickness:	45		
Soleplate / headbinder thickness:	45 mm	x wide:	195 mm
Angle of skew screw (*from vertical*):	0 °	Sheathing thickness:	mm
Lowest timber grade:	C16		
Nail diameter used:	3 mm	.	
Nail length used:	90 mm	*Edge dist. 5d:*	*15.00 mm*
Dimension 'x' :	0	*Spacing perp to grain 10d:*	*30.00 mm*

Values from BS 5268-2:2002 (Table 61)

Standrard Penetration: 36 mm

Basic Shear Load: 306 N



Caution! - Nail protrudes out of bottom of soleplate

Pointside penetration into soleplate: 45 mm

Ratio of actual to standard thickness of headside member: 1.250 .

Ratio of actual penetration to standard pointside thickness: 1.250 .

.

Therefore reduction factor for sub-standard penetration is: 1.000 . .

Factor, K_{48} Load duration: 1.25

Factor, K_{50} number of fixings in line: 0.9

Admisable load per nail: 344.25 N

Note: If a factor of safety of 1.0 is used above, this is because the UKTFA technical guidance states that there is already a factor of 1.4 built into the values in BS 5268

Ground floor only

Nail arrangement: Single

Nail Spacing: 150 mm

Shear Capacity: 2.30 kN/m

Nailing Specification Adequate
3 mm dia x 90mm long nails at 150 mm

First floor and above

Nail arrangement: Single

Nail Spacing: 300 mm

Shear Capacity: 1.15 kN/m

Nailing Specification Adequate
3 mm dia x 90mm long nails at 300 mm

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072	

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Calculation sheet/revision no: PF 2

Horizontal Shear Between Soleplate & Rim Beam

Check there is adequate nailing at these interfaces to transmit the racking forces down through the structure, utilizing a friction coefficient of friction of: 0.40

The dead load that has been taken for this frictional resistance is: Ground to third: 1.25 kN/m
Third to Sixth: 0.00 kN/m

The following maximums occur: *(See racking calculations pages R1 Et. Seq.)*

Ground floor only 2.05 kN/m less frict. rest. of: 0.50 kN/m
First floor and above 0.00 kN/m less frict. rest. of: 0.00 kN/m

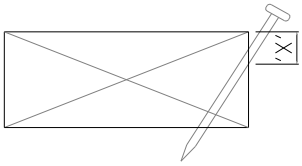
Therefore use the the following values for Ground floor only 1.55 kN/m
First floor and above 0.00 kN/m

Consider the worst case of panel base or head for material build up:

Angle of skew screw (*from vertical*) :	0 °	Sheathing thickness:	mm
Soleplate / headbinder thickness:	38 mm	x wide: 89 mm	
Structural deck thickness:	22 mm		
Lowest timber grade:	C16		
Nail diameter used:	3 mm	.	
Nail length used:	90 mm	*Edge dist. 5d:*	*15.00 mm*
Dimension 'x' :	0	*Spacing perp to grain 10d:*	*30.00 mm*

Values from BS 5268-2:2002 (Table 61)

Standrard Penetration: 36 mm
Basic Shear Load: 306 N



Pointside penetration into rim beam: 30 mm
Ratio of actual to standard thickness of headside member: 1.056 .
Ratio of actual penetration to standard pointside thickness: 0.833 .
.

Therefore reduction factor for sub-standard penetration is: 0.833 . .

Factor, K_{48} Load duration: 1.25
Factor, K_{50} number of fixings in line: 0.9

Admisable load per nail: 286.88 N

Ground floor only *This check only applicable for timber ground floors.*

Nail arrangement: Single
Nail Spacing: 150 mm
Shear Capacity: 1.91 kN/m

Nailing Specification Adequate
3 mm dia x 90mm long nails at 150 mm

First floor and above

Nail arrangement:
Nail Spacing: mm
Shear Capacity: kN/m

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Project	Project no	CALCULATION SHEET
First Floor Extension	3072.00	

Drawing no	Calculation by	Checked by	Date
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			Calculation sheet/revision no PF 3

Horizontal Shear Between Soleplate & Concrete Slab

Check there is adequate fixing at these interfaces to transmit the racking forces down through the structure, based upon screw fixings.

The following maximums occur: *(See racking calculations pages R1 Et. Seq.)*

Ground floor only 2.05 kN/m less frict. rest. of: 0.50 kN/m

If anchorage is based upon shortfall in sliding capacity (*see page OS1*) then the resulant shear force per m run of load bearing internal, external and party wall is: 0.00 kN/m

Base shear calculation on using: racking wall values

Therefore use the the following values between ground & third floor level: 1.55 kN/m

This shear value has no f.o.s. on the basis that the fixing s.w.l. has approx f.o.s. of 3.3.

Consider the worst case of panel base or head for material build up:

Fixing type: Tapcon masonry fastener Substrate: 7N Block

Upper Soleplate thickness (*if more than 1*): 38 mm x wide: 89 mm

Lowest timber grade: C24

Screw diameter used: 6 mm

Screw length used: 95 mm

Edge dist. 5d: *30.00 mm*

Spacing perp to grain 3d: *18.00 mm*

Values from BS 5268-2:2002 (Table 66)

Standrard Penetration: 21 mm (*Headside*)

Basic Shear Load: 826 N

Pointside penetration into slab: 57 mm

Ratio of actual to standard thickness of headside member: 1.810

Therefore reduction factor for sub-standard penetration is: 1.000

Factor, K_{52} Load duration: 1.25

Factor, K_{54} number of fixings in line: 0.9

Admisable load per fixing in timber: 929.25 N

Admisable load per fixing in substrate: 1180.00 N

Soleplete Fixings

Screw arrangement: Single

Screw Spacing: 300 mm **Fixing Specification Adequate**

Shear Capacity: 3.10 kN/m

Other alternatives are:

1. Masonry nails at 257mm centres with a 0.4kN SWL capacity to all load bearing walls.
Check edge distances. Hilti ref: NK64/S12 for a 38mm soleplate thickness

2. Soleplate anchors at 771mm centres fixed to the slab with 3no. masonry nails each having 0.4kN SWL capacity and to the soleplate with 3no. 3.75 x 30 sq twist nails.
Anchors to be fixed to all load bearing walls.

MASONRY NAILS ARE NOT SUITABLE FOR BEAM AND BLOCK FLOORS.

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Project	Project no	**CALCULATION SHEET**
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: PF 4

Horizontal Shear Between beam & block floor and masonry substructure

Check there is adequate shear strength between the beam and block floor and the masonry substructure.

This calc is provided for assurance to the client that all is in order but is strictly beyond the control of the timber frame fabricator.

It is based on the strength of the block work being 7N minimum and the beam and block floor bedded on a mortar joint and NOT laid on a dry joint.

Horizontal longitudinal force taken from page PF3: 2.05 kN/m unfactored

Partial safety factor for wind load = 1.4. 2.88 kN/m factored

Resulting shear stress in bed joint based block width of: 100 mm

is 0.03 N/mm^2

Assuming class iii mortar, characteristic shear strength from BS5628 is

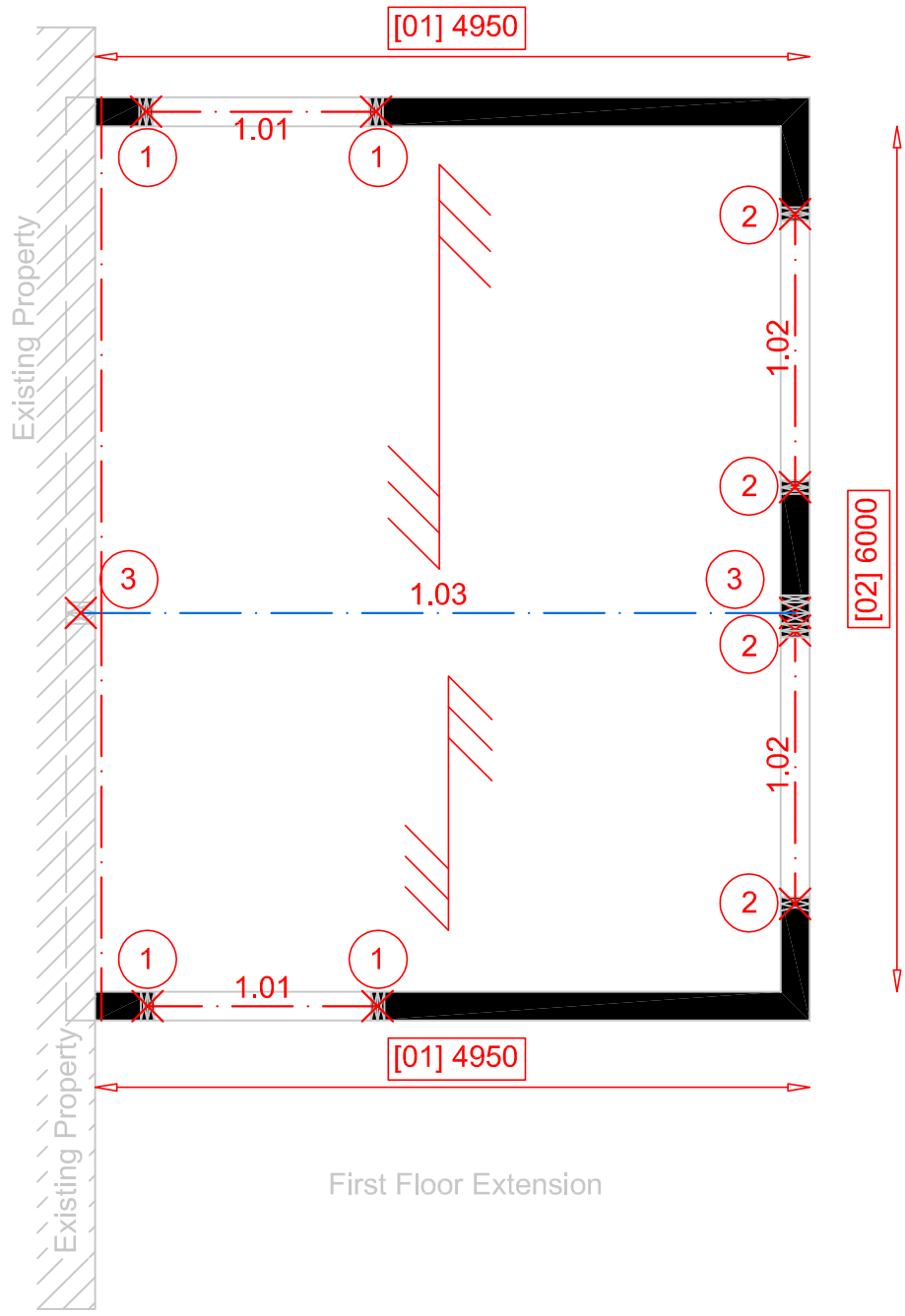
$fv = 0.15 + 0.6gA$, with a maximum value of $1.4N/mm^2$

$\gamma mv = 2.5$ (Clause 27.4)

Assuming an average dead load of:	1.25	kN/m
gA then =:	0.013	N/mm^2
& 0.6gA=:	0.008	N/mm^2
fv=:	0.158	N/mm^2
fv / γm =:	0.063	N/mm^2

Masonry shear stress O.K.

45.64%



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PROJECT First Floor Extension Clive Lott, Hafod, Bancyffordd, Llandysul SA44 4SD		Drawing title REFERENCES	Drawing Number SK1
CLIENT Melingoed Ltd		Date 15/02/2017	Project Number 3072

IF NOT STATED OTHERWISE USE :

		STUDS:	LINTELS MIN.	WALL SHEATHING:	NOGGINS:	ALIGNMENT OF STUDS WITH JOISTS/TRUSSES:
WALLS:	External (u.n.o)	47x200mm C16 @ 600mm	2/47x200mm C16	11mm OSB + 12.5mm Plasterboad	Structurally not required.	Not Required.
	Party (u.n.o)	N.A.	N.A.	N.A.	N.A.	N.A.
	Internal (u.n.o)	N.A.	N.A.	N.A.	N.A.	N.A.
SHEATHING:	Parallel to gables:	11mm OSB 2.80mm ϕ nails @ 150mm c/c			Perpendicular to gables:	11mm OSB 2.80 ϕ nails @ 150mm c/c

LOCATING PLATE FIXINGS:	TAPCON 6.35x95 @300mm c/c
FF PANEL STRAPING:	Not required.
FF PANEL BASE&HEAD FIXINGS:	ϕ3x90mm nails @ 150mm c/c
PARTY WALL TIES:	N.A.

TYPICAL LOADINGS:

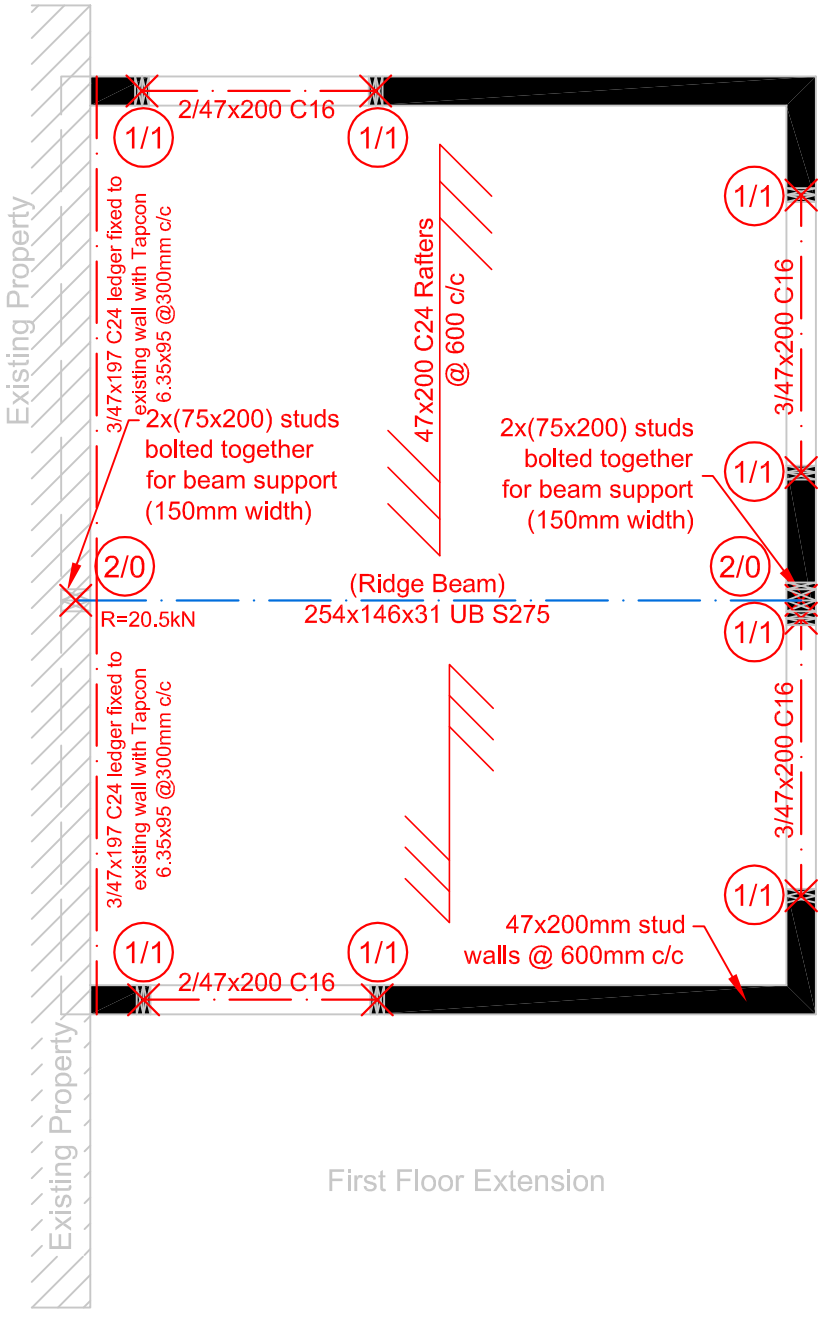
Roof-	Dead (On Slope)	= 1.154 kN/m²
	Imposed	= 0.750 kN/m²
Floor -	Dead	= N.A.
	Imposed	= N.A.
Walls -	External	= 0.296 kN/m²
	Party	= N.A.
	Internal	= N.A.

F.A.O. Truss Designer:

ROOF STRUCTURE:	47x197 C24 Rafters @ 600mm c/c
ROOF ANCHORAGE:	Truss clips @ 600 c/c to restrain against uplift
ROOF BRACING:	Standard bracing or sarking Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 1.150 kN/m².

STRUCTURAL MARK-UPS LEGEND:

- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Structural Studs.
- 2/1 No. Cripple Studs/No. Full Height Studs: 1/1 for lintels next to windows and doors 0/2 for beams, trimmers and girders



ADEPT Consulting(UK)Ltd Riverside Court, Beaufort Park, Chepstow, Monmouthshire NP16 5UH Tel: 01291-635522 Fax: 01173-376702 E-mail: info@adeptco.co.uk	PROJECT First Floor Extension Clive Lott, Hafod, Bancyffordd, Llandysul SA44 4SD	Drawing title STRUCTURAL MARK-UPS	Drawing Number 002
	CLIENT Melingoed Ltd	Date 15/02/2017	Project Number 3072

.

ADEPT Consulting (UK) Ltd
Riverside Court, Beaufort Park Way,
Chepstow, Monmouthshire NP16 5UH
Tel: 01291 635522

Project	Project no	**CALCULATION SHEET**
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: FND 1

Wall Foundation Loads - Unfactored

				Wind kN/m +/-		
Wall Ref	**Dead kN/m**	**Live kN/m**	**Total kN/m**	**Longitudinal**	**Lateral**	**Vertical**
1	2.00	1.00	6.00	1.60	1.98	3.00
2	4.00	2.00	11.00	2.78	1.66	5.00

NOTE 1: Loads given above exclude any external masonry leaf unless it is carried by the timber frame.
NOTE 2: Steel transfer grillages should be designed based upon a maximum deflection of L/360 or 14mm, whichever is the lesser, under total loads to prevent undue distress to the timber frame.

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Riverside Court, Beaufort Park Way,
Chepstow, Monmouthshire NP16 5UH
Tel: 01291 635522

Project	Project no	CALCULATION SHEET
First Floor Extension	3072	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no FND 2

Cripple Stud Foundation Loads - Unfactored

Stud Ref	Dead kN	Live kN	Total kN
1	3.20	3.47	6.67
2	3.71	6.35	10.06
3	12.08	8.44	20.52

NOTE 1: Loads given above exclude any external masonry leaf unless it is carried by the timber frame.

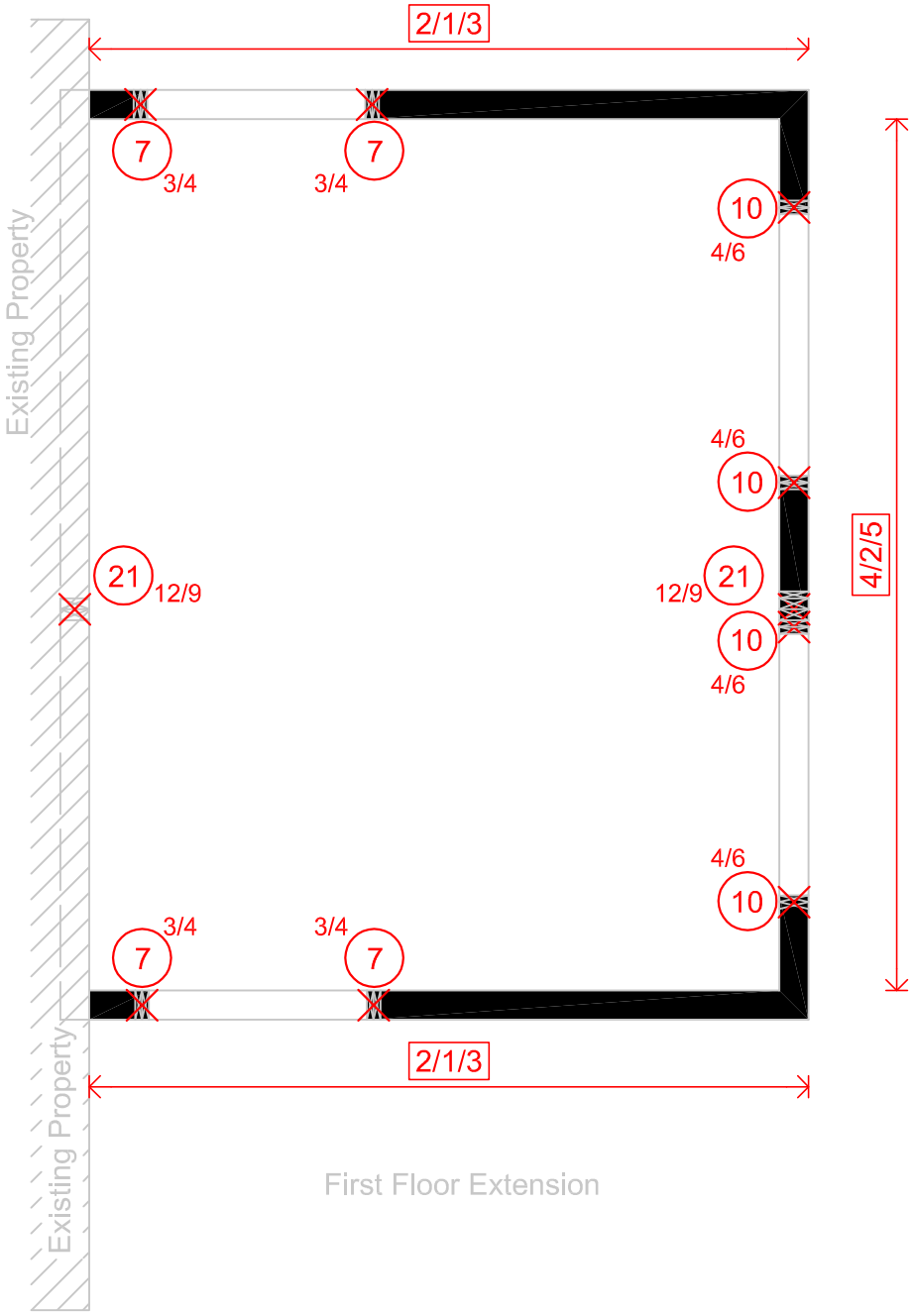
NOTE 2: Steel transfer grillages should be designed based upon a maximum deflection of L/360 or 14mm, whichever is the lesser, under total loads to prevent undue distress to the timber frame.

NOTES:

5/2/1 Denotes (UNFACTORED DEAD/IMPOSED/WIND) Line Loads IN kN/m run. Minimum loads of 5kN/m Ommited for Clarity.
The wind load gives a reversible triangular load distribution of max.positive to max.negative.

25 9/16 Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads in kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight cladding, if present is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 3kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings in both the internal and external loadbearing wall (refer to architects layouts for extent of all openings). these should be calculated from UDL and allowed for in the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR Inner leafs. if masonry is included it will be denoted : M -
Ground floor loads are excluded. If a timber ground floor floor is included it will be denoted : GF -



ADEPT
Consulting(UK)Ltd
Riverside Court, Beaufort Park, Chepstow, Monmouthshire NP16 5UH
Tel: 01291-635522 Fax: 01173-376702
E-mail: info@adeptco.co.uk

PROJECT: First Floor Extension, Clive Lott, Hafod, Bancyffordd, Llandysul SA44 4SD		Drawing title: LINE & POINT LOADS	Drawing Number: 001
CLIENT: Melingoed Ltd		Date: 15/02/2017	Project Number: 3072

IF NOT STATED OTHERWISE USE :

		STUDS:	LINTELS MIN.	WALL SHEATHING:	NOGGINS:	ALIGNMENT OF STUDS WITH JOISTS/TRUSSES:
WALLS:	External (u.n.o)	47x200mm C16 @ 600mm	2/47x200mm C16	11mm OSB + 12.5mm Plasterboad	Structurally not required.	Not Required.
	Party (u.n.o)	N.A.	N.A.	N.A.	N.A.	N.A.
	Internal (u.n.o)	N.A.	N.A.	N.A.	N.A.	N.A.
SHEATHING:	Parallel to gables:	11mm OSB 2.80mm ϕ nails @ 150mm c/c			Perpendicular to gables:	11mm OSB 2.80 ϕ nails @ 150mm c/c

LOCATING PLATE FIXINGS:	TAPCON 6.35x95 @300mm c/c
FF PANEL STRAPING:	Not required.
FF PANEL BASE&HEAD FIXINGS:	ϕ3x90mm nails @ 150mm c/c
PARTY WALL TIES:	N.A.

TYPICAL LOADINGS:

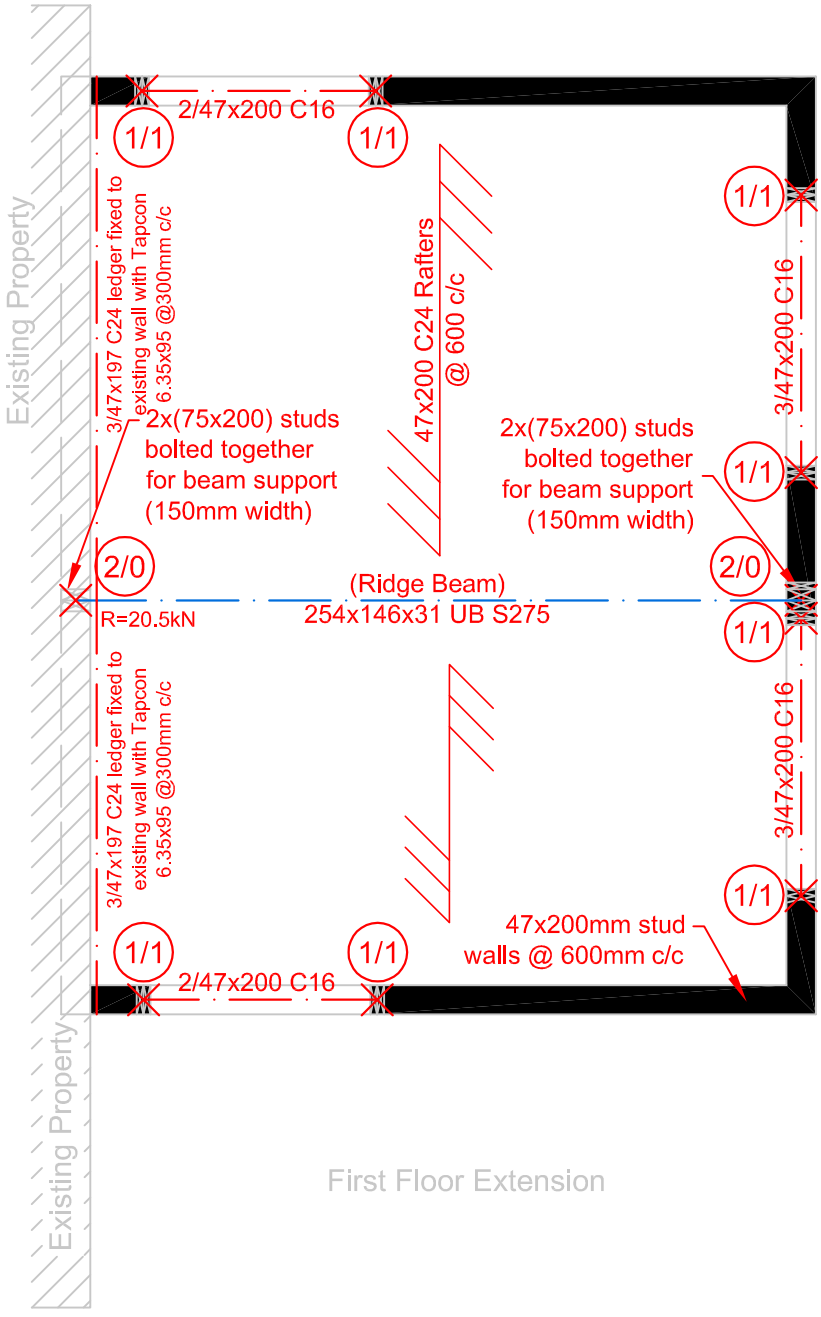
Roof-	Dead (On Slope)	= 1.154 kN/m²
	Imposed	= 0.750 kN/m²
Floor -	Dead	= N.A.
	Imposed	= N.A.
Walls -	External	= 0.296 kN/m²
	Party	= N.A.
	Internal	= N.A.

F.A.O. Truss Designer:

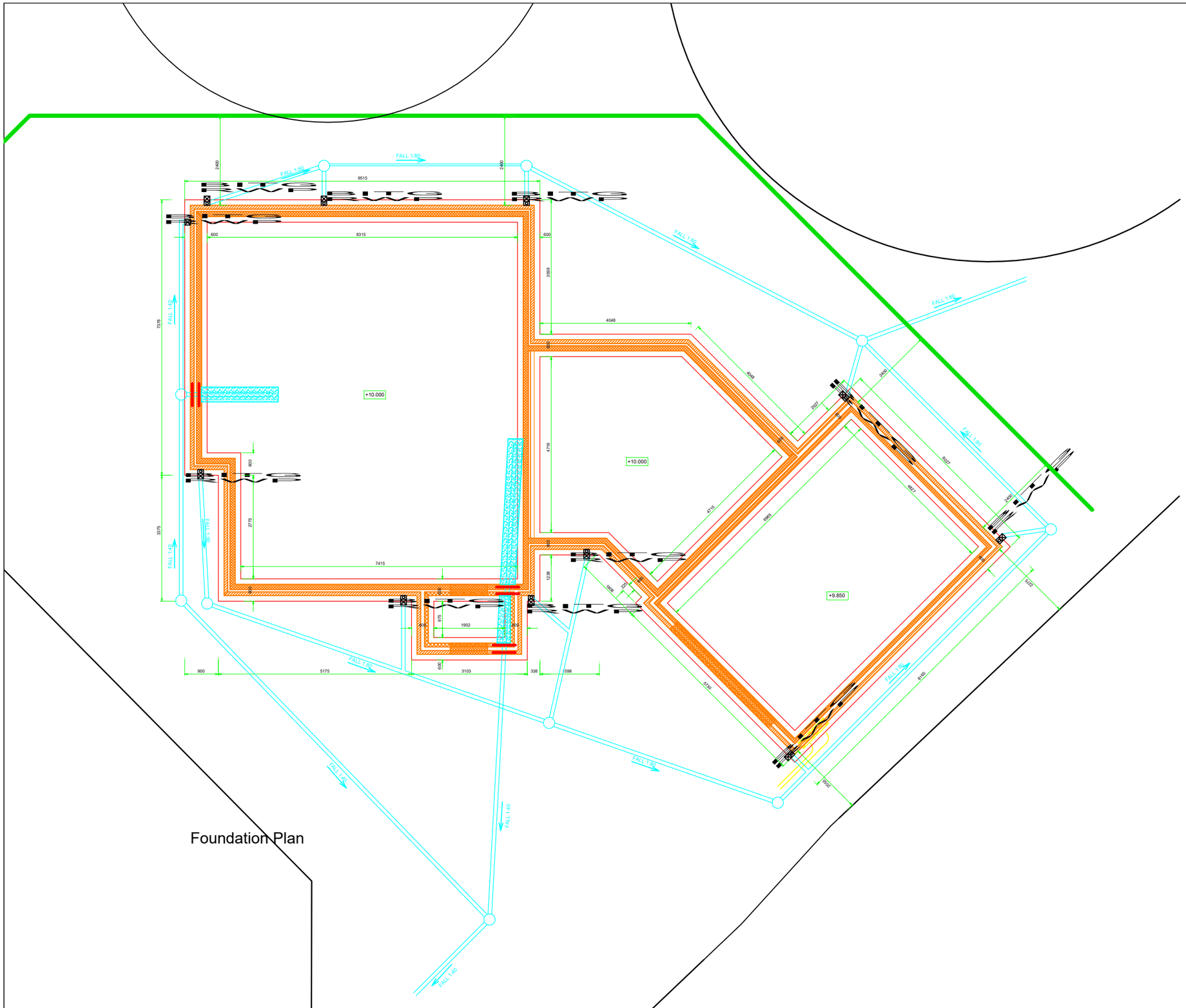
ROOF STRUCTURE:	47x197 C24 Rafters @ 600mm c/c
ROOF ANCHORAGE:	Truss clips @ 600 c/c to restrain against uplift
ROOF BRACING:	Standard bracing or sarking Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 1.150 kN/m².

STRUCTURAL MARK-UPS LEGEND:

- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Structural Studs.
- 2/1 No. Cripple Studs/No. Full Height Studs: 1/1 for lintels next to windows and doors 0/2 for beams, trimmers and girders



ADEPT Consulting(UK)Ltd Riverside Court, Beaufort Park, Chepstow, Monmouthshire NP16 5UH Tel: 01291-635522 Fax: 01173-376702 E-mail: info@adeptco.co.uk	PROJECT First Floor Extension Clive Lott, Hafod, Bancyffordd, Llandysul SA44 4SD	Drawing title STRUCTURAL MARK-UPS	Drawing Number 002
	CLIENT Melingoed Ltd	Date 15/02/2017	Project Number 3072



Foundation Plan

Drawing

HODGSON ARCHITECTURAL SERVICES

Chartered Institute of Architectural Technologists

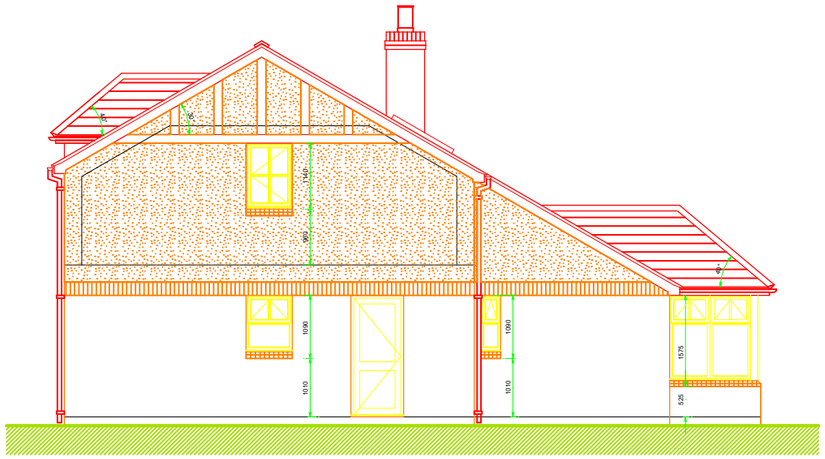
Job

New Home

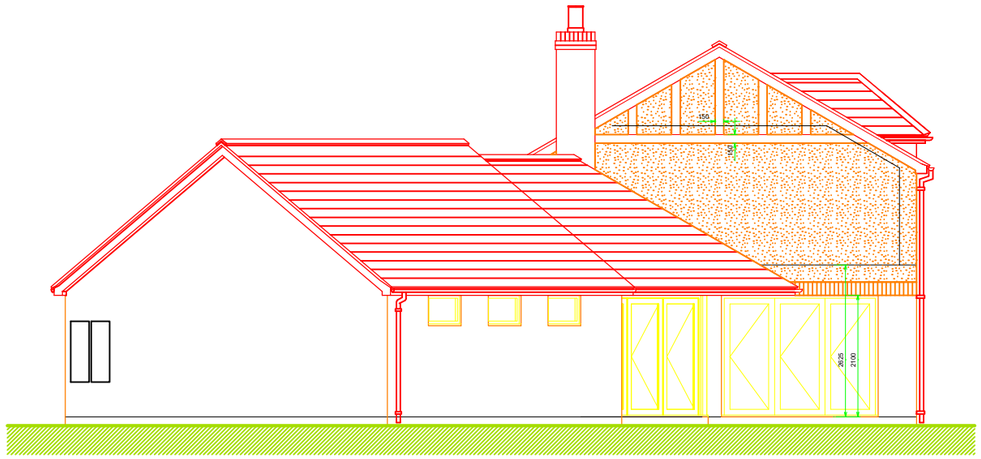
Drawing

Foundation Plan

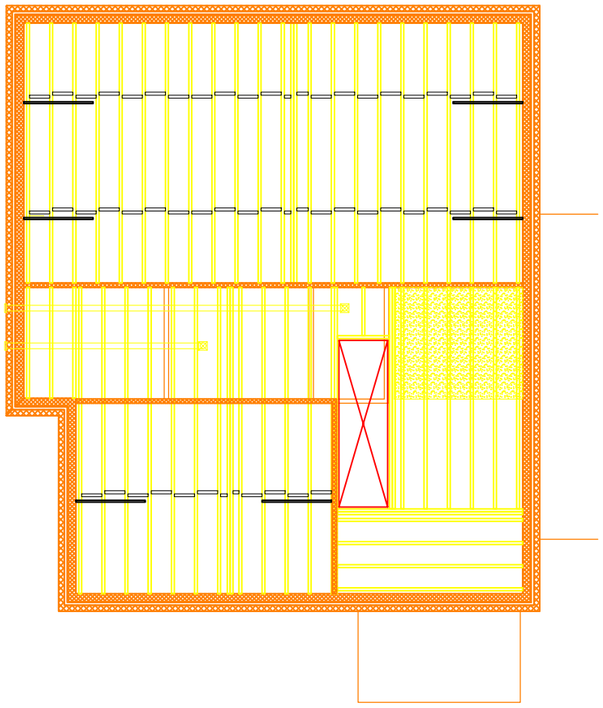
Date	Scale	
Feb'16	1:20 & 1:50 @ A1	
Job No.	Drawing No.	Revision
16/03	204	-



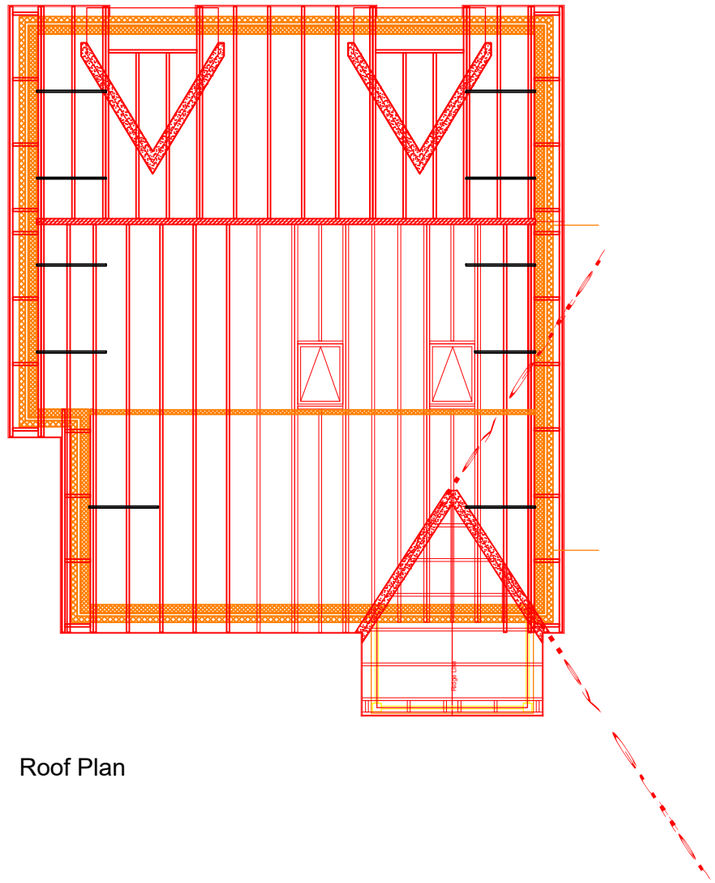
South East Elevation



North West Elevation



First Floor Joist Plan



Roof Plan

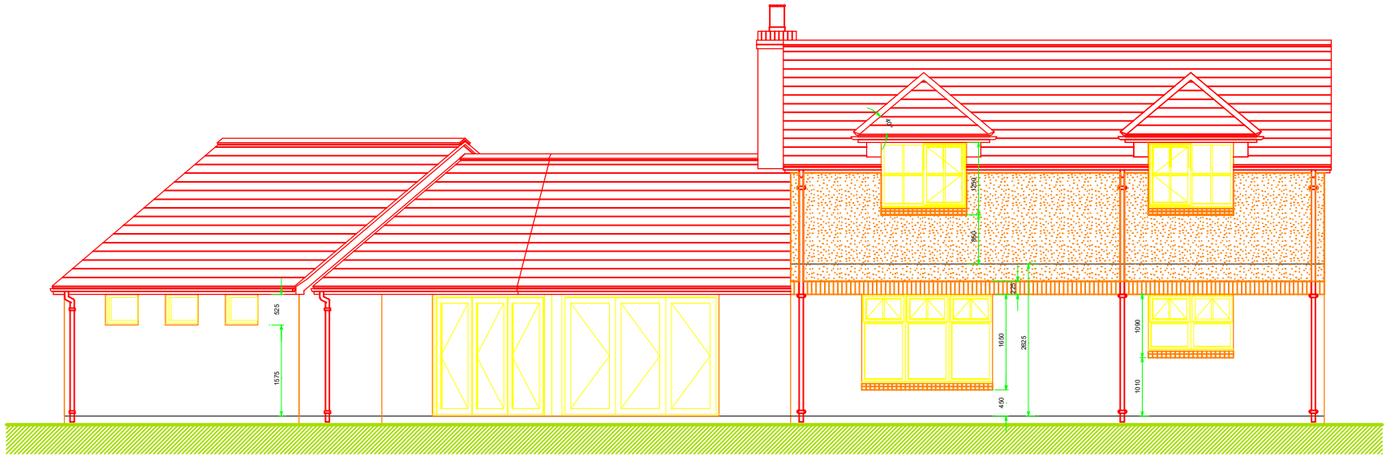
HODGSON ARCHITECTURAL SERVICES

Chartered Institute of Architectural Technologist

Job

Drawing

Date	Scale	
Feb'16	1:50 @ A1	
Job No.	Drawing No.	Revision
16/03	203	-



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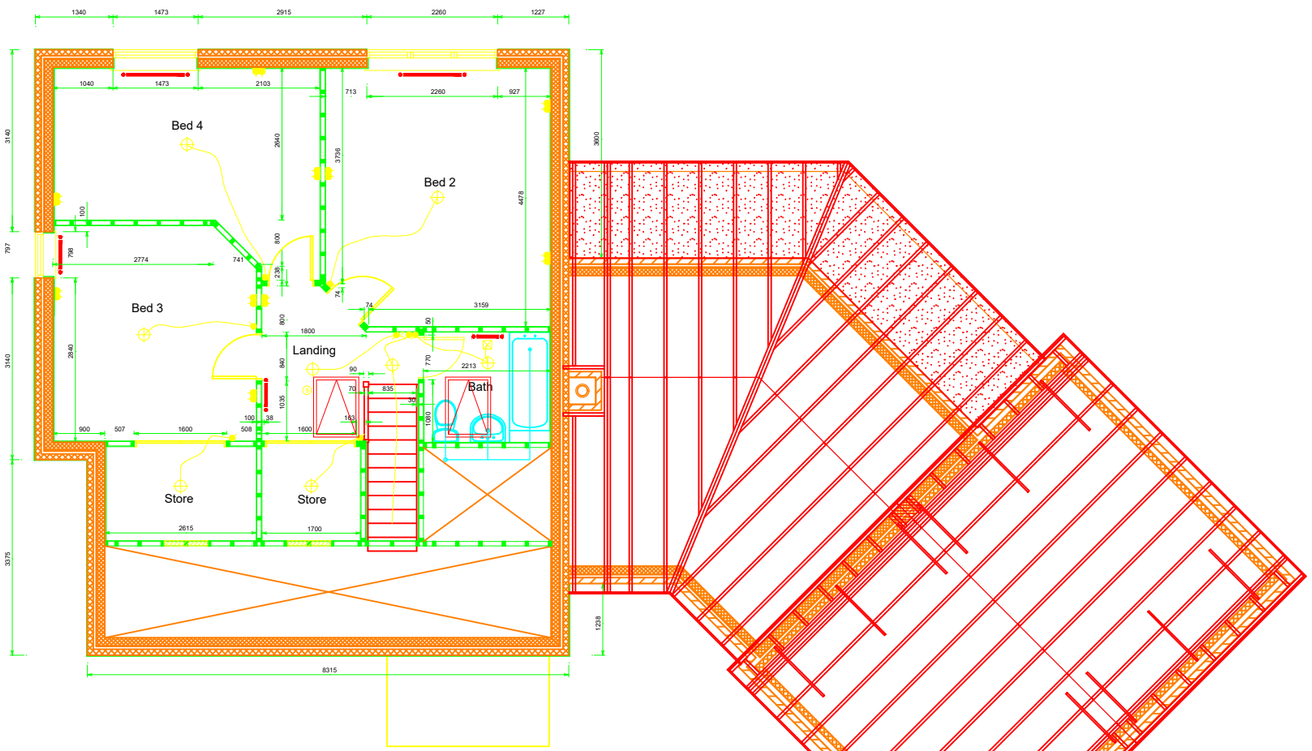

First Floor Plan / Roof Plan (part)

Heating Key

- Radiator (with trv's)
- Ceiling mounted air extract fan
- Wall mounted air extract fan

Electrical Key

- Light fitting (LV downlighter)
- Light fitting (ceiling pendent)
- Wall mounted light fitting
- Smoke detector
- TV point
- Telephone
- PIR detector head
- Alarm door contact
- Single way light switch
- Two way light switch
- Twin socket outlet
- Shaver socket
- Alarm keypad panel

All low level sockets @ 450mm above FFL
All high level sockets @ 1050mm above FFL
All wall light switches @ 1200mm above FFL

Wall Key

- Timber Frame Wall
- Blockwork Wall
- Facing Brickwork Wall
- Internal stud partition

HODGSON ARCHITECTURAL SERVICES
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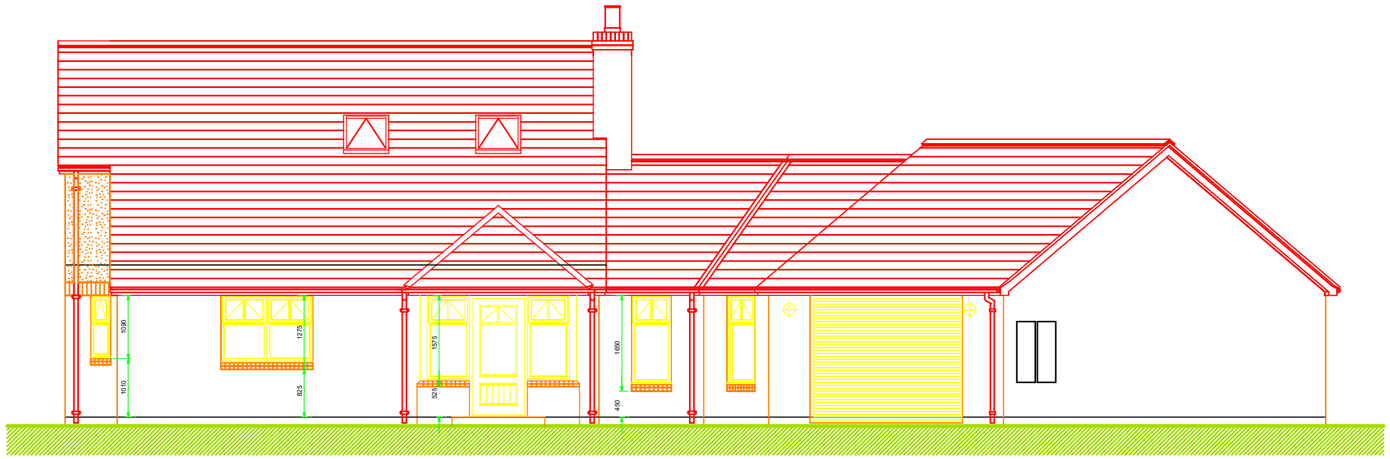
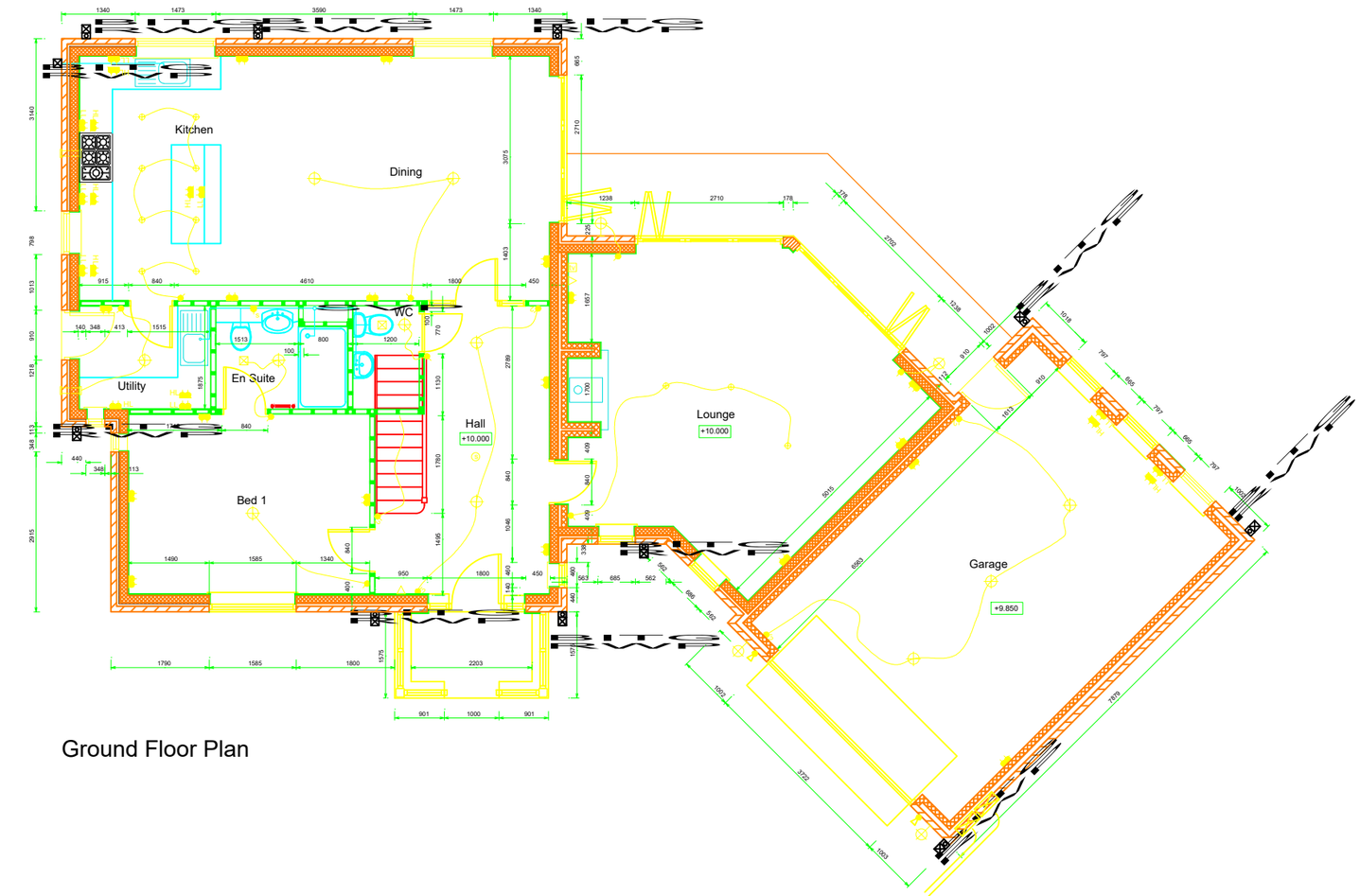
Job: New Home

Drawing: First Floor

Date	Scale	
Feb'16	1:20 & 1:50 @ A1	
Job No.	Drawing No.	Revision
16/03	202	-



North East Elevation



Ground Floor Plan

Heating Key

- Radiator (with trv's)
- Ceiling mounted air extract fan
- Wall mounted air extract fan

Electrical Key

- Light fitting (LV downlighter)
- Light fitting (ceiling pendent)
- Wall mounted light fitting
- Smoke detector
- TV point
- Telephone
- PIR detector head
- Alarm door contact
- Single way light switch
- 2 Two way light switch
- Twin socket outlet
- Shaver socket
- A Alarm keypad panel

All low level sockets @ 450mm above FFL
All high level sockets @ 1500mm above FFL
All wall light switches @ 1200mm above FFL

Wall Key

- Timber Frame Wall
- Blockwork Wall
- Facing Brickwork Wall
- Internal stud partition

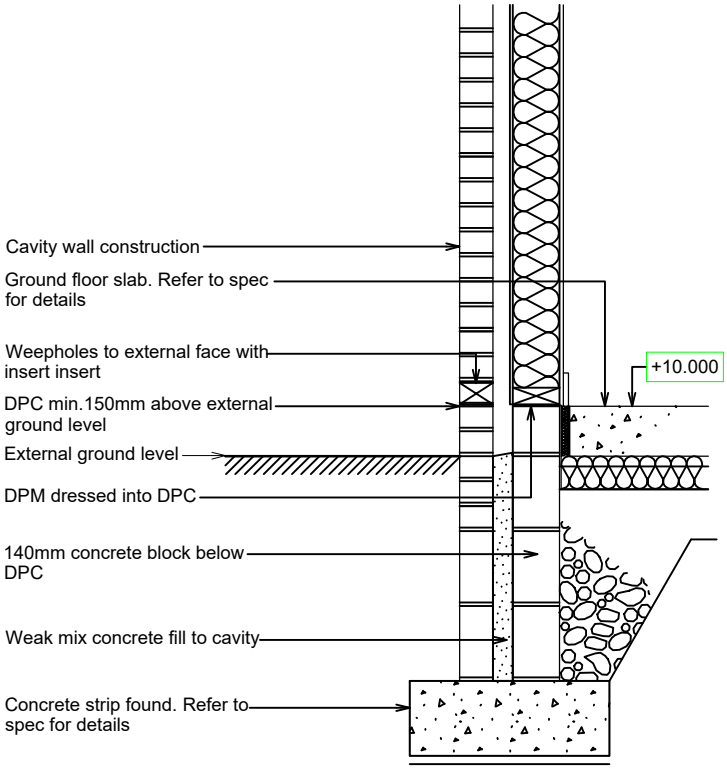
HODGSON ARCHITECTURAL SERVICES
Chartered Institute of Architectural Technologists

Job

Drawing

Date	Scale
Feb'16	1:20 & 1:50 @ A1

Job No.	Drawing No.	Revision
16/03	201	-



Foundation / Floor Detail

DRAWING REGISTER & ISSUE SHEET

ADEPT Consulting (UK) Ltd
Riverside Court Beaufort Park Way
Chepstow NP16 5UH
Tel: 01291 635522 Fax: 01173376702
E-mail: info@adeptco.co.uk

Job No.	3081	Sheet No.	1

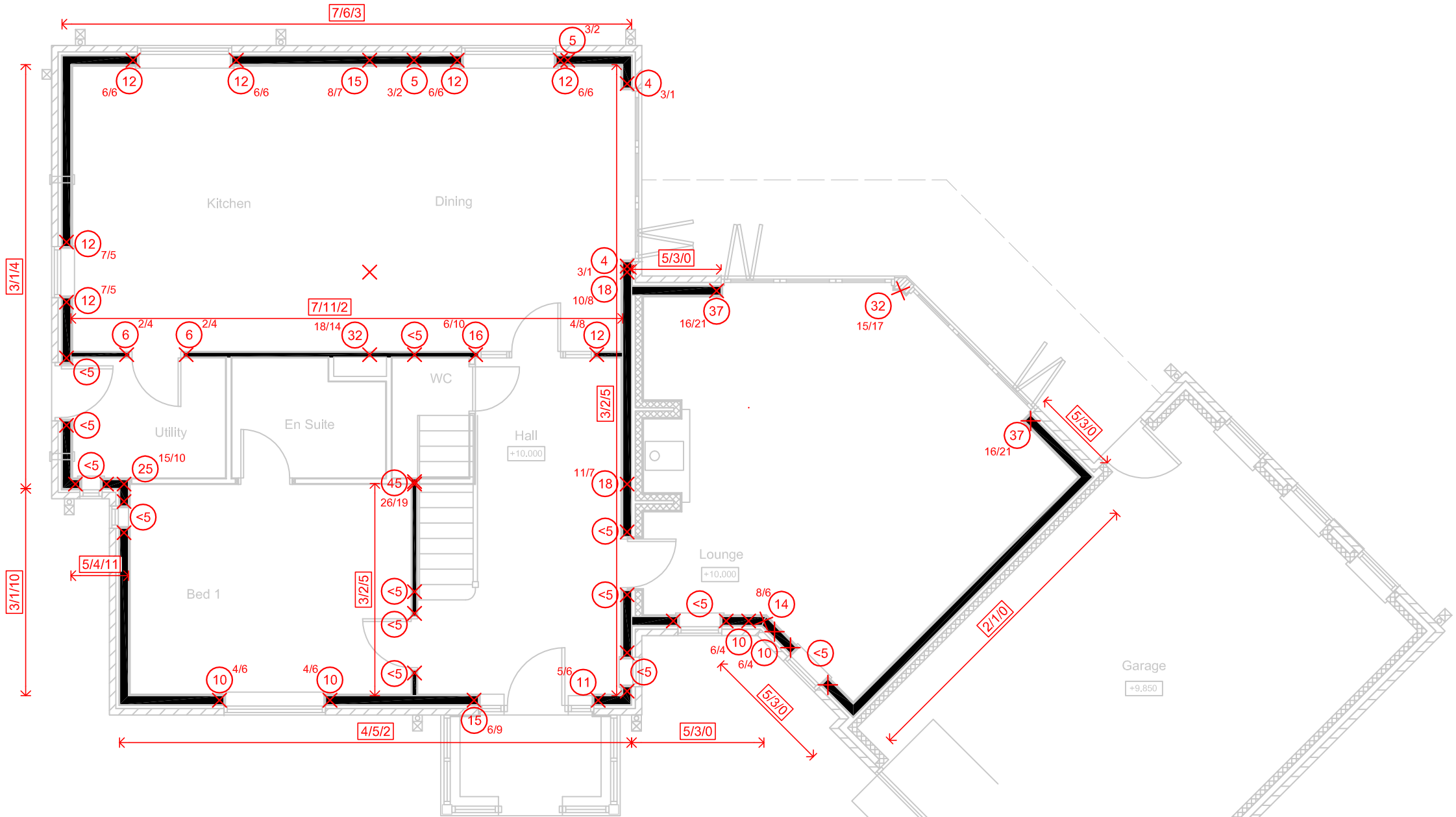
Project Title:	**New Detached Dwelling on land to Read of Holmside, Stirling Lane, Rowlands Gill.**

Drawing Description	Number	Size	Date of Issue														
			D	17													
			M	2													
			Y	17													
Line & Point Loads	001	A3		X													
GF Structural Mark-Ups	002	A3		X													
FF Structural Mark-Ups	003	A3		X													
Structural Calculations	1x	A4		X													

Distribution	Number of copies														
Colin Lunn - Karlin Timber Frame		X													

P - Paper N - Negative CD - CD disk E - E-mail	Media		E														
B - Billing T - Tender A - Approval P - Preliminary I - Information C - Construction	Status		C														
	Issued By		RG														

This sheet indicates the latest issue of registered drawings&calculations. Previous issues should be removed from circulation.



Large section timber beam and post members forming structural support for external porch. Refer to spec notes.

Ground Floor Plan

NOTES:

5/2/1 Denotes (UNFACTORED DEAD/IMPOSED/ VERTICAL WIND) Line Loads IN kN/m run.
Minimum loads of 5kN/m Ommited for Clarity.
The wind load gives a reversible triangular load distribution of max.positive to max.negative.

25 9/16 Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads in kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight cladding, if present is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 5 kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings in both the internal and external loadbearing wall (refer to architects layouts for extent of all openings). these should be calculated from UDL and allowed for in the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR inner leafs. If masonry is included it will be denoted : M -
Ground floor loads are excluded. If a timber ground floor is included it will be denoted : GF -

SP- Steel post.The steel post has to be fixed to a pad stone designed to resist loads given. Fixing to block upstand only is NOT ADVISABLE. Additionally, moment of 10 kNm and horizontal force of 12kN to be resisted as well.

Rev.	Date	Details	Drawn
-	-	-	-

ADEPT
Consulting(UK) Ltd

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Riverside Court,
Beufort Park
Chepstow
Monmouthshire
NP16 5UH
t: 01291635522
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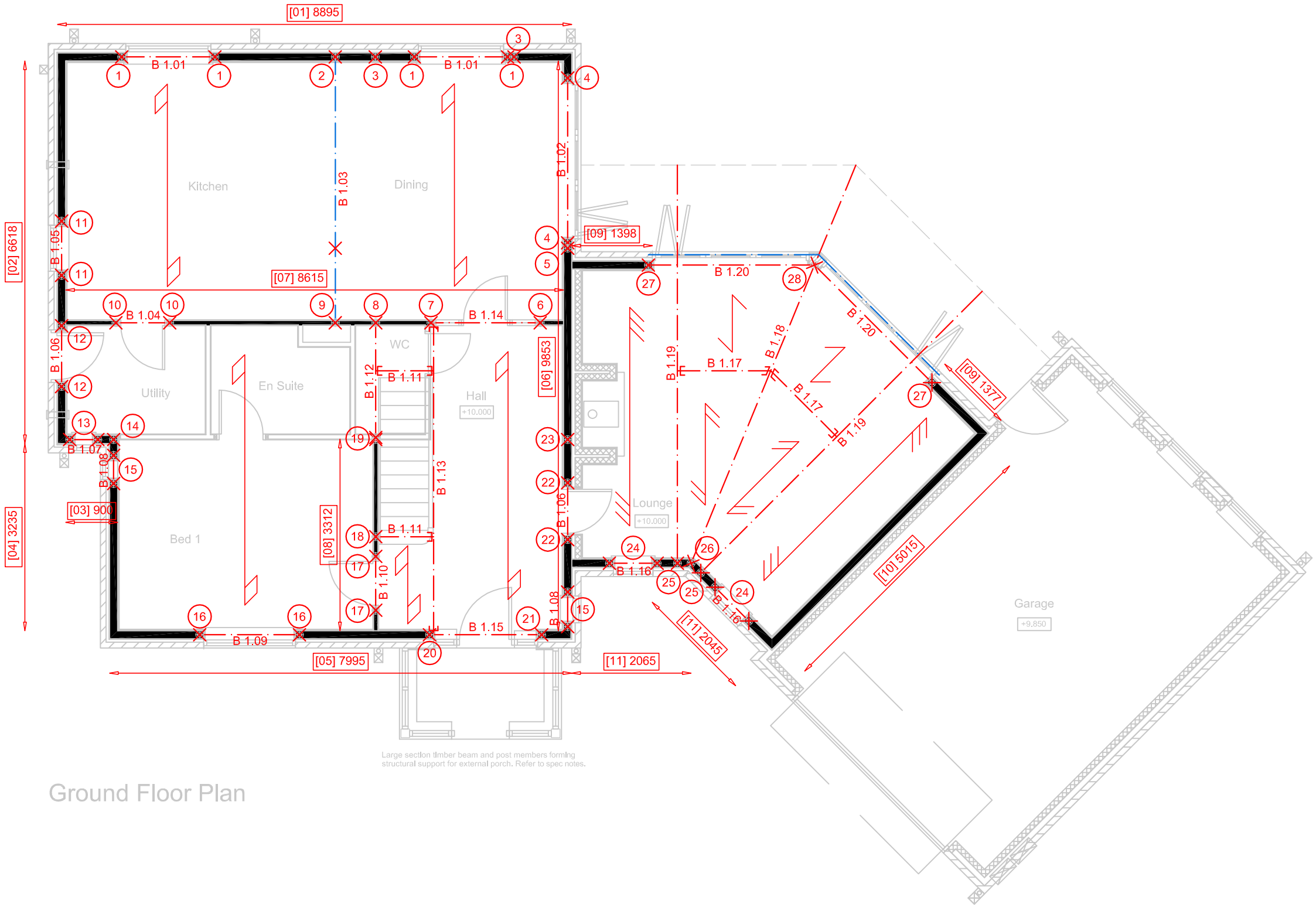
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address: Holmwood House, Clayton Road, Newcastle upon Tyne	Description: Line & Point Loads
Drawing Number: 3081 - 001	
Date: 17-Feb-17	Scale: 1:75 @ A3
Status: CONSTRUCTION	
AutoCAD Reference: N.A.	
Drawn: R.G.	Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.



Ground Floor Plan

Rev.	Date	Details	Drawn
-	-	-	-

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Riverside Court,
Beufort Park
Chepstow
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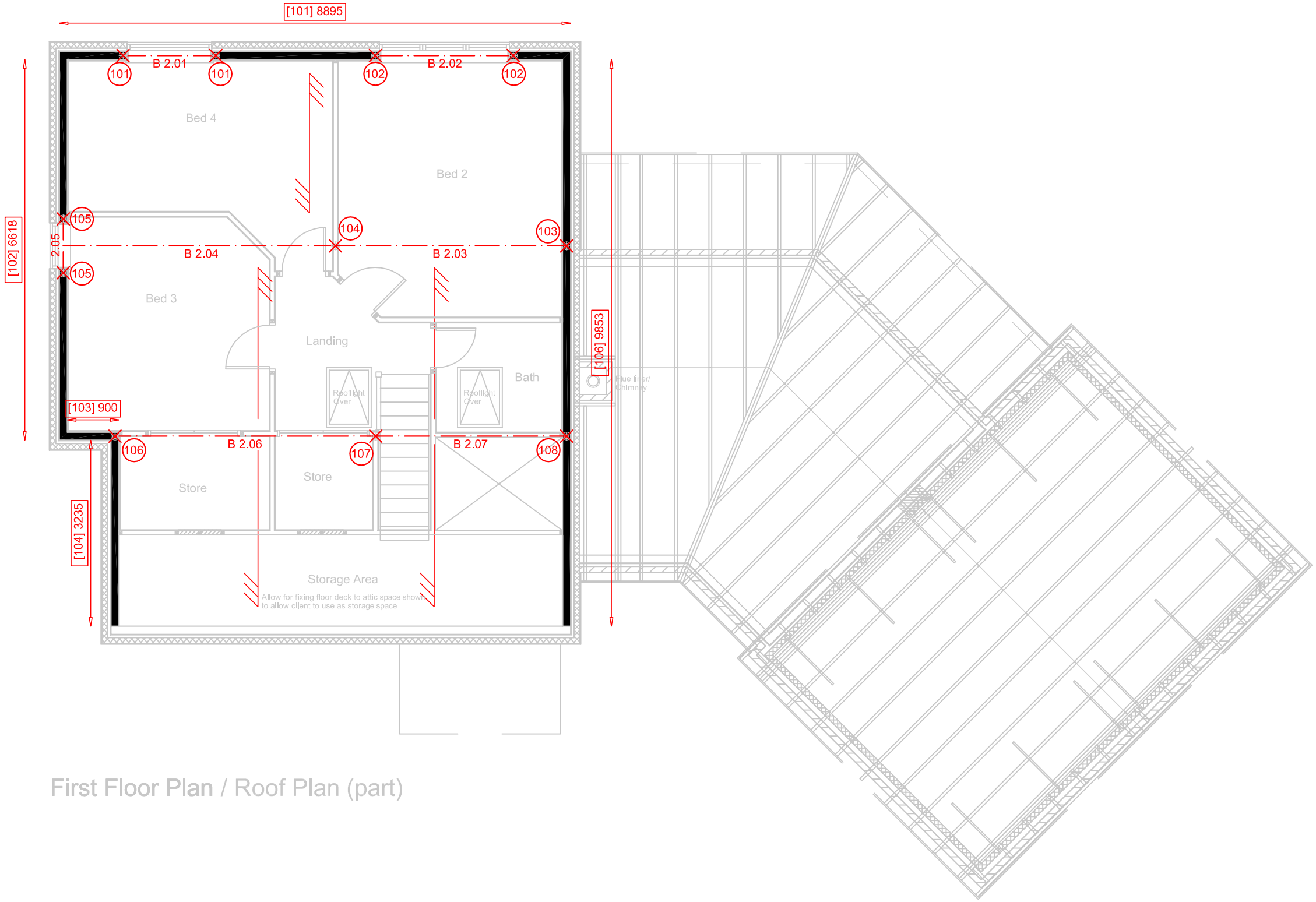
t: 01291635522
m: 07515361138
f: 01173 376702
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address: Holmwood House, Clayton Road, Newcastle upon Tyne	Description: Ground Floor References
Drawing Number: 3081 - SK1	
Date: 17-Feb-17	Scale: 1:75 @ A3
Status: CONSTRUCTION	
AutoCAD Reference: N.A.	
Drawn: R.G.	Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.



First Floor Plan / Roof Plan (part)

Rev.	Date	Details	Drawn
-	-	-	-

ADEPT
Consulting(UK) Ltd

ADEPT Consulting(UK) Ltd
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Beufort Park
Chepstow
Monmouthshire
NP16 5UH
t: 01291635522
m: 07515361138
f: 01173 376702
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address: Holmwood House, Clayton Road, Newcastle upon Tyne	Description: First Floor References
Drawing Number: 3081 - SK2	
Date: 17-Feb-17	Scale: 1:75 @ A3
Status: CONSTRUCTION	
AutoCAD Reference: N.A.	
Drawn: R.G.	Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

ADEPT Consulting (UK) Ltd
Riverside Court, Beaufort Park Way,
Chepstow, Monmouthshire NP16 5UH
Tel: 01291 635522

to Read of
ls Gill. NE39 1PS

Structural Calculations

For

Timber Frame Superstructure

On

New Detached Dwelling on land to Read of Holmside, Stirling Lane, Rowlands Gill. NE39 1PS

-

ADEPT Consulting (UK) Ltd
.

Riverside Court, Beaufort Park Way,
Chepstow, Monmouthshire NP16 5UH

tel 01291 635522
fax

Client:
Karlin Timber Frame (NE) Ltd
9 Maple Way
Aycliffe Industrial Park
Newton Aycliffe
County Durham
DL5 6BF
Tel: 01325 300250

Date: Feb-17

Project Reference: 3081
Project Engineer: RG
Checked By: MK
Date: 17/02/17

STRUCTURAL TIMBER ASSOCIATION
Building solutions in timber

TRADA member

ADEPT Consulting (UK) Ltd
Riverside Court, Beaufort Park Way,
Chepstow, Monmouthshire NP16 5UH
Offices also in Trigate Business Centre, 210-222 Hagley Road, Birmingham B68 0NP *Tel: 01291 635522*

Project	Project no	**CALCULATION SHEET**
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: Index 1

Design philosophy

These calculations have been produced broadly in line with the recommendations made in the TRADA publication Timber Frame Housing – Structural Recommendations and the Structural Timber Association (previously UKTFA) publication STRUCTURAL GUIDANCE for Platform Timber Frame. The full texts of these documents are available on the www. Where reference is made to British Standards, this also include the appropriate section of the Eurocodes.

1 Loading on structural elements

1.1 Structural duties of timber frame elements

1.1.1 Timber frame wall panels

Timber frame panels used in house construction have three major structural duties to perform: support of vertical loading, resistance to deformations caused by horizontal loading in their plane and resistance to wind loading perpendicular to their plane.
Resistance to vertical loads is checked according to normal engineering principles, bearing in mind that in timber design the duration of each load (long-, medium-, short- or very short-term) has to be considered because the strength of the timber members depends on the duration of the loads. The racking or shear resistance of wall panels to horizontal load is calculated according to procedures set out in BS 5268-6.1 Structural use of timber –
Code of practice for timber frame walls – Dwellings not exceeding four storeys, which are based on data from tests on typical timber frame wall panels. Where there are insufficient racking walls, sway frames may be added and the derivation of forces applied in the 2D plane frame analysis is shown in the relevant sections of the calculations.

1.1.2 Horizontal diaphragms

The horizontal diaphragms formed by floor, ceiling and roof systems are usually required to take loads in their own plane. The illustration shows a floor and roof diaphragm resisting wind load on a gable wall. The ends of the gable wall are supported directly by the front and rear walls of the building, and the bottom edge by the foundation. The load on the rest of the wall is transferred via the horizontal diaphragms into the front and rear walls where their shear resistance can transfer it to the foundations. The first floor diaphragm takes half the net load on the ground floor walls plus half the net load on the first floor walls. The roof diaphragm takes half the net load on the first floor walls plus load from the roof. For wind parallel to the ridge it is usual to assume that half the net horizontal wind load on the spandrels or roof is transferred to the roof diaphragm; for wind perpendicular to the ridge all the net horizontal roof load is transferred to it. Where adjacent panel edges are fastened with nails or screws to the same timber members such as joists or blocking, the resulting connection between the panels enables shear forces to be transferred from one panel to the next. This is an essential part of the diaphragm action. It may be assumed that conventional floors and flat roofs, in which a wood based panel product is fastened to timber joists, have adequate strength and stiffness as horizontal diaphragms, provided that:
• the diaphragm span : depth ratio does not exceed 2:1 in either wind direction (BS 5268-6-2 Clause 6.5)
• the span does not exceed 12 m between supporting walls (BS 5268-6-2 Clause 6.5)
• the fixing around the edges of the panels complies with standard recommendations (eg 3.00 mm diameter ringed shank nails at 150 mm centres for plywood or 3.35 mm ringed shank nails at 300 mm

for wood particleboard and OSB, with a length equal to 2.5 times the board thickness)
• the perimeter of the diaphragm is attached to the walls with fastenings of equivalent strength.

Plasterboard ceilings in roofs that comply with BS 5268-3 Annex A may also be assumed to provide adequate diaphragm action provided that truss clips are used to secure every truss to a head binder and the fixing around the edges complies with standard recommendations (3.5 mm diameter plasterboard nails or screws 40 mm long at 150 centres). It is recommended that in areas of high wind load (eg with a dynamic wind pressure > 1500 N/m²), and always for horizontal diaphragms outside the range given above, the required fastener spacing should be calculated.

6 Multi-storey buildings

6.1 General design considerations

The Timber Frame 2000 project, begun in 1995, was carried out by the Building Research Establishment and TRADA Technology Ltd in collaboration with the British Government and the timber frame industry. It demonstrated beyond doubt that conventional timber frame construction can be used to build economical, safe and serviceable multi-storey dwelling units. The report Multi-storey timber frame buildings – a design guide concluded that the use of BS 5268-6 can be extended to the design of platform frame buildings up to eight storeys without excessive deflection.

Particular attention should be given to the following issues:
• each storey should have sufficient strength and stiffness to resist a horizontal long-term force of 2.5% of the vertical load + live load
• overturning forces should be carefully checked
• where party walls separate the structure into separate units, the engineer should ensure that horizontal forces can be taken by each unit independently or be transferred across the party walls
• where additional stiffness has to be provided, eg by the introduction of portal frames, the deflection limit should be appropriate for the structure and finishes, but may be no more than height/500
• resistance to disproportionate collapse should be checked.

6.2 Construction

The stability of the building during construction, ie before vertical loads are applied and plasterboard is fixed, must be considered as part of the design process. It is acceptable to reduce the wind load in accordance with BS 6399-2 for the construction process. Particular attention should be given to the buckling resistance of studs in party walls, which may have neither plasterboard nor sheathing attached during construction. Significant vertical loads can result from the storage of construction materials such as plasterboard packs, so normally it will be necessary to specify requirements for temporary bracing (see BS 5268-6.1).

6.3 Disproportionate collapse

While the Timber Frame 2000 project demonstrated that timber frame construction is remarkably resilient to disproportionate collapse, specific design checks against this possibility may be required under the Building Regulations. Guidance is expected in a planned revision to BS 5268-2: 2002. Meanwhile, guidance has been published in the UK Timber Frame Association Technical Bulletin 3 Design guidance for disproportionate collapse. This specifies minimum nailing between the lower rails of wall panels through the interfaces to the upper rails of the panels beneath as follows:
3.1 mm diameter nails at 300 mm centres for Class 1 and Class 2A buildings
3.1 mm diameter nails at 200 mm centres for Class 2B buildings.

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New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: L1

Loading Schedule - Floors

Compartment Floor With Integral Ceiling

Not applicable

Dead	Density	Thickness			kN/m2
	1000	28			
	750	22			
	850	19			
	100	70			
	750	18			
	20	100			
	850	19			
	850	12.5			
	850	15			
	530	241	45		

Imposed

Bedrooms in hotels / student accomm. *(Bedrooms)*
(Communal)

For Eco joists:

Joist top chord dead load: 0.000 kN/m^2 + partitions

Joist bottom chord dead load: 0.000 kN/m^2

Total **0.00 KN/m^2**

Intermediate Floor

Applicable

Dead	Density	Thickness				kN/m2	
						0.000	
Chipboard deck	750	22				0.164	
Plasterboard	850	18				0.153	
Insulation	20	200				0.040	
Joists	530	300	38		400	0.151	
NLB partitions						0.270	
						0.778	0

Imposed

Self contained dwelling units	*(Bedrooms)*	0.000	kN PL	or	1.500	0
	(Communal)		kN PL	or		0

For Eco joists:

Joist top chord dead load: 0.164 kN/m^2 + partitions

Joist bottom chord dead load: 0.193 kN/m^2

Total **2.28 KN/m^2**

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Floors - continued

Compartment Floor With Separate Ceiling *Not applicable*

Dead	Density	Thickness	kN/m2

Imposed

(Bedrooms)
(Communal)

Total **0.00 KN/m²**

Roof Constructions

Flat Roof *Not applicable*

Dead	Density	Thickness	KN/m2
	750	4	
	150	85	
	530	18	
	20	150	
	850	12.5	
	530	245	44

Imposed

all

Effective Snow Drift Loads

Total **0.00 KN/m²**

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Roof Constructions - continued

Pitched / Curved Roof *Applicable* — Slope / Average Slope: 30.0 degrees

Dead (on slope area)	**Density**	**Thickness**			**KN/m2** (on slope area)	
Tiles	2000	35			0.700	
Battens & Felt	530	25	30	100	0.040	
Truss Rafters / Rafters	530	47	450	600	0.187	
Insulation	50	200			0.100	
Plasterboard	850	15			0.128	
Chipboard deck					0.000	
Bottom chord				600	0.000	
Plasterboard					0.000	
				On Slope	1.154	1.154
				On Plan - Attic	0.000	**0.000**
Imposed **Roof area**		m^2		On Plan - Other	1.333	**1.333**
External roof slope					0.750	
Internal Truss type:					0.250	

For attic trusses only: *Truss span:* *m*
Dim'n between verticals: *m*
Average imposed load: *kN/m²*

Total - Attic	**0.00 KN/m²**
Total -Other	**2.33 KN/m²**

External Balcony *Not applicable*

Dead	**Density**	**Thickness**		**KN/m2**
	3000	25		
	750	4		
	150	85		
	530	18		
	530	25	50	
	20	150		
	850	25		
	850	25		
	530	235	38	

Imposed
all

Total	**0.00 KN/m²**

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Wall Constructions

Party Wall *Not applicable*

	Density	Thickness	width	centres	KN/m2

Value for 1 Leaf **0.000 KN/m²**

Ht= 2.4 m gives **Total** **0.00 KN/m run**

Load-bearing Internal walls

			width	centres	KN/m2
Plasterboard *(optional)*					0.000
Plasterboard	850	25			0.213
Studs	530	89	38	600	0.030
No sheathing	0	9			0.000
Insulation	20	150			0.030
Plasterboard	850	25			0.213
Plasterboard *(optional)*					0.000
					0.485 KN/m2

Non Load-bearing Internal walls *(Partitions)*

Build up as Load Bearing walls but with only 1 layer 12.5mm plasterboard e.f.

Ht= 2.4 m, this is: **1.16 KN/m run** over 1.6m **0.73 KN/m²**

If this value is deemed inappropriate use, enter new value: **0.27** **0.27 KN/m²**

External Wall	Density	Thickness	width	centres	KN/m2	Eccentricity *(If applicable)*
Plasterboard	850	25			0.213	
					0.000	
Studs	530	140	38	600	0.047	
OSB	750	9			0.068	
Insulation	20	105			0.021	
					0.000	mm
					0.000	mm
					0.000	mm
					0.348 KN/m²	

Note: the eccentricities are from face of stud NOT the sheathing.

Ht= 2.4 m gives 0.84 KN/m run

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Summary of Design Wind Loads

	Wind on long elevation	Wind on short gable
For Building Stability Checks Use Wind Pressure:	**0.81 kN/m²**	**0.91 kN/m²**
Wind Uplift:	**-0.33 kN/m²**	

	General Condition	Zone A
For Panel Design Checks Use Wind Presssure / Suction:	**1.02 kN/m²**	**1.63 kN/m²**
Wind Uplift:	**-0.48 kN/m²**	

In order to avoid confusion on panel design use a common design wind pressure for all panels of:
1.02 kN/m² for General conditions and
1.63 kN/m² for Zone A

Refer to overall stability sheets for applicable k100 factors.

Site Location Map

National Grid Reference:

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Wind Loading - Building Parameters

Permanent Condition

This calculation is based upon the guidelines of BS 6399: Part 2: 1997

Standard Method or Hybrid Method *as noted below*

Dynamic Classification

Building Height, Hr:	Ridge:	6.90	m	Eaves: 4.20 m
Building Type Factor, Kb		0.5		*(Timber Framed Buildings)*
Dynamic Augmentation Factor, Cr		0.008		

Standard Method Calculation

Location	Rowlands Gill		
Basic Wind Speed,Vb	24.9	m/s	*(see fig. 6)*
Site Altitude	55.00	m	*(Base Altitude for Hybrid Method - - refer to cl. 3.2.3.4.10)*
Altitude Factor, Sa	1.06		
Direction Factor, Sd	1.00		
Season Factor, Ss	1.00		
Probability Factor, Sp	1.00		

Effective Height

Reference Height, Hr	6.90	m	
Terrain	Country		*(see Note 1 below)*
Average Roof Top Height, Ho		m	
Building Upwind Spacing, Xo		m	
Effective Height, He	6.90	m	

Effective Wind Speed

Closest Distance to Sea	23	km	*(see Note 1 below)*
Site Wind Speed, Vs	26.27	m/s	*(see table 4 for Standard Method)*
Terrain Factor, Sb	1.495		***Sb is taken from table 4 without interpolation.***
Effective Wind Speed, Ve	39.27	m/s	
Interpolated Value of Sb (*if reqd*.)			***Enter interpolated value if reqd.***
Dynamic Pressure - No wind angle	**0.945**	**kN/m²**	
			Wind at 0⁰ **0.683 kN/m**
Building reference angle	**0**		***Wind at 90⁰*** **0.927 kN/m**

Additional Details to BS 6399: Part 2: 1997 - ***Hybrid Method -*** (*Cl. 1.8.4 option b*)

Direction Factor, Sd for angle	240	1.00	(*Worst case*)	**Hybrid method: Yes**
Gust Peak Factor, g_t		3.44		*(see page WL5 for topographical data used.)*
Fetch Factor, S_c (*Table 22*)		0.906		
Fetch Adjustment Factor, T_c (*Table 23*)		1.000		
Turbulance Factor, S_t (*Table 22*)		0.189		
Fetch Adjustment Factor, T_t (*Table 23*)		1.000		
Distance to edge of town at worst case direction		0.000	km	*(see Note 1 below)*
Distance to sea at worst case direction		128.000	km	
Topographic Increment, S_h (*Table25*)		0.000	*(clause 3.2.3.4.10)*	

Note 1: If using the Hybrid Method, the Terrain and Closest Distance to the sea should be in the direction being considered.

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Wind Loading - Pressure Co-efficients for Overall Stability

Size Effect Factors

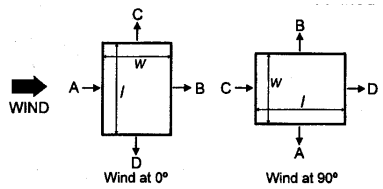
Surface	Dimn a		Ca *(see fig 4, Graph Line)*	B
Gable	11.478		0.95	
Elevation	10.127		0.95	
Roof	13.977		0.93	
Int Vol of 1 Apt.(m^3)	196.4	58.13	0.82	

External Pressure Coefficients - Walls

Building Width, W (*Gable*)	10.13	m
Building Length, L (*Elevation*)	8.92	m
Building Height, H	6.90	m
Exposure Case	Funnelling	

Dimn to between bldgs: 5.0
Adjacent faces: L
Result: ***Funnelling***

(see table 5)



Wind @ 0
D/H (*W/H*): 1.47
Wind @ 90
D/H (*L/H*): 1.29

Cpe Values

		Wind at 0^0			Wind at 90^0	
Surface A		0.85	Surfaces	Zone A	-1.60	*(see table 5 and fig 12)*
Surface B		-0.50	A & B	Zone B	-0.90	
Surfaces	Zone A	-1.30		Zone C	-0.90	
C & D	Zone B	-0.80	Surface C		0.85	
	Zone C	-0.50	Surface D		-0.50	

External Pressure Coefficients - Roof (*assuming equal pitches*) *(see tables 8-11incl. and figs. 12, 20 & 21)*

			Component forces (*kN/m*)		
Roof Type / Pitch	Gable end	30			
Wind Normal to Eaves	***Case 1***	***Case 2***	***Horizontal***	***Vertical***	
Zone C	-0.20	0.40	2.440	0.822	Max
Zone G	-0.50	-0.50		-1.995	Min
Wind Normal to Gable					
Zone C (*Zone B if hip roof*)	-0.60	-0.60	-0.271	-5.16442783	Max
Zone D (*Zone E if hip roof*)	-0.50	-0.50		-5.16	Min

Wind Pressure For Building Stability
(by observation stability against overturning will be critical with wind on the longest face) as cl 2.1.3.6

Wind at 0^0 on Elevation **0.81 kN/m²**

Wind at 90^0 on Gable **0.91 kN/m²**

Wind Suction On Roof For Building Stability **-0.33 kN/m²**
Max downward pressure for roof designs: 0.22 kN/m²

For these two cases the effects of internal conditions can be ignored.

Use wind pressure based on eaves level for long elevation based on BRE Digest 436 Part 1
Yes
Also applies to hip end buildings

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Wind Loading - Pressure Co-efficients for Panel Design

Internal Pressure Coefficients

Cpi	0.2	(int pressure)	Cpi x Ca:	0.16
Cpi	-0.3	(int suction)	Cpi x Ca:	-0.25

Size Effect Factor Ca taken as 1.0 for a max diagonal 'a' of 5m.

Analysis Results for Cpi + 0.2 in kN/m^2

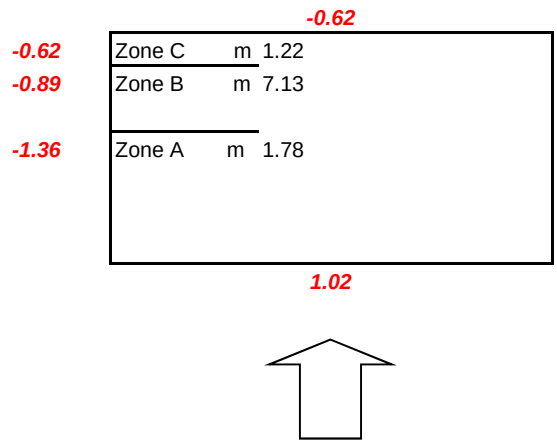
		Wind at 0^0			Wind at 90^0
Surface A		0.64	Surfaces	Zone A	-1.63
Surface B		-0.62	A & B	Zone B	-0.99
Surfaces	Zone A	-1.36		Zone C	-0.99
C & D	Zone B	-0.89	Surface C		0.64
	Zone C	-0.62	Surface D		-0.62

Analysis Results for Cpi - 0.3 in kN/m2

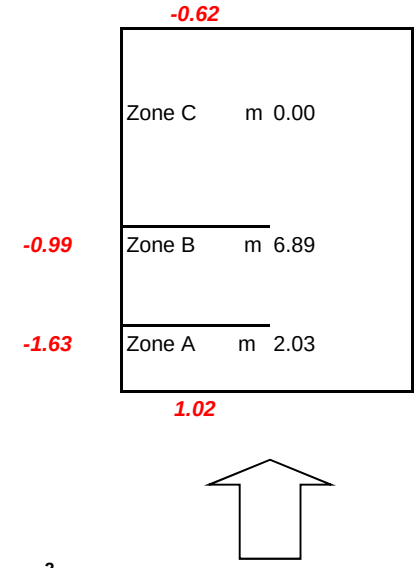
		Wind at 0^0			Wind at 90^0
Surface A		1.02	Surfaces	Zone A	-1.25
Surface B		-0.24	A & B	Zone B	-0.61
Surfaces	Zone A	-0.98		Zone C	-0.61
C & D	Zone B	-0.51	Surface C		1.02
	Zone C	-0.24	Surface D		-0.24

Diagramtic Summary of Wind Loads

Wind at 0^0



Wind at 90^0



Results Summary

General Condition	**1.02**	**kN/m^2**
Zone A	**1.63**	**kN/m^2**
Wind Uplift For Roof Design	**-0.48**	**kN/m^2**

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Wind Loading - Building Parameters

Temporary Condition - During Erection

This calculation is based upon the guidelines of BS 6399: Part 2: 1997

Dynamic Classification

Building Height	6.90	m	
Building Type Factor, Kb	0.5		*(Timber Framed Buildings)*
Dynamic Augmentation Factor, Cr	0.008		

Standard Method Calculation

Location	Rowlands Gill		
Basic Wind Speed,Vb	24.90	m/s	*(see fig. 6)*
Site Altitude	55.00	m	
Altitude Factor, Sa	1.06		
Direction Factor, Sd	1.00		
Season Factor, Ss	0.98		*(see Annex D, cl D.2 & table D.1)*
Probability Factor, Sp	0.749		*(see Annex D, cl D.1)*

Effective Height

Reference Height, Hr	6.90	m	
Terrain	Country		
Average Roof Top Height, Ho	0.00	m	
Building Upwind Spacing, Xo	0.00	m	
Effective Height, He	6.90	m	

Effective Wind Speed

Closest Distance to Sea	23	km	
Site Wind Speed, Vs	19.28	m/s	
Terrain Factor, Sb	1.495		*(see table 4)*
Effective Wind Speed, Ve	28.83	m/s	

Dynamic Pressure **0.51** **kN/m^2**

Topograhical data used

Wind Direction	Distance to Sea (km)	Dist. to edge of town (km)	Obstruction height H_o(m)	Obstruction spacing X_o(m)	Dyn. Press. q (kN/m^2)
0	78	0.00	0	0	0.64
30	29	0.00	0	0	0.58
60	23	0.00	0	0	0.58
90	24	0.00	0	0	0.59
120	33	0.00	0	0	0.56
150	248	0.00	0	0	0.61
180	469	0.00	0	0	0.68
210	183	0.00	0	0	0.82
240	128	0.00	0	0	0.95
270	101	0.00	0	0	0.93
300	286	0.00	0	0	0.78
330	144	0.00	0	0	0.64

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Overall Stability:

Finished & lined

K_{100} from BS 5268-6.1:1996

	Eaves elevation	Gable elevation
Grnd to 3rd	0.60	0.52
4th flr & above	1.00	1.00

Min brick buttress dimensions
Up to 3 storeys min 550mm
Up to 4 storeys min 950mm
Above 4 storeys min 1200mm

Design Wind Load for O/A Stability:

	Wind on long elevation	Wind on short gable
Grnd to 3rd	0.485 kN/m²	0.471 kN/m²
4th flr & above	0.808	0.905

	General Condition	Zone A
Design Wind Load for Stud Design:	1.016 kN/m²	1.635 kN/m²

Calcluate Total Dead Load

	Construction	*Area*	
Roof Area	Pitched / Curved Roof - Other	113.75	m²
5th Floor Area	N.A.		m²
4th Floor Area	N.A.		m²
3rd Floor Area	N.A.		m²
2nd Floor Area	N.A.		m²
1st Floor Area	Intermediate Floor	113.75	m²

5th Floor Length of Int. Walls		m
4th Floor Length of Int. Walls		m
3rd Floor Length of Int. Walls		m
2nd Floor Length of Int. Walls		m
1st Floor Length of Int. Walls		m
Gnd Floor Length of Int. Walls	11.93	m
5th Floor Length of Party Walls		m
4th Floor Length of Party Walls		m
3rd Floor Length of Party Walls		m
2nd Floor Length of Party Walls		m
1st Floor Length of Party Walls		m
Gnd Floor Length of Party Walls		m
5th Floor Length of Ext. Walls		m
4th Floor Length of Ext Walls		m
3rd Floor Length of Ext Walls		m
2nd Floor Length of Ext Walls		m
1st Floor Length of Ext Walls	29.50	m
Gnd Floor Length of Ext Walls	37.50	m

Total Roof Load	151.58 kN
Total Floor Loads	57.82 kN
Total Int. Wall loads	15.18 kN
Total Party Wall Load	0.00 kN
Total Ext. Wall Load	51.80 kN
Total Dead Load	**276.38 kN**

Loads (kN/m2)

Flat Roof	0.000
Pitched / Curved Roof - Attic	1.333
Pitched / Curved Roof - Other	1.333
Compartment Floor	0.000
Intermediate Floor	0.508
Perimeter Wall	0.348
Compartment Wall	0.000
Load-bearing Internal Wall	0.485

5th Floor Storey Ht	m
4th Floor Storey Ht	m
3rd Floor Storey Ht	m
2nd Floor Storey Ht	m
1st Floor Storey Ht	1.71 m
Grnd Floor Storey Ht	2.63 m

Note 1 : Non-loadbearing stud walls are to be excluded from the length of internal walls. Reference to ground floor is the lowest level of timber frame which may not be the literal ground floor.

Note 2 : External walls are calculated on the basis that that the cladding weight is excluded. To increase the building weight to account for the cladding attched to the timber frame make the following adjustment.

Gross external wall area with cladding:
117.3 m²
0.000 kN/m²

0.00 kN additional dead load due to cladding.
(*Included in the value for Ext walls* .)

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Building Dimensions

Roof Type: Gable end

O/A Length (*Eaves*) (m)	8.92	Eaves Height (m)	4.20	(*this value is to be the same as the overall height if it is a flat roof*)
O/A Width (*Gable*) (m)	10.13	Roof Slope Length (m)	5.396	(*includes 0.5m eaves o/h*)
O/A Height (*Ridge*) (m)	6.90	Top storey inset (m)		

Wind Forces Acting on Building (*including the reduction for wind shielding*)

Total wind on the gable of building:	35.52 kN	*when building considered as a complete unit*	(1)
Total wind on the gable of building:	28.09 kN	*when building considered as an end of terrace unit*	(2)
Total wind on the elevation of bldg.:	36.23 kN	***Use option:***	***(1)***

Racking Forces Acting on Ground Floor Walls

Total racking force on the gable of building:	29.26 kN	*(Wind on gable Elevation)*
Total racking force on the elevation of building:	30.55 kN	*(Wind on Elevation)*

Sliding Check

Sliding Force	36.23 kN	**Sliding O.K.**
Co-efficient of friction taken as :	0.4	*(with a DPC)*
Resistance to sliding: *from frictional resistance*	88.62 kN	
Resistance to sliding: *from additional fixings*	56.01 nails	
Factor of Safety against sliding:	3.99	
Required:	1.4	

Overturning Check

Ref BS 5268 - 6.1 cl. 4.4.2.2 - based on total dead load acting at half the building **dim'n**

Values displayed for all buildings, but refer to page OS5 for a more rigorous analysis

Overturning O.K.

	Front / Rear	***Left / Right***	
Overturning Moment:	356.33	366.95	kNm
Resistance to overturning: *dead load*	1400.28	1231.97	kNm
Height of masonry mobilised:			m
Resistance to overturning: *masonry*	0.00	0.00	kNm
Factor of Safety against overturning:	3.93	3.36	
Required:	1.4		
Masonry HD straps required:	N.A.	N.A.	

Based on Cullen HD straps with a SWL of 3kN

Uplift Check

External Roof Uplift:	-0.48	kN/m^2
Total Uplift Force	-54.84	kN
Resistance to uplift:	276.38	kN
Factor of Safety against uplift:	5.04	**Uplift O.K.**
Required:	1.4	

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Project	Project no	**CALCULATION SHEET**
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
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Top Storey Stability:

K100 applicable to top storey: No

Applicable to all buildings irrespective of number of storeys and assumes cl 4.4.2.2. principles

For this check the values are based upon the data for the top storey height entered above.

Sliding Check

Sliding Force	29.81 kN	
Co-efficient of friction taken as :	0.4	
Resistance to sliding: *from frictional resistance*	38.70 kN	
Resistance to sliding: *from additional fixings*		nails
Factor of Safety against sliding:		
Required:	1.4	

Overturning Check

Ref BS 5268 - 6.1 cl. 4.4.2.2 - based on total dead load acting at half the building **width**

	Front / Rear	
Overturning Moment:	303.30	**Overturning O.K.**
Resistance to overturning: *from dead load*	768.00	
Resistance to overturning: *from strapping*	0.00	
Factor of Safety against overturning: *no strapping*	2.53	
Factor of Safety against overturning: *with strapping*	2.53	
Required:	1.4	

Uplift Check

Roof type: Pitched / Curved Roof - Other

External Roof Uplift:	-0.48 kN/m^2	
Roof Dead Load:	1.333 kN/m^2	**Roof Uplift O.K.**
Required:	1.4	

To maintain a F.o.S specified on overturning and uplift, provide additional strapping to the value of **0.00 kN/m**

This force can be resisted by any of the following strapping arrangements, between the top storey and the adjacent lower storey, with an equal number of nails either side of the floor zone.

at 600 c/c	No. nails either side of floor zone
at 1200 c/c	No. nails either side of floor zone
at 1800 c/c	No. nails either side of floor zone
at 2400 c/c	No. nails either side of floor zone

Using 3.75mm x 30mm long square twist nails.
Basic load = 0.258kN *K 44 = 1.2*
Red.= 30/45=0.66 *k46 = 1.25*
k48=1.25
F = 0.258 x 1.2 x 1.25 x 1.25 x 0.66 = 0.319kN / nail.

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Project: New Detached Dwelling on land to Read of

Project no: 3081

CALCULATION SHEET

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: R 1

Racking Resistance With Wind on Gable Elevation

BS 5268: section 6.1 (1996)

Ground floor only

Wall Ref	01	03	05	07	09	11
Length (m)	8.90	0.90	8.00	8.62	1.40	2.07
Height (m) (MAX 2.7m)	2.40	2.40	2.40	2.40	2.40	2.40
Agg.area of openings (M^2)	4.81	0.38	6.46	5.54	0.00	1.05
UDL (kN/m)	5.50	4.50	3.01	6.14	4.35	4.35
Masonry Length (m)	8.90	0.90	8.00	0.00	1.40	2.07
Tie Density (x/M^2)	3.70	3.70	3.70	3.70	3.70	3.70
Basic Masonry Resistance	**3.56**	**0.36**	**3.20**	**0.00**	**0.56**	**0.83**
Primary Board						
Material	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)
Category	1	1	1	1	1	1
Thickness (mm)	9.00	9.00	9.00	9.00	9.00	9.00
Nail Diameter (mm)	2.8	2.8	2.8	2.8	2.8	2.8
Perimeter Nail Spacing (mm)	150	150	150	150	150	150
Basic Racking Rest.,Rb	1.68	1.68	1.68	1.68	1.68	1.68
K101	0.93	0.93	0.93	0.93	0.93	0.93
K102	1.00	1.00	1.00	1.00	1.00	1.00
K103	1.00	1.00	1.00	1.00	1.00	1.00
Modified Resist., Rb x Km	**1.57**	**1.57**	**1.57**	**1.57**	**1.57**	**1.57**
Secondary Board						
Material	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard
Category	4	4	4	4	4	4
Thickness (mm)	12.50	12.50	12.50	12.50	12.50	12.50
Nail Diameter (mm)	2.65	2.65	2.65	2.65	2.65	2.65
Perimeter Nail Spacing (mm)	150	150	150	150	150	150
Basic Racking Rest.,Rb	0.18	0.18	0.18	0.18	0.18	0.18
K101	1.00	1.00	1.00	1.00	1.00	1.00
K102	1.00	1.00	1.00	1.00	1.00	1.00
K103	1.00	1.00	1.00	1.00	1.00	1.00
Modified Resist., Rb x Km	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**
Wall anchorage / nailing	**No**	**No**	**No**	**No**	1.03kN / 4	**No**
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	1.00	1.00	1.00	1.00	1.00	1.00
K105	1.32	0.38	1.32	1.32	0.58	0.86
K106	0.50	0.59	0.32	0.42	1.00	0.53
K107	1.27	1.55	1.16	1.30	1.45	1.39
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	12.82	0.54	6.67	10.80	2.04	2.23
Secondary	1.47	0.06	0.77	1.24	0.23	0.26
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	12.82	0.54	6.67	10.80	2.04	2.23
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	1.47	0.06	0.77	1.24	0.23	0.26
Masonry (<25%of P+S)	3.56	0.15	1.86	0.00	0.56	0.62
Total Resistance kN	**17.85**	**0.75**	**9.30**	**12.04**	**2.83**	**3.11**

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: R 2

Racking Resistance With Wind on Eaves Elevation

BS 5268: section 6.1 (1996)

Ground floor only

Wall Ref	**02**	**04**	**06**	**08**		
Length (m)	6.62	3.24	6.78	3.31		
Height (m) (MAX 2.7m)	2.40	2.40	2.40	2.40	2.40	2.40
Agg.area of openings (M^2)	2.67	0.32	2.08	1.76		
UDL (kN/m)	2.14	2.14	2.54	1.86		
Masonry Length (m)	6.62	3.24	5.57	0.00	0.00	0.00
Tie Density (x/M^2)	3.70	3.70	3.70	3.70	None	None
Basic Masonry Resistance	**2.65**	**1.29**	**2.23**	**0.00**	**0.00**	**0.00**
Primary Board						
Material	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	None	None
Category	1	1	1	1		
Thickness (mm)	9.00	9.00	9.00	9.00	1.00	1.00
Nail Diameter (mm)	2.8	2.8	2.8	2.8		
Perimeter Nail Spacing (mm)	150	150	150	150		
Basic Racking Rest.,Rb	1.68	1.68	1.68	1.68		
K101	0.93	0.93	0.93	0.93		
K102	1.00	1.00	1.00	1.00		
K103	1.00	1.00	1.00	1.00		
Modified Resist., Rb x Km	**1.57**	**1.57**	**1.57**	**1.57**	**0.00**	**0.00**
Secondary Board						
Material	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	None	None
Category	4	4	4	4		
Thickness (mm)	12.50	12.50	12.50	12.50	1.00	1.00
Nail Diameter (mm)	2.65	2.65	2.65	2.65		
Perimeter Nail Spacing (mm)	150	150	150	150		
Basic Racking Rest.,Rb	0.18	0.18	0.18	0.18		
K101	1.00	1.00	1.00	1.00		
K102	1.00	1.00	1.00	1.00		
K103	1.00	1.00	1.00	1.00		
Modified Resist., Rb x Km	**0.18**	**0.18**	**0.18**	**0.18**	**0.00**	**0.00**
Wall anchorage / nailing	**No**	2.38kN / 8	**No**	**No**		
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	1.00	1.00	1.00	1.00	1.00	1.00
K105	1.32	1.13	1.32	1.14	0.00	0.00
K106	0.61	0.90	0.70	0.51		
K107	1.12	1.16	1.14	1.14	1.00	1.00
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	10.34	6.56	12.28	3.77		
Secondary	1.19	0.75	1.41	0.43		
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	10.34	6.56	12.28	3.77	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	1.19	0.75	1.41	0.43	0.00	0.00
Masonry (<25%of P+S)	2.65	1.29	2.23	0.00	0.00	0.00
Total Resistance kN	**14.17**	**8.61**	**15.91**	**4.20**	**0.00**	**0.00**

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Project | Project no | **CALCULATION SHEET**

New Detached Dwelling on land to Read of | 3081

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: R 3

Design Summary

Ground floor only

Racking Resistance With Wind on Gable Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
01	1	12.82	0.00	1.47	3.56	17.85	over 72	1.55
03	1	0.54	0.00	0.06	0.15	0.75	over 72	0.65
05	1	6.67	0.00	0.77	1.86	9.30	over 72	0.90
07	1	10.80	0.00	1.24	0.00	12.04	over 72	1.08
09	1	2.04	0.00	0.23	0.56	2.83	over 72	1.57
11	1	2.23	0.00	0.26	0.62	3.11	over 72	1.16
		0.00	0.00	0.00	0.00	0.00		
Total Resistances		35.10	0.00	4.03	6.75	**45.87** kN		
Total Required						29.26 kN		

Proportion of Cat 4 to 1: 11.48%

Proportions Adequate

Adequate Resistance

CSF = 0.64

<1.0 O.K.

Factor of safety required: 1

Any shortfall is to be provided by a steel sway frames. Use sway frame/s each with a capacity of: 0 — 0.00 kN

Racking Resistance With Wind on Eaves Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
02	1	10.34	0.00	1.19	2.65	14.17	over 72	1.81
04	1	6.56	0.00	0.75	1.29	8.61	over 72	2.25
06	1	12.28	0.00	1.41	2.23	15.91	over 72	1.98
08	1	3.77	0.00	0.43	0.00	4.20	over 72	1.07
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
		0.00	0.00	0.00	0.00	0.00		
Total Resistances		32.94	0.00	3.78	6.17	**42.89** kN		
Total Required						30.55 kN		

Proportion of Cat 4 to 1: 11.48%

Proportions Adequate

Adequate Resistance

CSF = 0.71

<1.0 O.K.

Factor of safety required: 1

Any shortfall is to be provided by a steel sway frames. Use sway frame/s each with a capacity of: 0 — 0.00 kN

Racking Resistance In the Temporary Condition

Ground floor only

Consider the racking resistance of the building in the temporary condition before the plasterboard is fixed, and contributes to the overall resistance. If resistance is inadequte provision of temporary bracing will be required.
In order to establish the temporary racking resistance, only cat 1 materials will be mobilised. The racking forces causing the disturbing effects will be based upon a pro rata of temporary wind load to design wind load and multiplied by the long term resistance required.

Design Wind Pressure:	**0.93**	**kN/m^2**
Temporary Wind Pressure:	**0.51**	**kN/m^2**

So Temporary Resistance to be: 54.97% of Design Resistance.

Racking Resistance With Wind on Gable Elevation

Design Resistance Required:	29.26	kN
Temporary Resistance Required:	16.09	kN
Temporary Resistance Provided:	35.10	kN

Therefore: **Temporary Bracing Is Not Required**

Racking Resistance With Wind on Eaves Elevation

Design Resistance Required:	30.55	kN
Temporary Resistance Required:	16.80	kN
Temporary Resistance Provided:	32.94	kN

Therefore: **Temporary Bracing Is Not Required**

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no R 5

Racking Resistance With Wind on Gable Elevation

BS 5268: section 6.1 (1996)

First floor and above

Wall Ref	**101**	**103**				
Length (m)	8.90	0.90				
Height (m) (MAX 2.7m)	1.90	1.90				
Agg.area of openings (M^2)	1.82	0.00				
UDL (kN/m)	2.80	2.80				
Masonry Length (m)	8.90	0.90				
Tie Density (x/M^2)	3.70	3.70	None	None	None	None
Basic Masonry Resistance	**3.56**	**0.36**	**0.00**	**0.00**	**0.00**	**0.00**
Primary Board						
Material	OSB (Type 3/4)	OSB (Type 3/4)	None	None	None	None
Category	1	1				
Thickness (mm)	9.00	9.00	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.8	2.8				
Perimeter Nail Spacing (mm)	150	150				
Basic Racking Rest.,Rb	1.68	1.68				
K101	0.93	0.93				
K102	1.00	1.00				
K103	1.00	1.00				
Modified Resist., Rb x Km	**1.57**	**1.57**	**0.00**	**0.00**	**0.00**	**0.00**
Secondary Board						
Material	N'd Plasterboard	N'd Plasterboard	None	None	None	None
Category	4	4				
Thickness (mm)	12.50	12.50	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.65	2.65				
Perimeter Nail Spacing (mm)	150	150				
Basic Racking Rest.,Rb	0.18	0.18				
K101	1.00	1.00				
K102	1.00	1.00				
K103	1.00	1.00				
Modified Resist., Rb x Km	**0.18**	**0.18**	**0.00**	**0.00**	**0.00**	**0.00**
Wall anchorage / nailing	**No**	**No**				
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	1.26	1.26				
K105	1.32	0.38	0.00	0.00	0.00	0.00
K106	0.74	1.00				
K107	1.14	1.36	1.00	1.00	1.00	1.00
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	21.61	1.00				
Secondary	2.48	0.11				
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	21.61	1.00	0.00	0.00	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	2.48	0.11	0.00	0.00	0.00	0.00
Masonry (<25%of P+S)	3.56	0.28	0.00	0.00	0.00	0.00
Total Resistance kN	**27.65**	**1.39**	**0.00**	**0.00**	**0.00**	**0.00**

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Project | Project no | **CALCULATION SHEET**

New Detached Dwelling on land to Read of | 3081

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: R 6

Racking Resistance With Wind on Eaves Elevation

BS 5268: section 6.1 (1996)

First floor and above

Wall Ref	**102**	**104**	**106**			
Length (m)	6.62	3.24	9.85			
Height (m) (MAX 2.7m)	2.70	2.70	2.70			
Agg.area of openings (M^2)	0.89	0.00	0.00			
UDL (kN/m)	0.99	0.99	0.99			
Masonry Length (m)	6.62	3.24	9.85			
Tie Density (x/M^2)	3.70	3.70	3.70	None	None	None
Basic Masonry Resistance	**2.65**	**1.29**	**3.94**	**0.00**	**0.00**	**0.00**
Primary Board						
Material	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	None	None	None
Category	1	1	1			
Thickness (mm)	9.00	9.00	9.00	1.00	1.00	1.00
Nail Diameter (mm)	2.8	2.8	2.8			
Perimeter Nail Spacing (mm)	150	150	150			
Basic Racking Rest.,Rb	1.68	1.68	1.68			
K101	0.93	0.93	0.93			
K102	1.00	1.00	1.00			
K103	1.00	1.00	1.00			
Modified Resist., Rb x Km	**1.57**	**1.57**	**1.57**	**0.00**	**0.00**	**0.00**
Secondary Board						
Material	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	None	None	None
Category	4	4	4			
Thickness (mm)	12.50	12.50	12.50	1.00	1.00	1.00
Nail Diameter (mm)	2.65	2.65	2.65			
Perimeter Nail Spacing (mm)	150	150	150			
Basic Racking Rest.,Rb	0.18	0.18	0.18			
K101	1.00	1.00	1.00			
K102	1.00	1.00	1.00			
K103	1.00	1.00	1.00			
Modified Resist., Rb x Km	**0.18**	**0.18**	**0.18**	**0.00**	**0.00**	**0.00**
Wall anchorage / nailing	**No**	**No**	**No**			
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	0.89	0.89	0.89			
K105	1.32	1.13	1.32	0.00	0.00	0.00
K106	0.87	1.00	1.00			
K107	1.06	1.08	1.05	1.00	1.00	1.00
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	12.40	6.02	20.93			
Secondary	1.42	0.69	2.40			
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	12.40	6.02	20.93	0.00	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	1.42	0.69	2.40	0.00	0.00	0.00
Masonry (<25%of P+S)	2.65	1.29	3.94	0.00	0.00	0.00
Total Resistance kN	**16.47**	**8.01**	**27.28**	**0.00**	**0.00**	**0.00**

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: R 7

Design Summary

First floor and above

Racking Resistance With Wind on Gable Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
101	1	21.61	0.00	2.48	3.56	27.65	over 72	2.46
103	1	1.00	0.00	0.11	0.28	1.39	over 72	1.22
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
Total Resistances		22.61	0.00	2.60	3.84	**29.04** kN		
Total Required						18.92 kN		

Proportion of Cat 4 to 1: 11.48% **Proportions Adequate**

Factor of safety required: 1

Adequate Resistance
CSF = 0.65
<1.0 O.K.

Racking Resistance With Wind on Eaves Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry		Red. If 63mm Stud Size	Act. kN/m
102	1	12.40	0.00	1.42	2.65	16.47	over 72	1.20
104	1	6.02	0.00	0.69	1.29	8.01	over 72	1.19
106	1	20.93	0.00	2.40	3.94	27.28	over 72	1.33
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
Total Resistances		39.36	0.00	4.52	7.88	**51.76** kN		
Total Required						21.19 kN		

Proportion of Cat 4 to 1: 11.48% **Proportions Adequate**

Factor of safety required: 1

Adequate Resistance
CSF = 0.41
<1.0 O.K.

Racking Resistance In the Temporary Condition

First floor and above

Consider the racking resistance of the building in the temporary condition before the plasterboard is fixed, and contributes to the overall resistance. If resistance is inadequte provision of temporary bracing will be required.
In order to establish the temporary racking resistance, only cat 1 materials will be mobilised. The racking forces causing the disturbing effects will be based upon a pro rata of temporary wind load to design wind load and multiplied by the long term resistance required.

Design Wind Pressure:	**0.93**	**kN/m^2**
Temporary Wind Pressure:	**0.51**	**kN/m^2**

So Temporary Resistance to be: 54.97% of Design Resistance.

Racking Resistance With Wind on Gable Elevation

Design Resistance Required:	18.92	kN
Temporary Resistance Required:	10.40	kN
Temporary Resistance Provided:	22.61	kN

Therefore: **Temporary Bracing Is Not Required**

Racking Resistance With Wind on Eaves Elevation

Design Resistance Required:	21.19	kN
Temporary Resistance Required:	11.65	kN
Temporary Resistance Provided:	39.36	kN

Therefore: **Temporary Bracing Is Not Required**

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Project	Project no	**CALCULATION SHEET**
New Detached Dwelling on land to Read of	3081.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no DS 1

Stud Design Summary

Ground Floor Walls

Wall Ref	Calc Page	Dead kN/m	Total kN/m	Stud Width	Stud Depth	Centres / Grade	Fire Ratio	CSI
1	6	5.50	12.94	38	140	600 / C16 / E	0.49	0.49
2	7	2.14	6.45	38	140	600 / C16 / E	0.40	0.40
3	8	4.50	17.27	38	140	600 / C16 / E	0.55	0.55
4	9	2.14	11.92	38	140	600 / C16 / E	0.47	0.47
5	10	3.01	8.57	38	140	600 / C16 / E	0.43	0.43
6	11	2.54	7.40	38	140	600 / C16 / E	0.41	0.41
7	12	6.14	17.21	38	89	600 TB / C16 / I	**0.69**	0.88
8	13	1.86	7.18	38	89	600 TB / C16 / I	0.25	0.25
9	14	4.35	6.93	38	140	600 / C16 / E	0.40	0.40
10	15	1.32	1.62	38	140	600 / C16 / E	0.33	0.33
11	16	4.35	6.93	38	140	600 / C16 / E	0.40	0.40

Note: 'TB' against the stud centres indicates that temporary bracing is required to prevent the stud buckling during construction

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Project: New Detached Dwelling on land to Read of

Project no: 3081.00

CALCULATION SHEET

Drawing no:

Calculation by: RG

Checked by:

Date: Feb-17

Calculation sheet/revision no: DS 2

Stud Design Summary

First Floor Walls

Wall Ref	Calc Page	Dead kN/m	Total kN/m	Stud Width	Stud Depth	Centres / Grade	Fire Ratio	CSI
101	1	2.80	4.45	38	140	600 / C16 / E	0.20	0.20
102	2	1.31	1.61	38	140	600 / C16 / E	**0.70**	0.70
103	3	2.80	4.45	38	140	600 / C16 / E	0.20	0.20
104	4	0.99	1.29	38	140	600 / C16 / E	0.17	0.17
106	5	1.31	1.61	38	140	600 / C16 / E	**0.70**	0.70

Note: 'TB' against the stud centres indicates that temporary bracing is required to prevent the stud buckling during construction

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New Detached Dwelling on land to Read of	3081.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no
			CDS 1

Cripple Stud Design Summary

Ground Floor Walls

Stud Ref	Calc Page	Dead kN	Total kN	Stud Width	Stud Depth	No. of Studs CS/FH	Grade	CSI
1	9	5.62	11.07	38	140	1 / 1	C16	0.70
2	10	7.46	13.59	38	140	1 / 0	C16	0.86
3	11	2.76	4.75	38	140	1 / 0	C16	0.30
4	12	2.34	3.40	38	140	1 / 1	C16	0.26
5	13	9.31	15.96	38	140	2 / 0	C16	0.62
6	14	3.81	10.94	38	89	2 / 1	C16	0.67
7	15	5.26	14.38	38	89	2 / 1	C16	0.88
8	16	0.75	1.87	38	89	2 / 0	C16	0.52
9	17	16.36	28.85	38	89	4 / 0	C16	0.97
10	18	1.84	5.32	38	89	1 / 1	C16	0.53
11	19	6.47	10.88	38	140	1 / 1	C16	0.69
12	20	0.85	1.24	38	140	1 / 1	C16	0.26
13	21	0.89	1.67	38	140	1 / 1	C16	0.26
14	22	13.21	22.58	38	140	2 / 0	C16	0.88
15	23	0.32	0.50	38	140	1 / 1	C16	0.26
16	24	3.79	8.71	38	140	1 / 1	C16	0.55
17	25	0.24	0.66	38	89	1 / 1	C16	0.49
18	26	0.40	1.03	38	89	2 / 0	C16	0.52
19	27	23.45	40.48	38	89	6 / 0	C16	0.91
20	28	5.93	13.76	38	140	1 / 1	C16	0.87
21	29	4.38	9.99	38	140	1 / 1	C16	0.63
22	30	0.85	1.24	38	140	1 / 1	C16	0.26
23	31	9.67	16.53	38	140	2 / 0	C16	0.64
24	32	1.45	2.51	38	140	1 / 1	C16	0.26
25	33	5.49	9.17	38	140	2 / 0	C16	0.36
26	34	7.46	12.57	38	140	2 / 0	C16	0.49
27	35	14.40	33.20	38	140	3 / 1	C16	0.95
28	36	13.40	28.60	38	140	3 / 2	C16	0.81

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Project	Project no	**CALCULATION SHEET**
New Detached Dwelling on land to Read of	3081.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: CDS 2

Cripple Stud Design Summary

First Floor Walls

Stud Ref	Calc Page	Dead kN	Total kN	Stud Width	Stud Depth	No. of Studs CS/FH	Grade	CSI
101	1	1.84	3.18	38	140	1 / 1	C16	0.20
102	2	2.76	4.75	38	140	1 / 1	C16	0.30
103	3	9.31	15.96	38	140	2 / 0	C16	0.62
104	4	20.27	34.75	38	89	5 / 0	C16	0.93
105	5	5.71	9.77	38	140	1 / 1	C16	0.62
106	6	13.21	22.58	38	140	2 / 0	C16	0.88
107	7	22.87	39.11	38	89	6 / 0	C16	0.88
108	8	9.67	16.53	38	140	2 / 0	C16	0.64

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no
			SBD 1

Steel Beam Design Ref: 1.03 Span (m): 4.60 m
No. off 1 Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	2.03	1.29	9.31	6.65
PL 2	2.04	1.29	10.96	7.83
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Ecc. (+/- mm)
UDL 1	Intermediate Fl	0.60	0.23	0.45	0
UDL 2	Intermediate Fl	0.60	0.23	0.45	0
UDL 3	Wall 1000 & 1(	-	0.31	0.00	0

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	16.36	7.46	D
	12.49	6.13	I
	28.85	13.59	Total
	42.89	**20.25**	**Ult**

Start dim'n	End dim'n
0.00	4.60
0.00	4.60
0.00	4.60

Ultimate Bending Moment: **54.48** **kNm**
Enter bending moment if a more accuarate analysis has been made: 53.06 kNm
Enter max shear force if a more accuarate analysis has been made: kN
Maximum length of unrestrained section: 0.60 m
Effective length factor for the unrestrained length: 1.00
Torsional bending moment: **0.000 kNm/m**
Beam Section Used: **254 x 146 x 31 UB** **Grade:** **S275**
No. of members: **1**

Beam Properties:

Wt	*31.10*	*kg/m*
D	*251.40*	*mm*
B	*146.10*	*mm*
t	*6.00*	*mm*
T	*8.60*	*mm*
Ixx	*4410.00*	*cm4*
Iyy	*448.00*	*cm4*
rxx	*10.50*	*cm*
ryy	*3.36*	*cm*
Zxx	*351.00*	*cm3*
Zyy	*61.30*	*cm3*
Sxx	*393.00*	*cm3*
Syy	*94.10*	*cm3*
A	*39.70*	*cm2*
u	*0.879*	
x	*29.60*	
D/T	29.23	
λ or Λε/ρψ	17.86	
λΛT	15.63	

Deflection Check: Limits: L/x Limit Value:(mm)
Live: 3.76 360 12.77 **Deflection O.K.**
Total: 8.41 250 14.00 **Deflection O.K.**
Limit for Masonry support (mm): 5 **N.A.**

Shear Capacity Check:
Maximum Shear Force: 42.89 kN
Pvx = 0.6 pyAv: 248.89 kN
Utilisation Ratio: 0.17 **Shear O.K.**

Bending Moment Check:
Maximum Bending Moment: 53.06 kNm
Moment Capacity is min of (1.2pyZx) or (pySx) 108.075 kNm

Buckling Moment Capacity (Simplified approach to BS 5950 cl 4.3.7)
Effective Length of Unrestrained section: 0.60 m

Bending Strength (Calculated as per Clause B2): 275 N/mm2
Buckling RM is min of (pbZx) or (pbSx)

Buckling Resistance Moment Mb : 96.53 kNm
Buckling Moment O.K.

Cripple Stud Requirements Bearing detail: Panel rail
Panel rail grade: C16 Stud size (w x d): 38 89
Adm Comp p to g on bottom rail: 2.2 N/mm2
Minimum bearing length: 147 mm on 4 38 x 89 studs
or 90 mm bearing based on beam width

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 1

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Timber Beam Design

Ref: 2.01 Span (m): 1.61 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 10	-	0.08	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	1.84	1.84	D
	1.33	1.33	I
	3.18	3.18	Total
	0.00	0.00	W
	3.18	**3.18**	**Max**
Start dim'n	0.00	1.61	
End dim'n	0.00	1.61	

Maximum Bending Moment: **1.28** **kNm**

Enter bending moment if a more accurate analysis has been made: 1.28 kNm

Enter max shear force if a more accurate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.89	360	4.48	**Deflection O.K.**
Total:	2.12	250	6.45	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	3.18	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.30	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	1.28	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	3.18	kN		
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	16	mm		
Min.bearing l. for c/s on panel rail:	16	mm	on 1	38 x 89 stud/s

Charring: 0 mm

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	13	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 2

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Timber Beam Design

Ref: 2.02 | Span (m): 2.40 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)	Start dim'n	End dim'n
UDL 1	Pitched / Curve	3.31	2.20	1.65	0.00	0.00	2.40
UDL 2	0.00	0.00	0.00	0.00	0.00	0.00	2.40
UDL 3	Wall 1000 & 10	-	0.10	0.00	*(inc. swt)*	0.00	2.40

Reactions (kN):

	LHS	RHS	Ser
	2.76	2.76	D
	1.99	1.99	I
	4.75	4.75	Total
	0.00	0.00	W
	4.75	**4.75**	**Max**

Floor joists continuous over beam: **No**

Maximum Bending Moment: 2.85 kNm

Enter bending moment if a more accurate analysis has been made: 2.85 kNm

Enter max shear force if a more accurate analysis has been made: kN

Consider design as a trimmer: **No**

Beam Section Used: **3 / 145 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*145*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*9.98*	*kg/m*
Ixx	*3429.70*	*cm4*
Zxx	*473.06*	*cm3*
A	*195.75*	*cm2*

Deflection Check: Limits: L/x | Limit Value:

Live:	2.53	360	6.67	**Deflection O.K.**
Total:	6.04	250	9.60	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	4.75	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.36	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	2.85	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	8.94	N/mm2
Maximum Adm. Bending Moment:	4.23	kNm

K7	*1.08*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	4.75	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2		
Minimum bearing length for beam:	22	mm		
Min.bearing l. for c/s on panel rail:	24	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 | Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	16	mm

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 3

Timber Beam Design

Ref: 2.03 Span (m): 4.02 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Reactions (kN):

	LHS	RHS	Ser
	9.31	9.31	D
	6.65	6.65	I
	15.96	15.96	Total
	0.00	0.00	W
	15.96	**15.96**	**Max**

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)	Start dim'n	End dim'n
UDL 1	Pitched / Curve	3.31	2.20	1.65	0.00	0.00	4.02
UDL 2	Pitched / Curve	3.31	2.20	1.65	0.00	0.00	4.02
UDL 3	Wall 1000 & 10	-	0.22	0.00	*(inc. swt)*	0.00	4.02

Floor joists continuous over beam: **No**

Maximum Bending Moment: **16.04** **kNm**

Enter bending moment if a more accuarate analysis has been made: 16.04 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **1 / 315 x 140 Glu** **Grade:** **C24** **Glulam:** **Yes**

Beam Properties:

D	*315*	*mm*
Total B	*140*	*mm*
No. of Timbers	1	

GL24h / GL28c

Axis of bending (relative to D & B): *x-x*

Service class: 1

K3 1.00

Wt 22.49 kg/m
Ixx 36465.19 cm4
Zxx 2315.25 cm3
A 441.00 cm2

Deflection Check:

		Limits: L/x	Limit Value:	
Live:	2.88	360	11.17	**Deflection O.K.**
Total:	6.91	250	14.00	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	15.96	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	1.66	N/mm2
Maximum Shear Stress:	0.54	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	16.04	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	10.31	N/mm2
Maximum Adm. Bending Moment:	23.86	kNm

K7 0.99
K8 1.00
K9 1.00

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	15.96	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	48	mm		
Min.bearing l. for c/s on panel rail:	82	mm	on 3	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	52	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 4

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Timber Beam Design

Ref: 2.04 | Span (m): 4.74 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 2	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 3	Wall 1000 & 10	-	0.22	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	10.96	10.96	D
	7.83	7.83	I
	18.80	18.80	Total
	0.00	0.00	W
	18.80	**18.80**	**Max**
	Start dim'n	End dim'n	
	0.00	4.74	
	0.00	4.74	
	0.00	4.74	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **22.25** **kNm**

Enter bending moment if a more accuarate analysis has been made: 22.25 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **1 / 315 x 140 Glu** **Grade: C24** **Glulam: Yes**

GL24h / GL28c

Beam Properties:

D	*315*	*mm*
Total B	*140*	*mm*
No. of Timbers	1	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*22.49*	*kg/m*
Ixx	*36465.19*	*cm4*
Zxx	*2315.25*	*cm3*
A	*441.00*	*cm2*

Deflection Check: Limits: L/x | Limit Value:

Live:	5.43	360	13.15	**Deflection O.K.**
Total:	13.03	250	14.00	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	18.80	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	1.66	N/mm2
Maximum Shear Stress:	0.64	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	22.25	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	10.31	N/mm2
Maximum Adm. Bending Moment:	23.86	kNm

K7	*0.99*
K8	*1.00*
K9	*1.00*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	18.80	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	57	mm		
Min.bearing l. for c/s on panel rail:	96	mm	on 3	38 x 89 stud/s

Panel rail grade: C16 | Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	61	mm

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New Detached Dwelling on land to Read of 3081

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no TBD 5

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Timber Beam Design

Ref: 2.05 Span (m): 0.94 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	2.04	0.47	10.96	7.83
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Pitched / Curve	0.60	0.40	0.30	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 10	-	0.10	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	5.71	5.71	D
	4.06	4.06	I
	9.77	9.77	Total
	0.00	0.00	W
	9.77	**9.77**	**Max**

Start dim'n	End dim'n
0.00	0.94
0.00	0.94
0.00	0.94

Floor joists continuous over beam: **No**

Maximum Bending Moment: **4.49** **kNm**

Enter bending moment if a more accuarate analysis has been made: 4.20 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 145 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*145*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*9.98*	*kg/m*
Ixx	*3429.70*	*cm4*
Zxx	*473.06*	*cm3*
A	*195.75*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.79	360	2.61	**Deflection O.K.**
Total:	1.77	250	3.75	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	9.77	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.75	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	4.20	kNm	*K7*	*1.08*
Basic bending stress:	7.5	N/mm2	*K8*	*1.10*
Adm.bending stress:	8.94	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	4.23	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	9.77	kN			Charring: 0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2			
Minimum bearing length for beam:	46	mm			
Min.bearing l. for c/s on panel rail:	50	mm	on	2	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	33	mm

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 6

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Timber Beam Design

Ref: 2.06 Span (m): 4.54 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 2	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 3	Wall 1000 & 10	-	0.25	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	13.21	13.21	D
	9.37	9.37	I
	22.58	22.58	Total
	0.00	0.00	W
	22.58	**22.58**	**Max**

	Start dim'n	End dim'n
UDL 1	0.00	4.54
UDL 2	0.00	4.54
UDL 3	0.00	4.54

Floor joists continuous over beam: **Yes**

Maximum Bending Moment: **25.60** **kNm**

Enter bending moment if a more accuarate analysis has been made: 31.99 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **1 / 360 x 140 Glu** **Grade: C27** **Glulam: Yes**

Beam Properties:

D	*360*	*mm*
Total B	*140*	*mm*
No. of Timbers	1	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*25.70*	*kg/m*
Ixx	*54432.00*	*cm4*
Zxx	*3024.00*	*cm3*
A	*504.00*	*cm2*

Deflection Check: Limits: L/x Limit Value: *GL28h*

Live:	3.57	360	12.60	**Deflection O.K.**
Total:	10.74	250	14.00	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	22.58	kN
Basic Shear Stress	1.10	N/mm2
Adm Shear Stress	1.64	N/mm2
Maximum Shear Stress:	0.67	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	31.99	kNm
Basic bending stress:	10	N/mm2
Adm.bending stress:	12.92	N/mm2
Maximum Adm. Bending Moment:	39.08	kNm

K7	*0.96*
K8	*1.00*
K9	*1.00*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	22.58	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.73	N/mm2		
Minimum bearing length for beam:	68	mm		
Min.bearing l. for c/s on panel rail:	115	mm	on 4	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	73	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 7

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Timber Beam Design

Ref: 2.07 | Span (m): 3.32 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 2	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 3	Wall 1000 & 10	-	0.25	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	9.67	9.67	D
	6.86	6.86	I
	16.53	16.53	Total
	0.00	0.00	W
	16.53	**16.53**	**Max**
	Start dim'n	End dim'n	
	0.00	3.32	
	0.00	3.32	
	0.00	3.32	

Floor joists continuous over beam: **Yes**

Maximum Bending Moment: 13.72 kNm

Enter bending moment if a more accuarate analysis has been made: 17.15 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **1 / 360 x 140 Glu** **Grade: C27** **Glulam: Yes** GL28h

Beam Properties:

D	*360*	*mm*
Total B	*140*	*mm*
No. of Timbers	1	

Axis of bending (relative to D & B): *x-x*

Service class: 1

K3 1.00

Wt *25.70* *kg/m*

Ixx *54432.00* *cm4*

Zxx *3024.00* *cm3*

A *504.00* *cm2*

Deflection Check: Limits: L/x | Limit Value:

Live:	1.09	360	9.22	**Deflection O.K.**
Total:	3.28	250	13.28	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	16.53	kN
Basic Shear Stress	1.10	N/mm2
Adm Shear Stress	1.64	N/mm2
Maximum Shear Stress:	0.49	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	17.15	kNm
Basic bending stress:	10	N/mm2
Adm.bending stress:	12.92	N/mm2
Maximum Adm. Bending Moment:	39.08	kNm

K7 *0.96*

K8 *1.00*

K9 *1.00*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	16.53	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.73	N/mm2		
Minimum bearing length for beam:	50	mm		
Min.bearing l. for c/s on panel rail:	84	mm	on 3	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	54	mm		

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 8

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Timber Beam Design

Ref: 1.01 Span (m): 1.61 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	4.60	1.79	3.45	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 101 & 10(	-	2.90	1.65	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	3.78	3.78	D
	4.12	4.12	I
	7.90	7.90	Total
	0.00	0.00	W
	7.90	**7.90**	**Max**

Start dim'n	End dim'n
0.00	1.61
0.00	1.61
0.00	1.61

Floor joists continuous over beam: **No**

Maximum Bending Moment: **3.18** **kNm**

Enter bending moment if a more accuarate analysis has been made: 3.18 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 145 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*145*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*9.98*	*kg/m*
Ixx	*3429.70*	*cm4*
Zxx	*473.06*	*cm3*
A	*195.75*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	1.69	360	4.48	**Deflection O.K.**
Total:	3.25	250	6.45	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	7.90	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.61	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	3.18	kNm	*K7*	*1.08*
Basic bending stress:	7.5	N/mm2	*K8*	*1.10*
Adm.bending stress:	8.94	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	4.23	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	7.90	kN			Charring: 0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2			
Minimum bearing length for beam:	37	mm			
Min.bearing l. for c/s on panel rail:	40	mm	on	2	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	27	mm		

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 9

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Timber Beam Design

Ref: 1.02 Span (m): 2.85 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 106 & 10(	-	1.41	0.30	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	2.34	2.34	D
	1.07	1.07	I
	3.40	3.40	Total
	0.00	0.00	W
	3.40	**3.40**	**Max**
Start dim'n	0.00	2.85	
End dim'n	0.00	2.85	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **2.43** **kNm**

Enter bending moment if a more accuarate analysis has been made: 2.43 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 145 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*145*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*9.98*	*kg/m*
Ixx	*3429.70*	*cm4*
Zxx	*473.06*	*cm3*
A	*195.75*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	2.24	360	7.92	**Deflection O.K.**
Total:	7.14	250	11.40	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	3.40	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.26	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	2.43	kNm	*K7*	*1.08*
Basic bending stress:	7.5	N/mm2	*K8*	*1.10*
Adm.bending stress:	8.94	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	4.23	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	3.40	kN		Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2			
Minimum bearing length for beam:	16	mm			
Min.bearing l. for c/s on panel rail:	17	mm	on 1	38 x 89 stud/s	

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	11	mm		

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New Detached Dwelling on land to Read of 3081

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no TBD 10

Timber Beam Design

Ref: 1.04 Span (m): 0.93 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	4.60	1.79	3.45	0.00
UDL 2	Intermediate Fl	5.40	2.10	4.05	0.00
UDL 3	Wall 1000 & 1(	-	0.07	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	1.84	1.84	D
	3.49	3.49	I
	5.32	5.32	Total
	0.00	0.00	W
	5.32	**5.32**	**Max**

Start dim'n	End dim'n
0.00	0.93
0.00	0.93
0.00	0.93

Floor joists continuous over beam: **No**

Maximum Bending Moment: **1.24** **kNm**

Enter bending moment if a more accuarate analysis has been made: 1.23 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 145 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*145*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*6.66*	*kg/m*
Ixx	*2286.47*	*cm4*
Zxx	*315.38*	*cm3*
A	*130.50*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.53	360	2.58	**Deflection O.K.**
Total:	0.80	250	3.72	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	5.32	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.61	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	1.23	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	8.94	N/mm2
Maximum Adm. Bending Moment:	2.82	kNm

K7	*1.08*
K8	*1.10*
K9	*1.14*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	5.32	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2		
Minimum bearing length for beam:	25	mm		
Min.bearing l. for c/s on panel rail:	27	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	27	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 11

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Timber Beam Design

Ref: 1.05 | Span (m): 0.94 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 102 & 10(	-	1.39	0.30	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	0.76	0.76	D
	0.35	0.35	I
	1.11	1.11	Total
	0.00	0.00	W
	1.11	**1.11**	**Max**

Start dim'n	End dim'n
0.00	0.94
0.00	0.94
0.00	0.94

Floor joists continuous over beam: **No**

Maximum Bending Moment: 0.26 kNm

Enter bending moment if a more accurate analysis has been made: 0.26 kNm

Enter max shear force if a more accurate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x | Limit Value: .

Live:	0.06	360	2.61	**Deflection O.K.**
Total:	0.17	250	3.75	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	1.11	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.10	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.26	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	1.11	kN		
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	6	mm		
Min.bearing l. for c/s on panel rail:	6	mm	on	1 38 x 89 stud/s

Charring: 0 mm

Panel rail grade: C16 | Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	4	mm

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no TBD 12

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Timber Beam Design

Ref: 1.06 Span (m): 1.05 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 102 & 10(	-	1.39	0.30	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	0.85	0.85	D
	0.39	0.39	I
	1.24	1.24	Total
	0.00	0.00	W
	1.24	**1.24**	**Max**

Start dim'n	End dim'n
0.00	1.05
0.00	1.05
0.00	1.05

Floor joists continuous over beam: **No**

Maximum Bending Moment: **0.33** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.33 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.08	360	2.92	**Deflection O.K.**
Total:	0.26	250	4.20	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	1.24	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.12	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.33	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	1.24	kN		
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	6	mm		
Min.bearing l. for c/s on panel rail:	6	mm	on	1 38 x 89 stud/s

Charring: 0 mm

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	5	mm		

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New Detached Dwelling on land to Read of 3081

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: TBD 13

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Timber Beam Design

Ref: 1.07 Span (m): 0.49 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	2.02	0.79	1.52	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 103 & 10(	-	2.88	1.65	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	0.89	0.89	D
	0.77	0.77	I
	1.67	1.67	Total
	0.00	0.00	W
	1.67	**1.67**	**Max**
Start dim'n	0.00	0.49	
End dim'n	0.00	0.49	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **0.20** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.20 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.03	360	1.36	**Deflection O.K.**
Total:	0.06	250	1.95	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	1.67	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.16	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.20	kNm	*K7*	*1.09*
Basic bending stress:	5.3	N/mm2	*K8*	*1.10*
Adm.bending stress:	6.34	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	2.36	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	1.67	kN		Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2			
Minimum bearing length for beam:	9	mm			
Min.bearing l. for c/s on panel rail:	9	mm	on	1	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	7	mm		

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 14

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Timber Beam Design

Ref: 1.08 | Span (m): 0.49 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 104 & 10(	-	1.07	0.30	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	0.32	0.32	D
	0.18	0.18	I
	0.50	0.50	Total
	0.00	0.00	W
	0.50	**0.50**	**Max**

	Start dim'n	End dim'n
UDL 1	0.00	0.49
UDL 2	0.00	0.49
UDL 3	0.00	0.49

Floor joists continuous over beam: **No**

Maximum Bending Moment: **0.06** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.06 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x | Limit Value: .

Live:	0.01	360	1.36	**Deflection O.K.**
Total:	0.02	250	1.95	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	0.50	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.05	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.06	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	0.50	kN		
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	3	mm		
Min.bearing l. for c/s on panel rail:	3	mm	on	1 38 x 89 stud/s

Charring: 0 mm

Panel rail grade: C16 | Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	2	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 15

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Timber Beam Design

Ref: 1.09 | Span (m): 1.73 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	5.40	2.10	4.05	0.00
UDL 2	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 3	Wall 1000 & 10	-	0.10	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	3.79	3.79	D
	4.92	4.92	I
	8.71	8.71	Total
	0.00	0.00	W
	8.71	**8.71**	**Max**

	Start dim'n	End dim'n
UDL 1	0.00	1.73
UDL 2	0.00	1.73
UDL 3	0.00	1.73

Floor joists continuous over beam: **No**

Maximum Bending Moment: **3.76** **kNm**

Enter bending moment if a more accurate analysis has been made: 3.75 kNm

Enter max shear force if a more accurate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 145 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*145*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*9.98*	*kg/m*
Ixx	*3429.70*	*cm4*
Zxx	*473.06*	*cm3*
A	*195.75*	*cm2*

Deflection Check: Limits: L/x | Limit Value:

Live:	2.44	360	4.79	**Deflection O.K.**
Total:	4.31	250	6.90	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	8.71	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.67	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	3.75	kNm	*K7*	*1.08*
Basic bending stress:	7.5	N/mm2	*K8*	*1.10*
Adm.bending stress:	8.94	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	4.23	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	8.71	kN			Charring: 0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2			
Minimum bearing length for beam:	41	mm			
Min.bearing l. for c/s on panel rail:	44	mm	on	2	38 x 89 stud/s

Panel rail grade: C16 | Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	29	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 16

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Timber Beam Design

Ref: 1.10 | Span (m): 0.93 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)	Start dim'n	End dim'n
UDL 1	Intermediate Fl	0.60	0.23	0.45	0.00	0.00	0.93
UDL 2	Intermediate Fl	0.60	0.23	0.45	0.00	0.00	0.93
UDL 3	Wall 1000 & 1(	-	0.05	0.00	*(inc. swt)*	0.00	0.93

Reactions (kN):

LHS	RHS	Ser
0.24	0.24	D
0.42	0.42	I
0.66	0.66	Total
0.00	0.00	W
0.66	**0.66**	**Max**

Floor joists continuous over beam: **No**

Maximum Bending Moment: **0.15** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.15 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*76*	*mm*
No. of Timbers	2	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*5.43*	*kg/m*
Ixx	*1737.87*	*cm4*
Zxx	*248.27*	*cm3*
A	*106.40*	*cm2*

Deflection Check: Limits: L/x | Limit Value: .

Live:	0.10	360	2.58	**Deflection O.K.**
Total:	0.16	250	3.72	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	0.66	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.09	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.15	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	1.57	kNm

K7	*1.09*
K8	*1.10*
K9	*1.14*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	0.66	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	4	mm		
Min.bearing l. for c/s on panel rail:	3	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 | Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	4	mm

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 17

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Timber Beam Design

Ref: 1.11 Span (m): 1.00 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	1.70	0.66	1.27	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 1(	-	0.14	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	0.40	0.40	D
	0.64	0.64	I
	1.03	1.03	Total
	0.00	0.00	W
	1.03	**1.03**	**Max**

Start dim'n	End dim'n
0.00	1.00
0.00	1.00
0.00	1.00

Floor joists continuous over beam: **No**

Maximum Bending Moment: **0.26** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.26 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 304 x 45 Glu** **Grade:** **C18** **Glulam:** **Yes**

Beam Properties:

D	*304*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	

GL24c

Axis of bending (relative to D & B): *x-x*

Service class: 1

K3 1.00

Wt	*13.95*	*kg/m*
Ixx	*21070.85*	*cm4*
Zxx	*1386.24*	*cm3*
A	*273.60*	*cm2*

Deflection Check: Limits: L/x Limit Value:

Live:	0.02	360	2.78	**Deflection O.K.**
Total:	0.03	250	4.00	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	1.03	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	2.01	N/mm2
Maximum Shear Stress:	0.06	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.26	kNm
Basic bending stress:	5.8	N/mm2
Adm.bending stress:	8.91	N/mm2
Maximum Adm. Bending Moment:	12.36	kNm

K7 1.01
K8 1.10
K9 1.00

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	1.03	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	3	mm		
Min.bearing l. for c/s on panel rail:	5	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	5	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 18

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Timber Beam Design

Ref: 1.12 | Span (m): 1.98 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	1.11	1.15	0.40	0.64
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 2	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 3	Wall 1000 & 1(	-	0.14	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	0.58	0.75	D
	0.79	1.11	I
	1.37	1.87	Total
	0.00	0.00	W
	1.37	**1.87**	**Max**
	Start dim'n	End dim'n	
	0.00	1.98	
	0.00	1.98	
	0.00	1.98	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **1.05** **kNm**

Enter bending moment if a more accuarate analysis has been made: 1.01 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 304 x 45 Glu** **Grade:** **C18** **Glulam:** **Yes**

Beam Properties:

D	*304*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*13.95*	*kg/m*
Ixx	*21070.85*	*cm4*
Zxx	*1386.24*	*cm3*
A	*273.60*	*cm2*

Deflection Check: Limits: L/x | Limit Value: | *GL24c*

Live:	0.15	360	5.51	**Deflection O.K.**
Total:	0.24	250	7.93	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	1.87	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	2.01	N/mm2
Maximum Shear Stress:	0.10	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	1.01	kNm	*K7*	*1.01*
Basic bending stress:	5.8	N/mm2	*K8*	*1.10*
Adm.bending stress:	8.91	N/mm2	*K9*	*1.00*
Maximum Adm. Bending Moment:	12.36	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	1.87	kN	Charring:	0	mm
Adm Comp p to g on u/s beam:	3.72	N/mm2			
Minimum bearing length for beam:	6	mm			
Min.bearing l. for c/s on panel rail:	10	mm	on	1	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	9	mm		

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 19

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Timber Beam Design

Ref: 1.13 Span (m): 5.40 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	1.11	1.70	0.40	0.64
PL 2	1.11	4.57	0.40	0.64
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 2	Intermediate Fl	0.60	0.23	0.45	0.00
UDL 3	Wall 1000 & 1(	-	0.14	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	1.67	1.53	D
	2.39	2.08	I
	4.06	3.60	Total
	0.00	0.00	W
	4.06	**3.60**	**Max**
	Start dim'n	End dim'n	
UDL 1	0.00	5.40	
UDL 2	0.00	1.70	
UDL 3	0.00	5.40	

Maximum Bending Moment: **5.62** **kNm**
Enter bending moment if a more accuarate analysis has been made: 4.86 kNm
Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 304 x 45 Glu** **Grade:** **C18**
Glulam: **Yes**

Beam Properties:

D	*304*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	

GL24c

Axis of bending (relative to D & B): *x-x*

Service class: 1

K3 1.00

Wt	*13.95*	*kg/m*
Ixx	*21070.85*	*cm4*
Zxx	*1386.24*	*cm3*
A	*273.60*	*cm2*

Deflection Check: Limits: L/x Limit Value:

Live:	4.63	360	14.00	**Deflection O.K.**
Total:	6.84	250	14.00	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	4.06	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	2.01	N/mm2
Maximum Shear Stress:	0.22	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	4.86	kNm
Basic bending stress:	5.8	N/mm2
Adm.bending stress:	8.91	N/mm2
Maximum Adm. Bending Moment:	12.36	kNm

K7 1.01
K8 1.10
K9 1.00

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	4.06	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	12	mm		
Min.bearing l. for c/s on panel rail:	21	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	21	mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: TBD 20

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Timber Beam Design

Ref: 1.14 | Span (m): 1.89 m | Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	1.13	0.05	1.53	2.08
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	5.40	2.10	4.05	0.00
UDL 2	Intermediate Fl	4.60	1.79	3.45	0.00
UDL 3	Wall 1000 & 1(	-	0.10	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	5.26	3.81	D
	9.11	7.13	I
	14.38	10.94	Total
	0.00	0.00	W
	14.38	**10.94**	**Max**
Start dim'n	0.00	1.89	
End dim'n	0.00	1.89	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **5.29** **kNm**

Enter bending moment if a more accuarate analysis has been made: 5.20 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 225 x 45 Glu** **Grade: C18** **Glulam: Yes** *GL24c*

Beam Properties:

D	*225*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*10.33*	*kg/m*
Ixx	*8542.97*	*cm4*
Zxx	*759.38*	*cm3*
A	*202.50*	*cm2*

Deflection Check: Limits: L/x | Limit Value:

Live:	1.66	360	5.25	**Deflection O.K.**
Total:	2.51	250	7.56	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	14.38	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	2.01	N/mm2
Maximum Shear Stress:	1.06	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	5.20	kNm
Basic bending stress:	5.8	N/mm2
Adm.bending stress:	9.11	N/mm2
Maximum Adm. Bending Moment:	6.92	kNm

K7	*1.03*
K8	*1.10*
K9	*1.00*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail | Fire rating: N.A.

Maximum reaction:	14.38	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	43	mm		
Min.bearing l. for c/s on panel rail:	73	mm	on 2	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	73	mm		

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no TBD 21

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Timber Beam Design

Ref: 1.15 Span (m): 1.94 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	1.13	0.07	1.67	2.39
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Intermediate Fl	5.40	2.10	4.05	0.00
UDL 2	Pitched / Curve	3.31	2.20	1.65	0.00
UDL 3	Wall 1000 & 10	-	0.15	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	5.93	4.38	D
	7.83	5.61	I
	13.76	9.99	Total
	0.00	0.00	W
	13.76	**9.99**	**Max**
Start dim'n	0.00	1.94	
End dim'n	0.00	1.94	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **5.05** **kNm**

Enter bending moment if a more accuarate analysis has been made: 4.91 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 220 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*220*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*15.15*	*kg/m*
Ixx	*11979.00*	*cm4*
Zxx	*1089.00*	*cm3*
A	*297.00*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	1.28	360	5.39	**Deflection O.K.**
Total:	2.21	250	7.76	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	13.76	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.69	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	4.91	kNm	*K7*	*1.03*
Basic bending stress:	7.5	N/mm2	*K8*	*1.10*
Adm.bending stress:	8.54	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	9.30	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	13.76	kN			Charring: 0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2			
Minimum bearing length for beam:	64	mm			
Min.bearing l. for c/s on panel rail:	70	mm	on	2	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	46	mm		

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 22

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Timber Beam Design

Ref: 1.16 Span (m): 0.83 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Pitched / Curve	5.16	3.43	2.58	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 10	-	0.08	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	1.45	1.45	D
	1.06	1.06	I
	2.51	2.51	Total
	0.00	0.00	W
	2.51	**2.51**	**Max**

Start dim'n	End dim'n
0.00	0.83
0.00	0.83
0.00	0.83

Floor joists continuous over beam: **No**

Maximum Bending Moment: 0.52 kNm

Enter bending moment if a more accuarate analysis has been made: 0.52 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.12	360	2.29	**Deflection O.K.**
Total:	0.29	250	3.30	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	2.51	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.24	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.52	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	2.51	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	13	mm		
Min.bearing l. for c/s on panel rail:	13	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	10	mm

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Project: New Detached Dwelling on land to Read of

Project no: ######

CALCULATION SHEET

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: TBDS 1

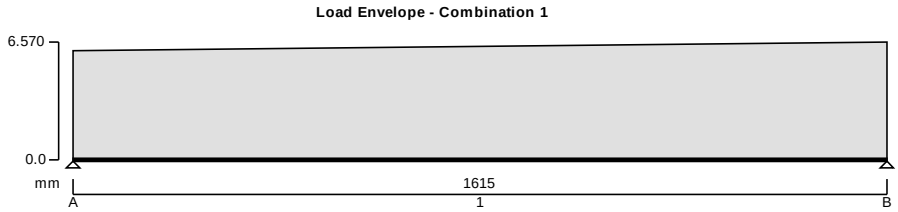
Trimmer Beam Design Summary

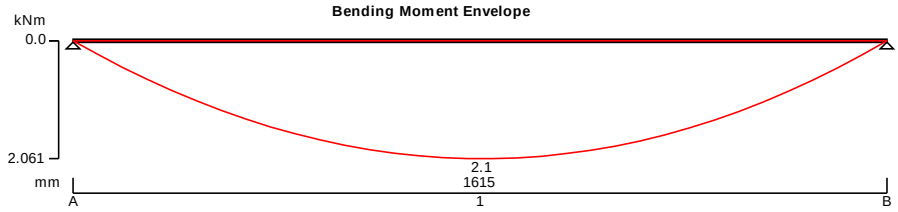
Design Data		Bearing Length (mm)		Unfactored Reactions in kN				*Calc page*
Beam Ref	Section	& No. of Cripple studs	Grade / No. Off	LHS D	LHS I	RHS D	RHS I	*no.*
2.07	1 / 360 x 140 Glu	54 / 3	GL28h	9.67	6.86	9.67	6.86	TBD7
2.06	1 / 360 x 140 Glu	74 / 4	GL28h	13.21	9.37	13.21	9.37	TBD6
2.05	3 / 145 x 45	33 / 2	C24	5.71	4.06	5.71	4.06	TBD5
2.04	1 / 315 x 140 Glu	62 / 3	GL24h / GL28c	10.96	7.83	10.96	7.83	TBD4
2.03	1 / 315 x 140 Glu	52 / 3	GL24h / GL28c	9.31	6.65	9.31	6.65	TBD3
2.02	3 / 145 x 45	16 / 1	C24	2.76	1.99	2.76	1.99	TBD2
2.01	3 / 140 x 38	13 / 1	C16	1.84	1.33	1.84	1.33	TBD1
1.16	3 / 140 x 38	11 / 1	C16	1.45	1.06	1.45	1.06	TBD22
1.15	3 / 220 x 45	47 / 2	C24	5.93	7.83	4.38	5.61	TBD21
1.14	2 / 225 x 45 Glu	73 / 2	GL24c	5.26	9.11	3.81	7.13	TBD20
1.13	2 / 304 x 45 Glu	21 / 1	GL24c	1.67	2.39	1.53	2.08	TBD19
1.12	2 / 304 x 45 Glu	10 / 1	GL24c	0.58	0.79	0.75	1.11	TBD18
1.11	2 / 304 x 45 Glu	6 / 1	GL24c	0.40	0.64	0.40	0.64	TBD17
1.10	2 / 140 x 38	4 / 1	C16	0.24	0.42	0.24	0.42	TBD16
1.09	3 / 145 x 45	30 / 2	C24	3.79	4.92	3.79	4.92	TBD15
1.08	3 / 140 x 38	3 / 1	C16	0.32	0.18	0.32	0.18	TBD14
1.07	3 / 140 x 38	7 / 1	C16	0.89	0.77	0.89	0.77	TBD13
1.06	3 / 140 x 38	5 / 1	C16	0.85	0.39	0.85	0.39	TBD12
1.05	3 / 140 x 38	5 / 1	C16	0.76	0.35	0.76	0.35	TBD11
1.04	2 / 145 x 45	27 / 1	C24	1.84	3.49	1.84	3.49	TBD10
1.03	1No. 254 x 146 x 31 UB	90 / 4	S275 / 1	16.36	12.49	7.46	6.13	SBD1
1.02	3 / 145 x 45	12 / 1	C24	2.34	1.07	2.34	1.07	TBD9
1.01	3 / 145 x 45	27 / 2	C24	3.78	4.12	3.78	4.12	TBD8

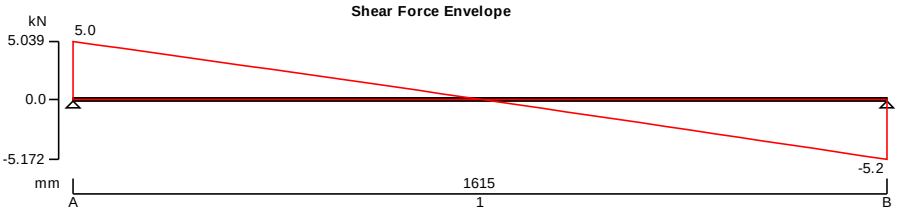
Tedds Adeptco	Project: New Detached Dwelling on NE39 1PS				Job no.: 3081 - B 1.17	
	Calcs for: Karlin Timber Frame (NE) Ltd				Start page no./Revision: 1	
	Calcs by: RG	Calcs date: 17/02/2017	Checked by: MK	Checked date:	Approved by: MK	Approved date:

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.5.07







Applied loading

Beam loads

Dead self weight of beam × 1
Dead full VDL 3.436 kN/m to 3.719 kN/m
Imposed full VDL 2.578 kN/m to 2.790 kN/m

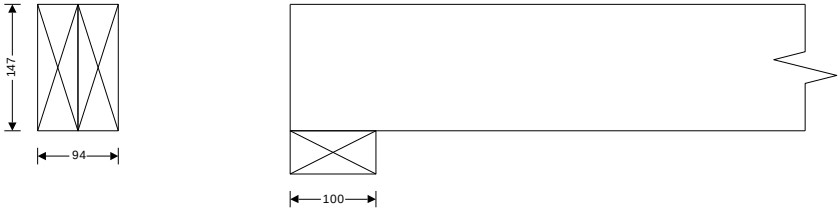
Load combinations

Load combination 1	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00

Analysis results

Maximum moment	M_{max} = **2.061** kNm	M_{min} = **0.000** kNm
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **2.061** kNm	
Maximum shear	F_{max} = **5.039** kN	F_{min} = **-5.172** kN

Design shear	$F = \max(\text{abs}(F_{max}),\text{abs}(F_{min})) =$ **5.172** kN	
Total load on beam	$W_{tot} =$ **10.211** kN	
Reactions at support A	$R_{A\_max} =$ **5.039** kN	$R_{A\_min} =$ **5.039** kN
Unfactored dead load reaction at support A	$R_{A\_Dead} =$ **2.900** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed} =$ **2.139** kN	
Reactions at support B	$R_{B\_max} =$ **5.172** kN	$R_{B\_min} =$ **5.172** kN
Unfactored dead load reaction at support B	$R_{B\_Dead} =$ **2.976** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed} =$ **2.196** kN	



Timber section details

Breadth of sections	$b =$ **47** mm
Depth of sections	$h =$ **147** mm
Number of sections in member	$N =$ **2**
Overall breadth of member	$b_b = N \times b =$ **94** mm
Timber strength class	**TR26**

Member details

Service class of timber	**1**
Load duration	**Long term**
Length of bearing	$L_b =$ **100** mm

Section properties

Cross sectional area of member	$A = N \times b \times h =$ **13818** mm^2
Section modulus	$Z_x = N \times b \times h^2 / 6 =$ **338541** mm^3
	$Z_y = h \times (N \times b)^2 / 6 =$ **216482** mm^3
Second moment of area	$I_x = N \times b \times h^3 / 12 =$ **24882763** mm^4
	$I_y = h \times (N \times b)^3 / 12 =$ **10174654** mm^4
Radius of gyration	$i_x = \sqrt{(I_x / A)} =$ **42.4** mm
	$i_y = \sqrt{(I_y / A)} =$ **27.1** mm

Modification factors

Duration of loading - Table 17	$K_3 =$ **1.00**
Bearing stress - Table 18	$K_4 =$ **1.00**
Total depth of member - cl.2.10.6	$K_7 = (300 \text{ mm} / h)^{0.11} =$ **1.08**
Load sharing - cl.2.9	$K_8 =$ **1.00**

Lateral support - cl.2.10.8

Ends held in position	
Permissible depth-to-breadth ratio - Table 19	**3.00**
Actual depth-to-breadth ratio	$h / (N \times b) =$ **1.56**

PASS - Lateral support is adequate

Compression perpendicular to grain

Permissible bearing stress (no wane)	$\sigma_{c\_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 =$ **2.500** N/mm^2

Applied bearing stress

$\sigma_{c\_a} = R_{B\_max} / (N \times b \times L_b) = \mathbf{0.550}$ N/mm^2

$\sigma_{c\_a} / \sigma_{c\_adm} = \mathbf{0.220}$

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress

$\sigma_{m\_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = \mathbf{10.816}$ N/mm^2

Applied bending stress

$\sigma_{m\_a} = M / Z_x = \mathbf{6.089}$ N/mm^2

$\sigma_{m\_a} / \sigma_{m\_adm} = \mathbf{0.563}$

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress

$\tau_{adm} = \tau \times K_3 \times K_8 = \mathbf{1.100}$ N/mm^2

Applied shear stress

$\tau_a = 3 \times F / (2 \times A) = \mathbf{0.561}$ N/mm^2

$\tau_a / \tau_{adm} = \mathbf{0.510}$

PASS - Applied shear stress is less than permissible shear stress

Deflection

Modulus of elasticity for deflection

$E = E_{min} = \mathbf{7400}$ N/mm^2

Permissible deflection

$\delta_{adm} = \min(14 \text{ mm}, 0.003 \times L_{s1}) = \mathbf{4.845}$ mm

Bending deflection

$\delta_{b\_s1} = \mathbf{3.041}$ mm

Shear deflection

$\delta_{v\_s1} = \mathbf{0.387}$ mm

Total deflection

$\delta_a = \delta_{b\_s1} + \delta_{v\_s1} = \mathbf{3.429}$ mm

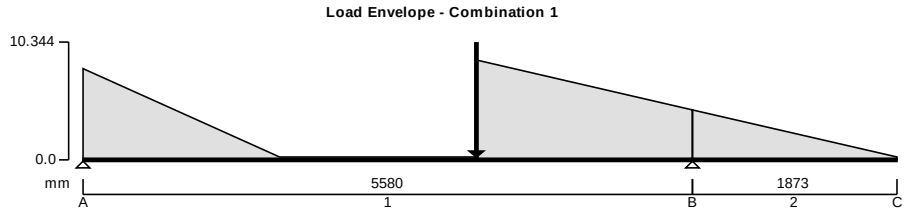
$\delta_a / \delta_{adm} = \mathbf{0.708}$

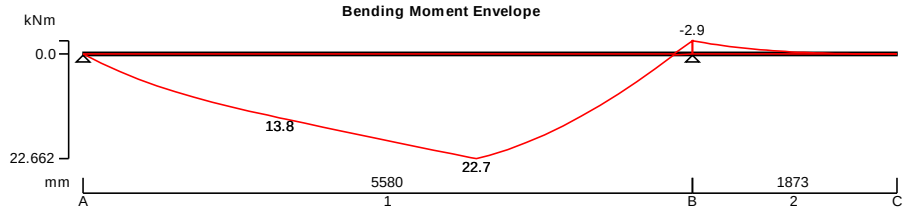
PASS - Total deflection is less than permissible deflection

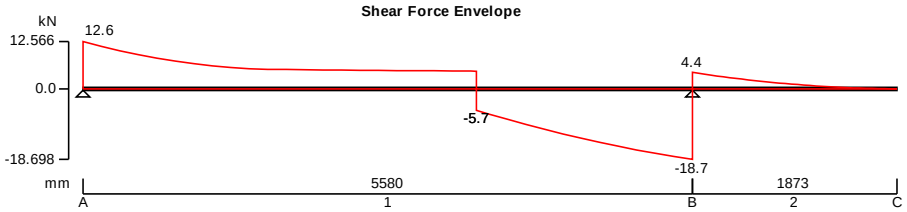
Tedds Adeptco	Project: New Detached Dwelling on NE39 1PS				Job no.: 3081 - B 1.18	
	Calcs for: Karlin Timber Frame (NE) Ltd				Start page no./Revision: 1	
	Calcs by: RG	Calcs date: 17/02/2017	Checked by: MK	Checked date:	Approved by: MK	Approved date:

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.5.07







Applied loading

Beam loads

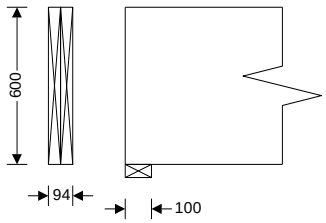
	Dead self weight of beam × 1
Left Side	Dead partial VDL 2.218 kN/m at 0 mm to 0.000 kN/m at 1801 mm
Left Side	Imposed partial VDL 1.664 kN/m at 0 mm to 0.000 kN/m at 1801 mm
Left Side	Dead partial VDL 2.437 kN/m at 3602 mm to 0.000 kN/m at 7453 mm
Left Side	Imposed partial VDL 1.828 kN/m at 3602 mm to 0.000 kN/m at 7453 mm
Left Side	Dead point load 2.976 kN at 3602 mm
Left Side	Imposed point load 2.196 kN at 3602 mm
Right Side	Dead partial VDL 2.218 kN/m at 0 mm to 0.000 kN/m at 1801 mm
Right Side	Imposed partial VDL 1.664 kN/m at 0 mm to 0.000 kN/m at 1801 mm
Right Side	Dead partial VDL 2.437 kN/m at 3602 mm to 0.000 kN/m at 7453 mm
Right Side	Imposed partial VDL 1.828 kN/m at 3602 mm to 0.000 kN/m at 7453 mm
Right Side	Dead point load 2.976 kN at 3602 mm
Right Side	Imposed point load 2.196 kN at 3602 mm

Load combinations

Load combination 1	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00
	Span 2	Dead × 1.00
		Imposed × 1.00
	Support C	Dead × 1.00
		Imposed × 1.00

Analysis results

Maximum moment	M_{max} = **22.662** kNm	M_{min} = **-2.862** kNm
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **22.662** kNm	
Maximum shear	F_{max} = **12.566** kN	F_{min} = **-18.698** kN
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **18.698** kN	
Total load on beam	W_{tot} = **35.615** kN	
Reactions at support A	R_{A_max} = **12.566** kN	R_{A_min} = **12.566** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **7.459** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **5.107** kN	
Reactions at support B	R_{B_max} = **23.049** kN	R_{B_min} = **23.049** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **13.728** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **9.321** kN	
Reactions at support C	R_{C_max} = **0.000** kN	R_{C_min} = **0.000** kN
Unfactored dead load reaction at support C	R_{C_Dead} = **0.000** kN	
Unfactored imposed load reaction at support C	$R_{C\_Imposed}$ = **0.000** kN	



Timber section details

Breadth of sections	b = **47** mm
Depth of sections	h = **600** mm
Number of sections in member	N = **2**
Overall breadth of member	b_b = N × b = **94** mm
Timber strength class	**TR26**

Member details

Service class of timber	**1**
Load duration	**Long term**
Length of bearing	L_b = **100** mm

Section properties

Cross sectional area of member — $A = N \times b \times h =$ **56400** mm^2

Section modulus — $Z_x = N \times b \times h^2 / 6 =$ **5640000** mm^3

$Z_y = h \times (N \times b)^2 / 6 =$ **883600** mm^3

Second moment of area — $I_x = N \times b \times h^3 / 12 =$ **1692000000** mm^4

$I_y = h \times (N \times b)^3 / 12 =$ **41529200** mm^4

Radius of gyration — $i_x = \sqrt{(I_x / A)} =$ **173.2** mm

$i_y = \sqrt{(I_y / A)} =$ **27.1** mm

Modification factors

Duration of loading - Table 17 — $K_3 =$ **1.00**

Bearing stress - Table 18 — $K_4 =$ **1.10**

Total depth of member - cl.2.10.6 — $K_7 = 0.81 \times (h^2 + 92300\ mm^2) / (h^2 + 56800\ mm^2) =$ **0.88**

Load sharing - cl.2.9 — $K_8 =$ **1.00**

Lateral support - cl.2.10.8

Ends held in position

Permissible depth-to-breadth ratio - Table 19 — **3.00**

Actual depth-to-breadth ratio — $h / (N \times b) =$ **6.38**

FAIL - Lateral support is inadequate

Compression perpendicular to grain

Permissible bearing stress (no wane) — $\sigma_{c\_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 =$ **2.750** N/mm^2

Applied bearing stress — $\sigma_{c\_a} = R_{B\_max} / (N \times b \times L_b) =$ **2.452** N/mm^2

$\sigma_{c\_a} / \sigma_{c\_adm} =$ **0.892**

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress — $\sigma_{m\_adm} = \sigma_m \times K_3 \times K_7 \times K_8 =$ **8.790** N/mm^2

Applied bending stress — $\sigma_{m\_a} = M / Z_x =$ **4.018** N/mm^2

$\sigma_{m\_a} / \sigma_{m\_adm} =$ **0.457**

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress — $\tau_{adm} = \tau \times K_3 \times K_8 =$ **1.100** N/mm^2

Applied shear stress — $\tau_a = 3 \times F / (2 \times A) =$ **0.497** N/mm^2

$\tau_a / \tau_{adm} =$ **0.452**

PASS - Applied shear stress is less than permissible shear stress

Deflection

Modulus of elasticity for deflection — $E = E_{min} =$ **7400** N/mm^2

Permissible deflection — $\delta_{adm} = \min(14\ mm, 0.003 \times L_{s2}) =$ **5.619** mm

Bending deflection — $\delta_{b\_s2} =$ **5.440** mm

Shear deflection — $\delta_{v\_s2} =$ **0.000** mm

Total deflection — $\delta_a = \delta_{b\_s2} + \delta_{v\_s2} =$ **5.440** mm

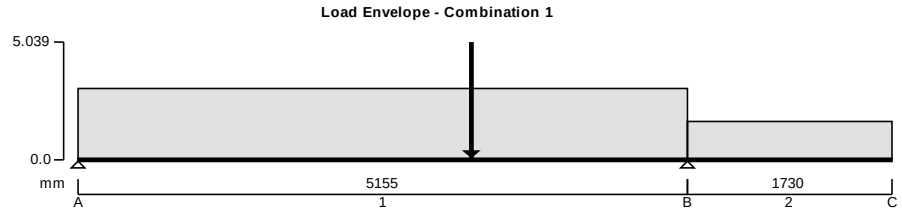
$\delta_a / \delta_{adm} =$ **0.968**

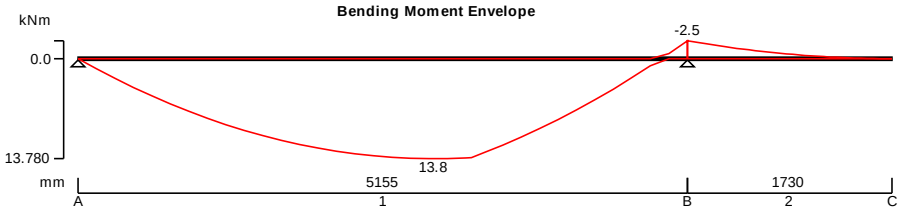
PASS - Total deflection is less than permissible deflection

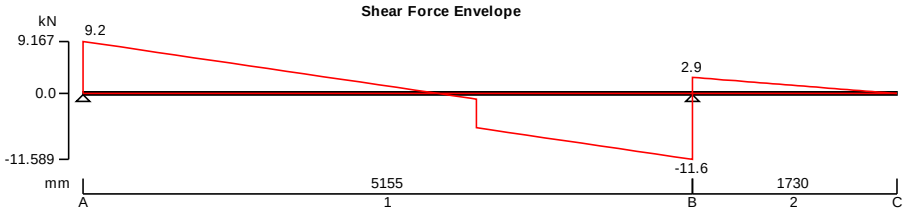
Tedds Adeptco	Project: New Detached Dwelling on NE39 1PS				Job no.: 3081 - B 1.19	
	Calcs for: Karlin Timber Frame (NE) Ltd				Start page no./Revision: 1	
	Calcs by: RG	Calcs date: 17/02/2017	Checked by: MK	Checked date:	Approved by: MK	Approved date:

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.5.07







Applied loading

Beam loads

	Dead self weight of beam × 1
Side 1	Dead full UDL 0.800 kN/m
Side 1	Imposed full UDL 0.600 kN/m
	Dead point load 2.900 kN at 3327 mm
	Imposed point load 2.139 kN at 3327 mm
Side 2	Dead partial UDL 0.800 kN/m from 0 mm to 5155 mm
Side 2	Imposed partial UDL 0.600 kN/m from 0 mm to 5155 mm

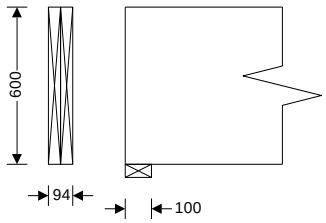
Load combinations

Load combination 1	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00

	Span 2	Dead × 1.00
		Imposed × 1.00
	Support C	Dead × 1.00
		Imposed × 1.00

Analysis results

Maximum moment	M_{max} = **13.780** kNm	M_{min} = **-2.467** kNm
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **13.780** kNm	
Maximum shear	F_{max} = **9.167** kN	F_{min} = **-11.589** kN
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **11.589** kN	
Total load on beam	W_{tot} = **23.609** kN	
Reactions at support A	R_{A_max} = **9.167** kN	R_{A_min} = **9.167** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **5.489** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **3.677** kN	
Reactions at support B	R_{B_max} = **14.442** kN	R_{B_min} = **14.442** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **8.756** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **5.686** kN	
Reactions at support C	R_{C_max} = **0.000** kN	R_{C_min} = **0.000** kN
Unfactored dead load reaction at support C	R_{C_Dead} = **0.000** kN	
Unfactored imposed load reaction at support C	$R_{C\_Imposed}$ = **0.000** kN	



Timber section details

Breadth of sections	b = **47** mm
Depth of sections	h = **600** mm
Number of sections in member	N = **2**
Overall breadth of member	b_b = N × b = **94** mm
Timber strength class	**TR26**

Member details

Service class of timber	**1**
Load duration	**Long term**
Length of bearing	L_b = **100** mm

Section properties

Cross sectional area of member	A = N × b × h = **56400** mm^2
Section modulus	Z_x = N × b × h^2 / 6 = **5640000** mm^3
	Z_y = h × (N × b)^2 / 6 = **883600** mm^3
Second moment of area	I_x = N × b × h^3 / 12 = **1692000000** mm^4
	I_y = h × (N × b)^3 / 12 = **41529200** mm^4
Radius of gyration	i_x = √(I_x / A) = **173.2** mm
	i_y = √(I_y / A) = **27.1** mm

Modification factors

Duration of loading - Table 17	K_3 = **1.00**
Bearing stress - Table 18	K_4 = **1.10**
Total depth of member - cl.2.10.6	$K_7 = 0.81 \times (h^2 + 92300\ mm^2) / (h^2 + 56800\ mm^2)$ = **0.88**
Load sharing - cl.2.9	K_8 = **1.00**

Lateral support - cl.2.10.8

Ends held in position	
Permissible depth-to-breadth ratio - Table 19	**3.00**
Actual depth-to-breadth ratio	$h / (N \times b)$ = **6.38**

FAIL - Lateral support is inadequate

Compression perpendicular to grain

Permissible bearing stress (no wane)	$\sigma_{c\_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8$ = **2.750** N/mm²
Applied bearing stress	$\sigma_{c\_a} = R_{B\_max} / (N \times b \times L_b)$ = **1.536** N/mm²
	$\sigma_{c\_a} / \sigma_{c\_adm}$ = **0.559**

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress	$\sigma_{m\_adm} = \sigma_m \times K_3 \times K_7 \times K_8$ = **8.790** N/mm²
Applied bending stress	$\sigma_{m\_a} = M / Z_x$ = **2.443** N/mm²
	$\sigma_{m\_a} / \sigma_{m\_adm}$ = **0.278**

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress	$\tau_{adm} = \tau \times K_3 \times K_8$ = **1.100** N/mm²
Applied shear stress	$\tau_a = 3 \times F / (2 \times A)$ = **0.308** N/mm²
	τ_a / τ_{adm} = **0.280**

PASS - Applied shear stress is less than permissible shear stress

Deflection

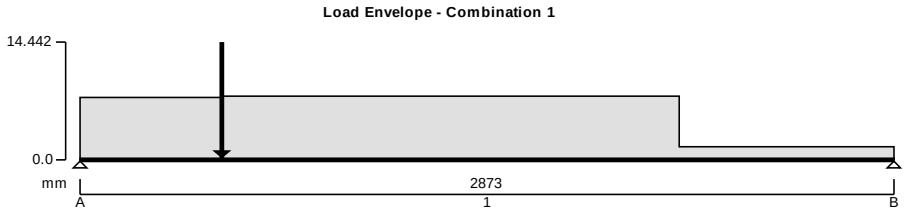
Modulus of elasticity for deflection	$E = E_{min}$ = **7400** N/mm²
Permissible deflection	$\delta_{adm} = \min(14\ mm, 0.003 \times L_{s2})$ = **5.190** mm
Bending deflection	δ_{b_s2} = **2.832** mm
Shear deflection	δ_{v_s2} = **0.000** mm
Total deflection	$\delta_a = \delta_{b\_s2} + \delta_{v\_s2}$ = **2.832** mm
	δ_a / δ_{adm} = **0.546**

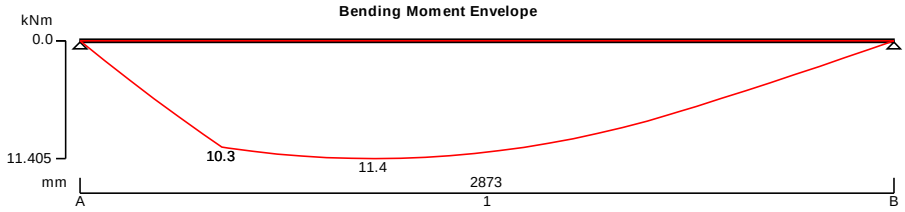
PASS - Total deflection is less than permissible deflection

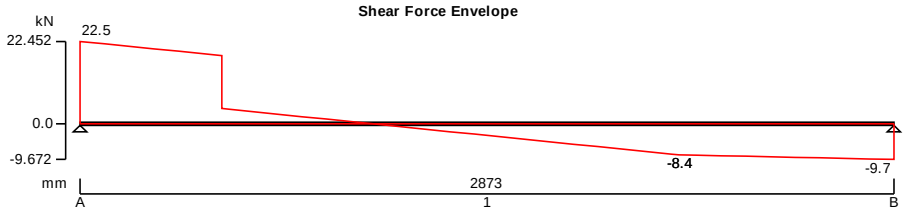
Tedds Adeptco	Project: New Detached Dwelling on NE39 1PS				Job no.: 3081 - B 1.20 (Option 1)	
	Calcs for: Karlin Timber Frame (NE) Ltd				Start page no./Revision: 1	
	Calcs by: RG	Calcs date: 17/02/2017	Checked by: MK	Checked date:	Approved by: MK	Approved date:

GLULAM BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.5.07







Applied loading

Beam loads

Dead self weight of beam × 1
Dead partial UDL 3.436 kN/m from 0 mm to 501 mm
Imposed partial UDL 2.578 kN/m from 0 mm to 501 mm
Dead point load 8.756 kN at 501 mm
Imposed point load 5.686 kN at 501 mm
Dead partial UDL 3.524 kN/m from 501 mm to 2116 mm
Imposed partial UDL 2.644 kN/m from 501 mm to 2116 mm
Dead full UDL 1.500 kN/m

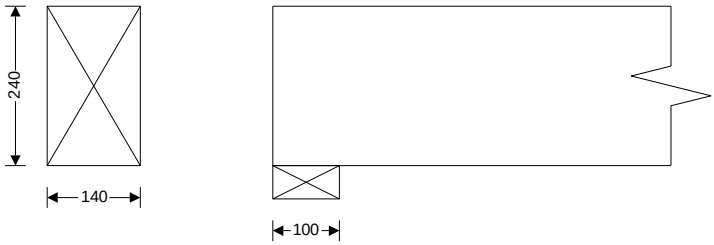
Load combinations

Load combination 1	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00

Imposed × 1.00

Analysis results

Maximum moment	M_{max} = **11.405** kNm	M_{min} = **0.000** kNm
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **11.405** kNm	
Maximum shear	F_{max} = **22.452** kN	F_{min} = **-9.672** kN
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **22.452** kN	
Total load on beam	W_{tot} = **32.123** kN	
Reactions at support A	R_{A_max} = **22.452** kN	R_{A_min} = **22.452** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **14.253** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **8.199** kN	
Reactions at support B	R_{B_max} = **9.672** kN	R_{B_min} = **9.672** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **6.623** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **3.049** kN	



Glulam section details

Breadth of section	b = **140** mm
Depth of section	h = **240** mm
Number of sections in member	N = **1**
Overall breadth of member	b_b = N × b = **140** mm
Number of laminations	N_{lam} = **5**
Alignment of laminations	**Horizontal**
Timber strength class	**C24**

Member details

Service class of timber	**1**
Load duration	**Long term**
Length of bearing	L_b = **100** mm

Section properties

Cross sectional area of member	A = N × b × h = **33600** mm^2
Section modulus	Z_x = N × b × h^2 / 6 = **1344000** mm^3
	Z_y = h × (N × b)^2 / 6 = **784000** mm^3
Second moment of area	I_x = N × b × h^3 / 12 = **161280000** mm^4
	I_y = h × (N × b)^3 / 12 = **54880000** mm^4
Radius of gyration	i_x = √(I_x / A) = **69.3** mm
	i_y = √(I_y / A) = **40.4** mm

Modification factors

Duration of loading - Table 17	K_3 = **1.00**
Bearing stress - Table 18	K_4 = **1.00**
Total depth of member - cl.2.10.6	K_7 = (300 mm / h)$^{0.11}$ = **1.02**

Bending parallel to grain - Table 24	K_{15} = **1.34**
Tension parallel to grain - Table 24	K_{16} = **1.34**
Compression parallel to grain - Table 24	K_{17} = **1.04**
Compression perpendicular to grain - Table 24	K_{18} = **1.55**
Shear parallel to grain - Table 24	K_{19} = **2.34**
Modulus of elasticity - Table 24	K_{20} = **1.07**

Lateral support - cl.2.10.8

Ends held in position	
Permissible depth-to-breadth ratio - Table 19	**3.00**
Actual depth-to-breadth ratio	$h / (N \times b)$ = **1.71**

PASS - Lateral support is adequate

Compression perpendicular to grain

Permissible bearing stress	$\sigma_{c\_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_{18}$ = **3.720** N/mm^2
Applied bearing stress	$\sigma_{c\_a} = R_{A\_max} / (N \times b \times L_b)$ = **1.604** N/mm^2
	$\sigma_{c\_a} / \sigma_{c\_adm}$ = **0.431**

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress	$\sigma_{m\_adm} = \sigma_m \times K_3 \times K_7 \times K_{15}$ = **10.300** N/mm^2
Applied bending stress	$\sigma_{m\_a} = M / Z_x$ = **8.486** N/mm^2
	$\sigma_{m\_a} / \sigma_{m\_adm}$ = **0.824**

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress	$\tau_{adm} = \tau \times K_3 \times K_{19}$ = **1.661** N/mm^2
Applied shear stress	$\tau_a = 3 \times F / (2 \times A)$ = **1.002** N/mm^2
	τ_a / τ_{adm} = **0.603**

PASS - Applied shear stress is less than permissible shear stress

Deflection

Modulus of elasticity for deflection	$E = E_{mean} \times K_{20}$ = **11556** N/mm^2
Permissible deflection	$\delta_{adm} = \min(14\text{ mm}, 0.003 \times L_{s1})$ = **8.619** mm
Bending deflection	δ_{b_s1} = **5.187** mm
Shear deflection	δ_{v_s1} = **0.564** mm
Total deflection	$\delta_a = \delta_{b\_s1} + \delta_{v\_s1}$ = **5.751** mm
	δ_a / δ_{adm} = **0.667**

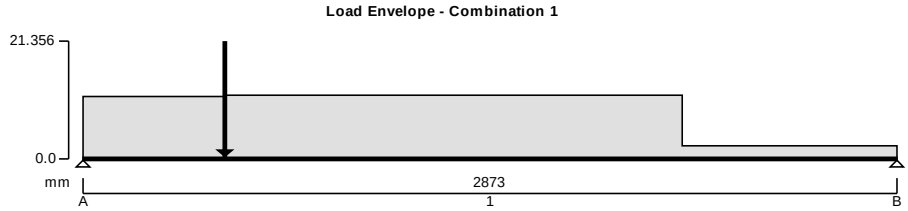
PASS - Total deflection is less than permissible deflection

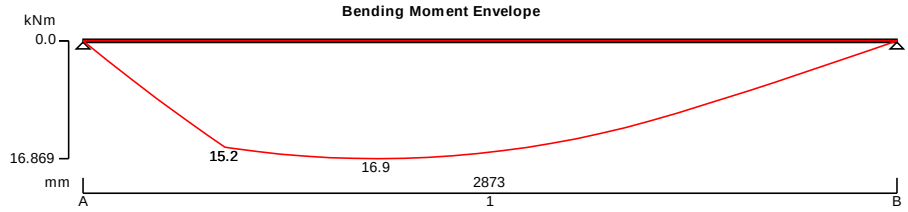
Tedds Adeptco	Project: New Detached Dwelling on NE39 1PS				Job no.: 3081 - B 1.20 (Option 2)	
	Calcs for: Karlin Timber Frame (NE) Ltd				Start page no./Revision: 1	
	Calcs by: RG	Calcs date: 17/02/2017	Checked by: MK	Checked date:	Approved by: MK	Approved date:

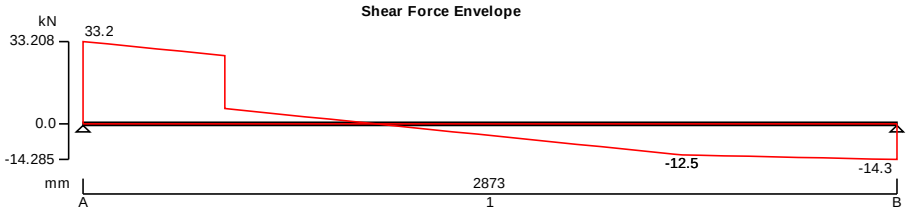
STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.04







Support conditions

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

Applied loading

Beam loads	Dead self weight of beam × 1
	Dead partial UDL 3.436 kN/m from 0 mm to 501 mm
	Imposed partial UDL 2.578 kN/m from 0 mm to 501 mm
	Dead point load 8.756 kN at 501 mm
	Imposed point load 5.686 kN at 501 mm
	Dead partial UDL 3.524 kN/m from 501 mm to 2116 mm
	Imposed partial UDL 2.644 kN/m from 501 mm to 2116 mm
	Dead full UDL 1.5 kN/m

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
	Span 1	Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

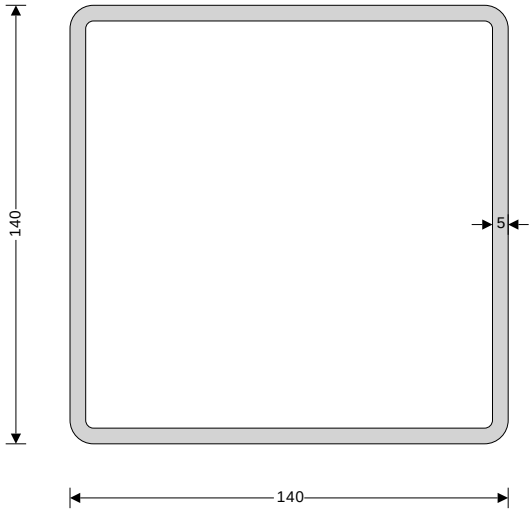
Maximum moment	M_{max} = **16.9** kNm	M_{min} = **0** kNm
Maximum moment span 1 segment 1	$M_{s1\_seg1\_max}$ = **16.3** kNm	$M_{s1\_seg1\_min}$ = **0** kNm
Maximum moment span 1 segment 2	$M_{s1\_seg2\_max}$ = **16.9** kNm	$M_{s1\_seg2\_min}$ = **0** kNm
Maximum moment span 1 segment 3	$M_{s1\_seg3\_max}$ = **15.9** kNm	$M_{s1\_seg3\_min}$ = **0** kNm
Maximum moment span 1 segment 4	$M_{s1\_seg4\_max}$ = **9.6** kNm	$M_{s1\_seg4\_min}$ = **0** kNm
Maximum shear	V_{max} = **33.2** kN	V_{min} = **-14.3** kN
Maximum shear span 1 segment 1	$V_{s1\_seg1\_max}$ = **33.2** kN	$V_{s1\_seg1\_min}$ = **0** kN
Maximum shear span 1 segment 2	$V_{s1\_seg2\_max}$ = **3.7** kN	$V_{s1\_seg2\_min}$ = **-4.6** kN
Maximum shear span 1 segment 3	$V_{s1\_seg3\_max}$ = **0** kN	$V_{s1\_seg3\_min}$ = **-12.6** kN
Maximum shear span 1 segment 4	$V_{s1\_seg4\_max}$ = **0** kN	$V_{s1\_seg4\_min}$ = **-14.3** kN
Deflection segment 5	δ_{max} = **5.9** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **33.2** kN	R_{A_min} = **33.2** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **14.4** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **8.2** kN	
Maximum reaction at support B	R_{B_max} = **14.3** kN	R_{B_min} = **14.3** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **6.7** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **3** kN	

Section details

Section type	**SHS 140x140x5.0**
Steel grade	**S275**

From table 9: Design strength p_y

Thickness of element	t = **5.0** mm
Design strength	p_y = **275** N/mm^2
Modulus of elasticity	E = **205000** N/mm^2



Lateral restraint

Span 1 has lateral restraint at supports plus quarter points

Effective length factors

Effective length factor in major axis K_x = **1.00**

Effective length factor in minor axis K_y = **1.00**

Effective length factor for lateral-torsional buckling $K_{LT.A}$ = **1.00**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275\ N/mm^2 / p_y]}$ = **1.00**

Web - major axis - Table 12

Depth of section $d = D - 3 \times t$ = **125** mm

$d / t = 25.0 \times \varepsilon <= 64 \times \varepsilon$ Class 1 plastic

Flange - major axis - Table 12

Width of section $b = B - 3 \times t$ = **125** mm

$b / t = 25.0 \times \varepsilon <= \min(28 \times \varepsilon, 80 \times \varepsilon - d / t)$ Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force $F_v = \max(\text{abs}(V_{max}), \text{abs}(V_{min}))$ = **33.2** kN

$(D - 3 \times t) / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area $A_v = A \times D / (D + B)$ = **1337** mm^2

Design shear resistance $P_v = 0.6 \times p_y \times A_v$ = **220.5** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity at span 1 segment 2 - Section 4.2.5

Design bending moment $M = \max(\text{abs}(M_{s1\_seg2\_max}), \text{abs}(M_{s1\_seg2\_min}))$ = **16.9** kNm

Moment capacity low shear - cl.4.2.5.2 $M_c = \min(p_y \times S, 1.2 \times p_y \times Z)$ = **37.1** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling $L_E = 1.0 \times L_{s1\_seg2}$ = **718** mm

Slenderness ratio $\lambda = L_E / r_{yy}$ = **13.069**

Equivalent slenderness - Annex B.2.6.1

Torsion constant — J = **12527186** mm^4

$\gamma_b = (1 - I_{yy} / I_{xx}) \times (1 - J / (2.6 \times I_{xx}))$ = **0.000**

$\phi_b = [S_{xx}^2 \times \gamma_b / (A \times J)]^{0.5}$ = **0.000**

Ratio - cl.4.3.6.9 — β_W = **1.000**

Equivalent slenderness — $\lambda_{LT} = 2.25 \times \sqrt{[\phi_b \times \lambda \times \beta_W]}$ = **0.000**

Limiting slenderness - Annex B.2.2 — $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5}$ = **34.310**

λ_{LT} < λ_{L0} - No allowance need be made for lateral-torsional buckling

Buckling resistance moment - Section 4.3.6.4

Bending strength — $p_b = p_y$ = **275** N/mm^2

Buckling resistance moment — $M_b = p_b \times S$ = **37.1** kNm

PASS - Moment capacity exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection — $\delta_{lim} = \min(14 \text{ mm}, L_{s1} / 250)$ = **11.492** mm

Maximum deflection span 1 — $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min}))$ = **5.877** mm

PASS - Maximum deflection does not exceed deflection limit

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by: SPD | Date: Feb-17 | Calculation sheet/revision no: 1

Adept Consulting (UK) Ltd - Timber Frame Engineering™ v BS.17.01.13.166.03 2001-2017© 0

Steel Post Design

Ref: 28 Ht (m): 2.26 m
Eff length factor.: 1.00
Eff length: 2.26 m

Floor Level : G
Is super load reduction required: No
Total no.of storeys: 1
No.of floors qualifying for load red.: 1
Nett Allowable % Red. This Floor: 0%

Connection eccentricity from face of steel: 100 mm

Loading (Unfactored Point loads kN)

	PL 1 x-x	PL 3 x-x	PL 2 y-y	PL 4 y-y	From Above	Moment x-x	Moment y-y
Dead	13.40	0.00	0.00	0.00	0.00	3.19	0.00
Imposed	6.00	0.00	0.00	0.00	0.00	1.63	0.00
Total	19.40	0.00	0.00	0.00	0.00	4.82	0.00

Column Section Used: 140 x 140 x 5.0 SHS **Grade: S275**
(check availabilty if noted ?) .

Ultimate Loads: (after Super Load Reduction if applicable)

Ult. Additional Mmt x-x: 1.278 kNm
Ult. Additional Mmt y-y: kNm
Ult. Mmt x-x: 6.10 kNm
Ult. Mmt y-y: 0.00 kNm
Ult. Vertical Dead Load: 18.76 kN
Ult. Vertical Imposed Load: 9.60 kN

Check column to Clause 4.7.7 BS 5950 Part 1

Fc: 28.36 kN Pc: 692.58
Mx: 6.10 kNm Mbs: 31.63
My: 0.00 kNm pyZy: 31.63

Unity Factor: 0.23 **Column Adequate**

Column Properties:

Wt	*21.00*	*kg/m*
D	*140.00*	*mm*
B	*140.00*	*mm*
t	*5.00*	*mm*
T	*0.00*	*mm*
Ixx	*807.00*	*cm4*
Iyy	*807.00*	*cm4*
rxx	*5.50*	*cm*
ryy	*5.50*	*cm*
Zxx	*115.00*	*cm3*
Zyy	*115.00*	*cm3*
Sxx	*135.00*	*cm3*
Syy	*135.00*	*cm3*
A	*26.70*	*cm2*
u	*0.00*	
x	*0.00*	

Baseplate To Timber Soleplate Design:

Max comp perp to grain: 7.00 N/mm2
Max w = cpg x 1.5: 10.50
Baseplate Size Used: 300 x 300 mm sq. (E denotes offset baseplate,
Pyp: 275 N/mm2 Act w: **0.32** N/mm2
Minimum Thickness: 4.7 mm

For UC / UB Sections Only
D/T .
ambda or Le/ry 41.09
Lambda LT 20.55

Cap Plate: Use same as baseplate.

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Project	Project no	**CALCULATION SHEET**
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no SPDS 1

Steel Post Design Summary

Design Data				Unfactored Loads (kN)		Cap plate & Baseplate Size (mm x mm)	Cap plate & Baseplate Thk (mm)	
Post Ref	Section	Height (m)	Grade	Dead	Imposed			CSI
28	140 x 140 x 5.0 SHS	2.26	S275	13.40	6.00	300 x 300	4.7	0.23

Headbinder Design

It is usual in timber frame construction to have a headbinder above the top rail of the panel. This is used so that the joists do not have to coincide with the stud below. It is generally accepted that where a headbinder is present no design checks are required on the capacity on the two rails to carry the joist reaction to the adjacent studs.
Where no headbinder is present the maximum offset between joist and stud is half the joist width.
However, provided the Designer can demonstate that a single top panel rail is adequate there is no other design requirement for a headbinder.

One considerations to be made before omitting the headbinder is the practical issue of being able to align the panels. Where single panels generally intersect at corners or at incoming walls there is less of a requierment than where long walls are constructed from numerous panels.

One advantage in omitting the headbinder is that it reduces the potential for cross grain shrinkage.

Consider the following conditions for headbinder designs.

1. Party wall		mm studs
2. External wall	140	mm studs
3. Internal wall	89	mm studs
4. Internal wall	89	mm studs
5. Roofs	140	mm studs

Not all combinations may occur on this project.
Since the joist reaction can be applied at any point check for maximum shear stress in addition to bending. Other materials in addition to CLS may be used and there shear stress values are listed below.
If the headbinder should fail in either shear or bending then the studs must be positioned below the joist reaction to negate this condition.

Note: The reference to headbinder also includes the top rail to the panel. It is the timber rail/s which carry the joist reactions.

The bending moment and shear force coefficients have been taken from the Timber Designers Manual, and also cross checked against the design rules for crane beams.

Bending overstress of up to 40% against calculation methods have been permitted on the basis of the report by the Eastern Forest Products Laboratory, Ottawa titled 'The Strength of Top Plates on Wood Stud Walls' dated 1975. This report concludes that 2 x 38 x 89 rails will safely support 8.0kN.
Engineers must satisfy themselves as to the validity of this report due to changes within the industry.

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Project | Project no | **CALCULATION SHEET**

New Detached Dwelling on land to Read of 3081.00

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: HB2

Headbinder Design - Condition 1 - Party wall

Floor type:						
Total Load:		kN/m^2				
Joist Span:		m				
Joist Spacing:		mm				
Stud - Spacing:		mm				
Headbinder Depth:	38	mm				
Headbinder Width:	0	mm				
Number of rails:	2	No. (*Top panel rail counts as 1*)				
Timber Grade:	C16				*Mmt coeff.:*	
Basic Bending Stress:	5.30	N/mm^2	K_3	1.00	*Shear coeff.:*	
Adm Bending Stress:	6.12	N/mm^2				
Joist Reaction:		kN			Max Shear Force:	kN
Max Bending Moment in headbinder:		kNm				
Section Modulus of Headbinder:	0	mm^3				
Adm Bending Moment:	0.000	kNm				
Adm Shear Stress:	0.74	N/mm^2				
Max Shear Stress:		N/mm^2				

Headbinder Design - Condition 2 - External wall

Floor type:	Intermediate Floor Bedroom					
Total Load:	2.28	kN/m^2				
Joist Span:	5.40	m				
Joist Spacing:	600	mm				
Stud Spacing:	600	mm				
Headbinder Depth:	38	mm				
Headbinder Width:	140	mm				
Number of rails:	2	No. (*Top panel rail counts as 1*)				
Timber Grade:	C16				*Mmt coeff.:*	*0.08*
Basic Bending Stress:	5.30	N/mm^2	K_3	1.00	*Shear coeff.:*	*0.715*
Adm Bending Stress:	6.12	N/mm^2				
Joist Reaction:	3.69	kN			Max Shear Force:	2.64 kN
Max Bending Moment in headbinder:	0.177	kNm				
Section Modulus of Headbinder:	67387	mm^3			.	
Adm Bending Moment:	0.413	kNm		42.91%	**Bending Adequate**	
Adm Shear Stress:	0.74	N/mm^2			.	
Max Shear Stress:	0.37	N/mm^2		50.43%	**Shear Adequate**	
					.	

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Project | Project no | **CALCULATION SHEET**

New Detached Dwelling on land to Read of 3081.00

Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: HB3

Headbinder Design - Condition 3 - Internal wall

Floor type:	Intermediate Floor Bedroom				
Total Load:	2.28	kN/m^2			
Joist Span 1:	5.40	m	Joist Span 2:	4.60	m
Joist Spacing:	600	mm			
Stud Spacing:	400	mm			
Joists continuous over headbinder:	No				
Headbinder Depth:	38	mm			
Headbinder Width:	89	mm			
Number of rails:	2	No. (*Top panel rail counts as 1*)		*Mmt coeff.:*	*0.08*
Timber Grade:	C16			*Shear coeff.:*	*0.57*
Basic Bending Stress:	5.30	N/mm^2	K_3 1.00		
Adm Bending Stress:	6.12	N/mm^2			
Joist Reaction:	6.83	kN		Max Shear Force:	3.89 kN
Max Bending Moment in headbinder:	0.219	kNm			
				40% overstress permitted	
Section Modulus of Headbinder:	42839	mm^3		**Bending Adequate**	
Adm Bending Moment:	0.262	kNm	83.35%	.	
Adm Shear Stress:	0.74	N/mm^2		**Shear Adequate**	
Max Shear Stress:	0.86	N/mm^2	**117.14%**	.	

Headbinder Design - Condition 4 - Internal wall

Floor type:	Intermediate Floor Bedroom				
Total Load:	2.28	kN/m^2			
Joist Span 1:	0.60	m	Joist Span 2:	0.60	m
Joist Spacing:	600	mm			
Stud Spacing:	600	mm			
Joists continuous over headbinder:	No				
Headbinder Depth:	38	mm			
Headbinder Width:	89	mm			
Number of rails:	1	No. (*Top panel rail counts as 1*)		*Mmt coeff.:*	*0.08*
Timber Grade:	C16			*Shear coeff.:*	*0.715*
Basic Bending Stress:	5.30	N/mm^2	K_3 1.00		
Adm Bending Stress:	5.57	N/mm^2			
Joist Reaction:	0.82	kN		Max Shear Force:	0.59 kN
Max Bending Moment in headbinder:	0.039	kNm			
				.	
Section Modulus of Headbinder:	21419	mm^3		**Bending Adequate**	
Adm Bending Moment:	0.119	kNm	33.03%	.	
Adm Shear Stress:	0.67	N/mm^2		**Shear Adequate**	
Max Shear Stress:	0.26	N/mm^2	38.82%	.	

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New Detached Dwelling on land to Read of 3081.00

Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: HB4

Headbinder Design - Condition 5 - Roof

Roof type: Pitched / Curved Roof - Other

Dead Load:	1.33 kN/m² (*LT*)	External Imposed:	0.75	kN/m² (*ST*)	
		Internal Imposed:	0.25	kN/m² (*MT*)	
Truss Span:	3.31 m		0.00	kN/m² (*LT*)	
Truss Spacing:	600 mm	Max attic floor span:		m	
Stud Spacing:	600 mm				

Headbinder Depth:	38 mm		
Headbinder Width:	140 mm		
Number of rails:	1 No. (*Top panel rail counts as 1*)	*Mmt coeff.:*	*0.08*
Timber Grade:	C16	*Shear coeff.:*	*0.715*
Basic Bending Stress:	5.30 N/mm²		
Adm Bending Stress (*LT*)	5.57 N/mm²		
Adm Bending Stress (*MT*)	6.96 N/mm²		
Adm Bending Stress (*ST*)	8.35 N/mm²		

Truss Reaction (*LT*):	1.32 kN	Max Shear Force:	0.95 kN
Truss Reaction (*MT*):	1.57 kN	Max Shear Force:	1.12 kN
Truss Reaction (*ST*):	2.32 kN	Max Shear Force:	1.66 kN

Max Bending Moment in headbinder (*LT*)	0.064 kNm		
Max Bending Moment in headbinder (*MT*)	0.075 kNm		
Max Bending Moment in headbinder (*ST*)	0.111 kNm		
Section Modulus of Headbinder:	33693 mm³		
Adm Bending Moment (*LT*):	0.188 kNm	33.88%	.
Adm Bending Moment (*MT*):	0.234 kNm	32.18%	**Bending Adequate**
Adm Bending Moment (*ST*):	0.281 kNm	39.53%	.

Adm Shear Stress (*LT*):	0.70 N/mm²		
Adm Shear Stress (*MT*):	0.88 N/mm²		
Adm Shear Stress (*ST*):	1.06 N/mm²		
Max Shear Stress (*LT*):	0.27 N/mm²	37.92%	.
Max Shear Stress (*MT*):	0.32 N/mm²	36.03%	**Shear Adequate**
Max Shear Stress (*LT*):	0.47 N/mm²	44.25%	.

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

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			Calculation sheet/revision no PF 1

Horizontal Shear Between Panels & Soleplate or Between Multiple Soleplates

This also satisfies the Disproportionate Collapse requirements of 2A structures

Check there is adequate nailing at these interfaces to transmit the racking forces down through the structure, utilizing a friction coefficient of friction of: 0.40

The **average** dead load taken for this frictional resistance is:
Ground floor only 5.59 kN/m
First floor and above 5.73 kN/m

The following maximums occur based upon racking wall calculations:
Ground floor only 2.25 kN/m less frict. rest. of: 2.24 kN/m
First floor and above 2.46 kN/m less frict. rest. of: 2.29 kN/m

Factor of safety required: 1 *(See racking calculations pages R1 Et. Seq.)*

If anchorage is based upon shortfall in sliding capacity (*see page OS1*) then the resulant shear force per m run of load bearing internal, external and party wall is: 0.00 kN/m

Base shear calculation on using: racking wall values

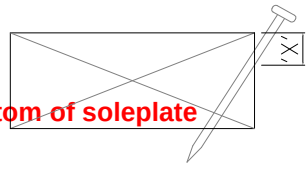
Therefore use the the following values:
Ground floor only 0.01 kN/m
First floor and above 0.17 kN/m

Consider the worst case of panel base or head for material build up:

Panel rail thickness:	38			
Soleplate / headbinder thickness:	38	mm x wide:	89	mm
Angle of skew screw (*from vertical*):	0	°	Sheathing thickness:	mm
Lowest timber grade:	C16			
Nail diameter used:	3	mm	.	
Nail length used:	90	mm	*Edge dist. 5d:*	*15.00 mm*
Dimension 'x' :	0		*Spacing perp to grain 10d:*	*30.00 mm*

Values from BS 5268-2:2002 (Table 61)

Standrard Penetration: 36 mm
Basic Shear Load: 306 N



Caution! - Nail protrudes out of bottom of soleplate

Pointside penetration into soleplate: 38 mm
Ratio of actual to standard thickness of headside member: 1.056 .
Ratio of actual penetration to standard pointside thickness: 1.056 .
.

Therefore reduction factor for sub-standard penetration is: 1.000 . .

Factor, K_{48} Load duration: 1.25
Factor, K_{50} number of fixings in line: 0.9

Admisable load per nail: 344.25 N

Note: If a factor of safety of 1.0 is used above, this is because the UKTFA technical guidance states that there is already a factor of 1.4 built into the values in BS 5268

Ground floor only

Nail arrangement: Single
Nail Spacing: 300 mm
Shear Capacity: 1.15 kN/m

Nailing Specification Adequate
3 mm dia x 90mm long nails at 300 mm

First floor and above

Nail arrangement: Single
Nail Spacing: 300 mm
Shear Capacity: 1.15 kN/m

Nailing Specification Adequate
3 mm dia x 90mm long nails at 300 mm

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Project: New Detached Dwelling on land to Read of | Project no: 3081 | **CALCULATION SHEET**

Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: PF 2

Horizontal Shear Between Soleplate & Rim Beam

Check there is adequate nailing at these interfaces to transmit the racking forces down through the structure, utilizing a friction coefficient of friction of: 0.40

The dead load that has been taken for this frictional resistance is: Ground to third: 5.59 kN/m
Third to Sixth: 5.73 kN/m

The following maximums occur: *(See racking calculations pages R1 Et. Seq.)*

Ground floor only	2.25 kN/m	less frict. rest. of:	2.24 kN/m
First floor and above	2.46 kN/m	less frict. rest. of:	2.29 kN/m

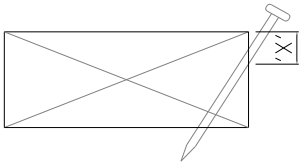
Therefore use the the following values for Ground floor only 0.01 kN/m
First floor and above 0.17 kN/m

Consider the worst case of panel base or head for material build up:

Angle of skew screw (*from vertical*) :	0 °	Sheathing thickness:	mm
Soleplate / headbinder thickness:	38 mm	x wide: 89 mm	
Structural deck thickness:	22 mm		
Lowest timber grade:	C16		
Nail diameter used:	3 mm		
Nail length used:	90 mm	*Edge dist. 5d:*	*15.00 mm*
Dimension 'x' :	0	*Spacing perp to grain 10d:*	*30.00 mm*

Values from BS 5268-2:2002 (Table 61)

Standrard Penetration: 36 mm
Basic Shear Load: 306 N



Pointside penetration into rim beam: 30 mm
Ratio of actual to standard thickness of headside member: 1.056
Ratio of actual penetration to standard pointside thickness: 0.833

Therefore reduction factor for sub-standard penetration is: 0.833

Factor, K_{48} Load duration: 1.25
Factor, K_{50} number of fixings in line: 0.9

Admisable load per nail: 286.88 N

Ground floor only *This check only applicable for timber ground floors.*
Nail arrangement:
Nail Spacing: mm
Shear Capacity: kN/m

First floor and above
Nail arrangement:
Nail Spacing: mm
Shear Capacity: kN/m

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Project | Project no | **CALCULATION SHEET**

New Detached Dwelling on land to Read of 3081.00

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: PF 3

Horizontal Shear Between Soleplate & Concrete Slab

Check there is adequate fixing at these interfaces to transmit the racking forces down through the structure, based upon screw fixings.

The following maximums occur: *(See racking calculations pages R1 Et. Seq.)*

Ground floor only 2.25 kN/m less frict. rest. of: 2.24 kN/m

If anchorage is based upon shortfall in sliding capacity (*see page OS1*) then the resulant shear force per m run of load bearing internal, external and party wall is: 0.00 kN/m

Base shear calculation on using: racking wall values

Therefore use the the following values between ground & third floor level: 0.01 kN/m

This shear value has no f.o.s. on the basis that the fixing s.w.l. has approx f.o.s. of 3.3.

Consider the worst case of panel base or head for material build up:

Fixing type: Fischer Hammerfix Substrate: 7N Block

Upper Soleplate thickness (*if more than 1*): 38 mm x wide: 89 mm

Lowest timber grade: C16

Screw diameter used: 5 mm

Screw length used: 125 mm

Edge dist. 5d: *25.00 mm*

Spacing perp to grain 3d: *15.00 mm*

Values from BS 5268-2:2002 (Table 66)

Standrard Penetration: 18 mm (*Headside*)

Basic Shear Load: 550 N

Pointside penetration into slab: 87 mm

Ratio of actual to standard thickness of headside member: 2.111

Therefore reduction factor for sub-standard penetration is: 1.000

Factor, K_{52} Load duration: 1.25

Factor, K_{54} number of fixings in line: 0.9

Admisable load per fixing in timber: 618.75 N

Admisable load per fixing in substrate: 340.00 N

Soleplete Fixings

Screw arrangement: Single

Screw Spacing: 300 mm **Fixing Specification Adequate**

Shear Capacity: 1.13 kN/m **Fischer Hammerfix Ref N8 x 120Z**

Other alternatives are:

1. Masonry nails at 1500mm centres with a 0.4kN SWL capacity to all load bearing walls.
Check edge distances. Hilti ref: NK64/S12 for a 38mm soleplate thickness

2. Soleplate anchors at 4500mm centres fixed to the slab with 3no. masonry nails each having 0.4kN SWL capacity and to the soleplate with 3no. 3.75 x 30 sq twist nails.
Anchors to be fixed to all load bearing walls.

MASONRY NAILS ARE NOT SUITABLE FOR BEAM AND BLOCK FLOORS.

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Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no
PF 4

Horizontal Shear Between beam & block floor and masonry substructure

Check there is adequate shear strength between the beam and block floor and the masonry substructure.

This calc is provided for assurance to the client that all is in order but is strictly beyond the control of the timber frame fabricator.

It is based on the strength of the block work being 7N minimum and the beam and block floor bedded on a mortar joint and NOT laid on a dry joint.

Horizontal longitudinal force taken from page PF3: 2.25 kN/m unfactored

Partial safety factor for wind load = 1.4. 3.15 kN/m factored

Resulting shear stress in bed joint based block width of: 100 mm

is 0.03 N/mm^2

Assuming class iii mortar, characteristic shear strength from BS5628 is

$fv = 0.15 + 0.6gA$, with a maximum value of $1.4N/mm^2$

$\gamma mv = 2.5$ (Clause 27.4)

Assuming an average dead load of: 5.59 kN/m

gA then =: 0.056 N/mm^2

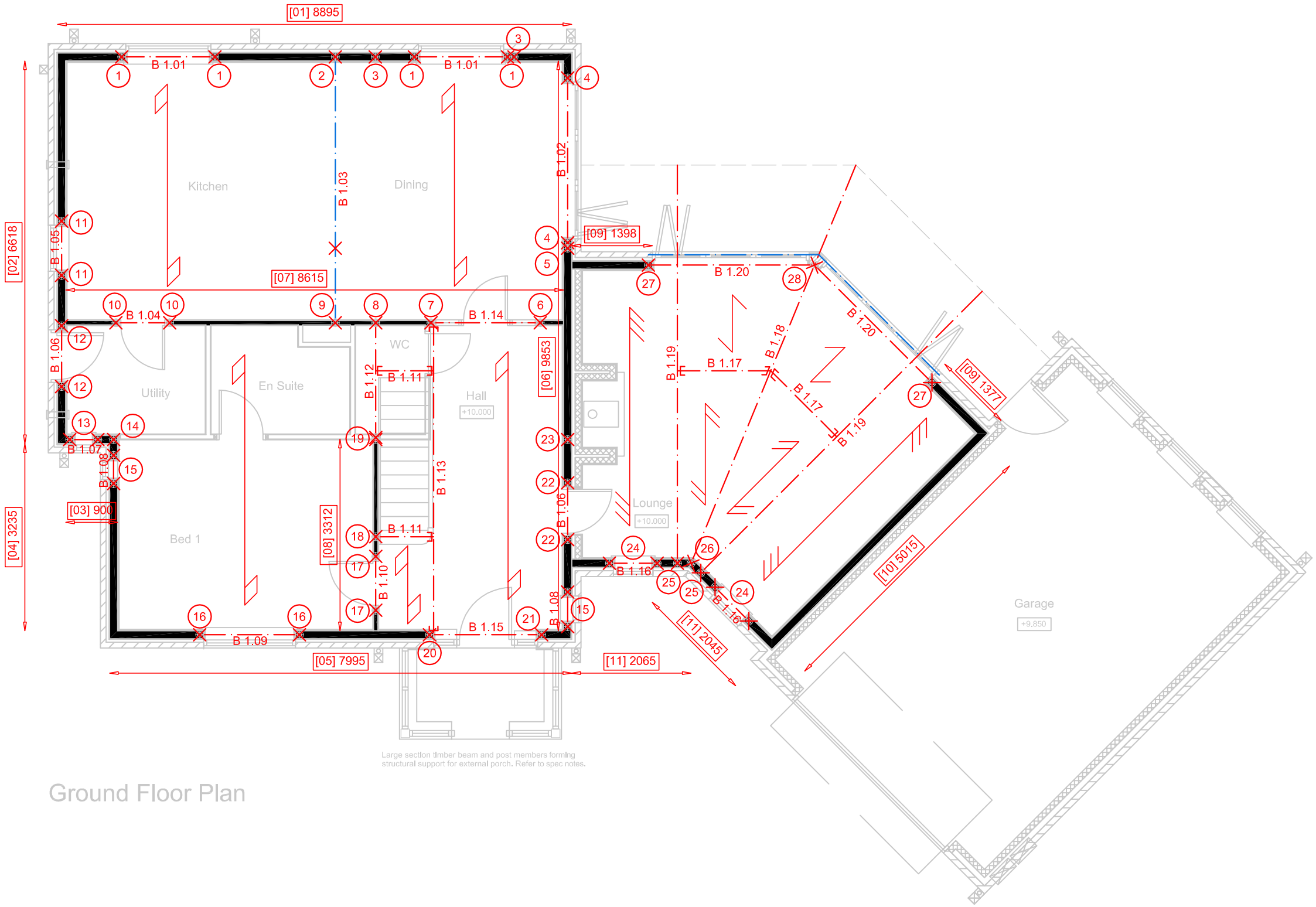
& 0.6gA=: 0.034 N/mm^2

fv=: 0.184 N/mm^2

fv / γm =: 0.073 N/mm^2

Masonry shear stress O.K.

42.85%



Ground Floor Plan

Rev.	Date	Details	Drawn
-	-	-	-

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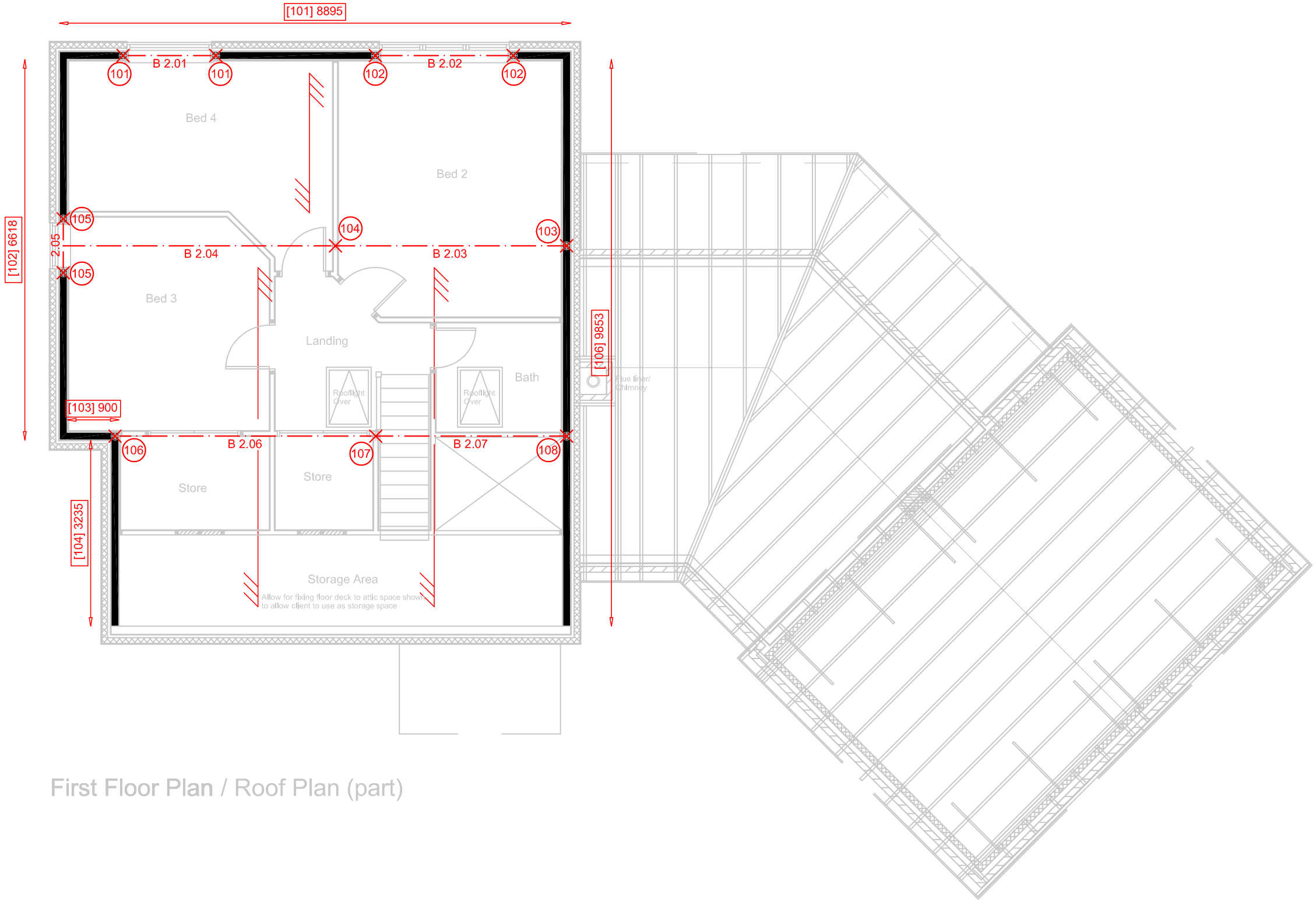
Site Address: Holmwood House, Clayton Road, Newcastle upon Tyne	Description: Ground Floor References
Drawing Number: 3081 - SK1	
Date: 17-Feb-17	Scale: 1:75 @ A3
Status: CONSTRUCTION	
AutoCAD Reference: N.A.	
Drawn: R.G.	Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.



First Floor Plan / Roof Plan (part)

Rev.	Date	Details	Drawn
-	-	-	-

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f: 01173 376702
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address: Holmwood House, Clayton Road, Newcastle upon Tyne	Description: First Floor References
Drawing Number: 3081 - SK2	
Date: 17-Feb-17	Scale: 1:75 @ A3
Status: CONSTRUCTION	
AutoCAD Reference: N.A.	
Drawn: R.G.	Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @600mm c/c
- Party = N/A
- ILB = 38x89mm C16 Studs @600mm c/c

Allgnment of studs wlth joists/trusses:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Tles:
- N/A

Wall Panel Fixings:
- Soleplate (s/p) =
  Fisher Hammerflx N8x120Z @ 300mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0 ϕx90mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 150mm c/c both gable and eaves directlons, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:

- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = 2/38x140 C16

Beams/Trimmers:
- N/A

Cripple/Full height Studs:
- N/A

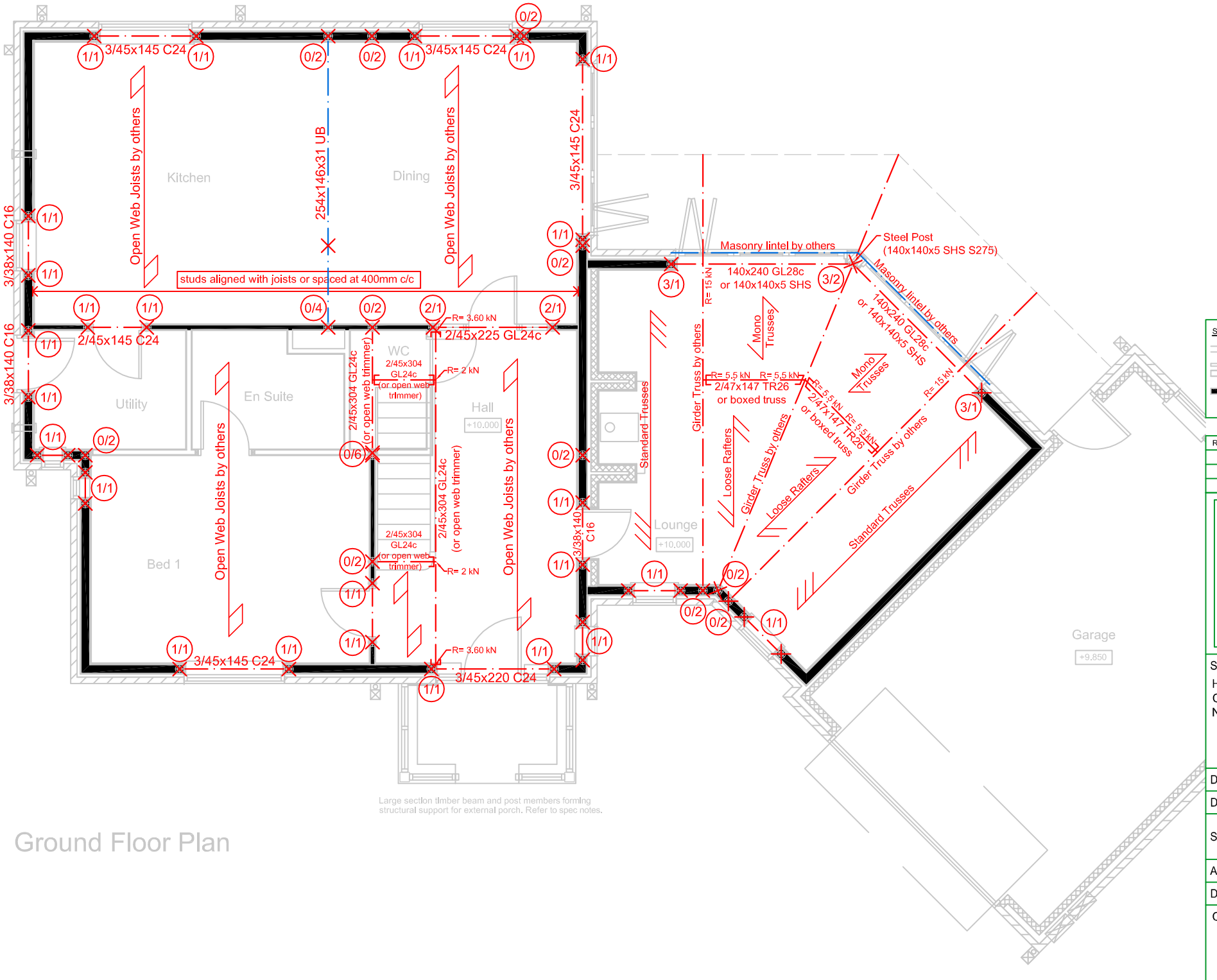
Floor Joists:
- Open-web joists designed by ohers

F.A.O. Truss Designer:
- Plots considered to lie within Country
  Maximum dynamic pressure of: 0.945 kN/m².
- Truss rafters used throughout at 600mm c/c designed by others
- Truss/Loose rafters to align with wall studs:
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.333 kN/m²
	Imposed	= 1.000 kN/m²
Floor -	Dead	= 0.778 kN/m²
	Imposed	= 1.500 kN/m²
Walls -	External	= 0.348 kN/m²
	Internal	= 0.485 kN/m²

THIS DRAWING MUST NOT BE SCALED.
PRIOR TO THE COMMENCEMENT OF ANY WORKS, THE BUILDER IS TO CHECK AND/OR DETERMINE ALL CONSTRUCTION DETAILS, INCLUDING CHECKING EXISTING SITE LEVELS AND DIMENSIONS. THE DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS, CONSTRUCTION NOTES AND/OR PROJECT SPECIFICATION. ALL DISCREPANCIES SHOULD BE REPORTED IMMEDIATELY.



Large section timber beam and post members forming structural support for external porch. Refer to spec notes.

Ground Floor Plan

STRUCTURAL MARK-UPS LEGEND:

- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. No. Cripple Studs/No. Full Height Studs 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
-	-	-	-

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Site Address:
Holmwood House,
Clayton Road,
Newcastle upon Tyne

Description:
Ground Floor
Structural Mark-Ups

Drawing Number: 3081 - 002

Date: 17-Feb-17 | Scale: 1:75 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G. | Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @600mm c/c
- Party = N/A
- ILB = 38x89mm C16 Studs @600mm c/c

Allgnment of studs wlth joists/trusses:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Tles:
- N/A

Wall Panel Fixings:
- Soleplate (s/p) =
  Fisher Hammerflx N8x120Z @ 300mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0 ϕx90mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 150mm c/c both gable and eaves directlons, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:

- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = 2/38x140 C16

Beams/Trimmers:
- N/A

Cripple/Full height Studs:
- N/A

Floor Joists:
- Open-web joists designed by others

F.A.O. Truss Designer:
- Plots considered to lie within Country
Maximum dynamic pressure of: 0.945 kN/m².
- Truss rafters used throughout at 600mm c/c designed by others
- Truss/Loose rafters to align with wall studs:
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.333 kN/m²
	Imposed	= 1.000 kN/m²
Floor -	Dead	= 0.778 kN/m²
	Imposed	= 1.500 kN/m²
Walls -	External	= 0.348 kN/m²
	Internal	= 0.485 kN/m²

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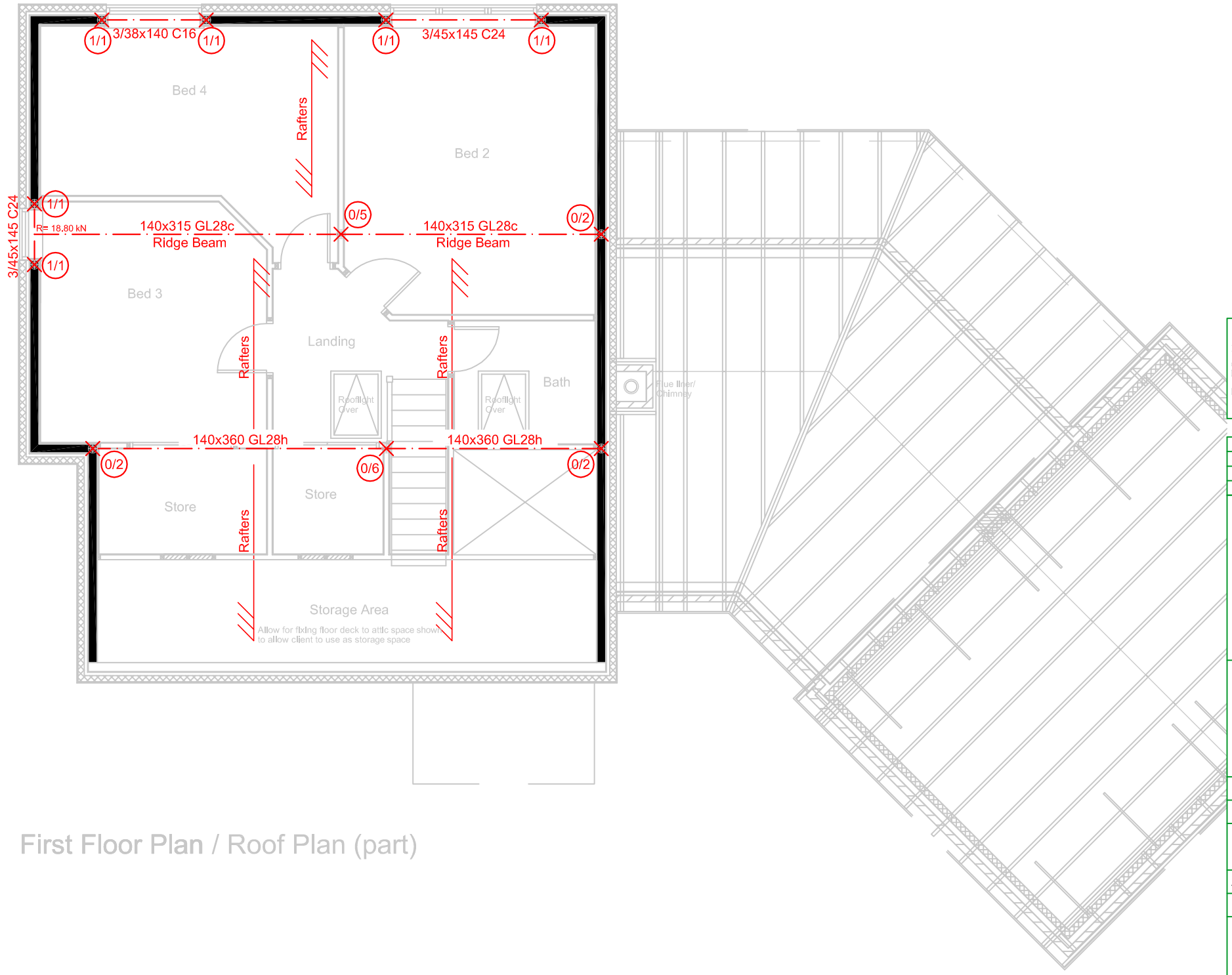

First Floor Plan / Roof Plan (part)

STRUCTURAL MARK-UPS LEGEND:
- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- 2/1 Structural Studs. No. Cripple Studs/No. Full Height Studs 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
-	-	-	-

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Site Address:
Holmwood House,
Clayton Road,
Newcastle upon Tyne

Description:
First Floor
Structural Mark-Ups

Drawing Number: 3081 - 003

Date: 17-Feb-17 Scale: 1:75 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G. Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

.

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Tel: 01291 635522

Project	Project no	**CALCULATION SHEET**
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no FND 1

Wall Foundation Loads - Unfactored

				Wind kN/m +/-		
Wall Ref	**Dead kN/m**	**Live kN/m**	**Total kN/m**	**Longitudinal**	**Lateral**	**Vertical**
1	7.00	6.00	16.00	1.76	1.47	3.00
2	3.00	1.00	8.00	1.99	1.47	4.00
3	5.00	4.00	20.00	0.73	1.47	11.00
4	3.00	1.00	14.00	2.47	1.47	10.00
5	4.00	5.00	11.00	1.02	1.47	2.00
6	3.00	2.00	10.00	2.18	1.47	5.00
7	7.00	11.00	20.00	1.23	0.00	2.00
8	3.00	2.00	10.00	1.18	0.00	5.00
9	5.00	3.00	8.00	0.00	1.47	0.00
10	2.00	1.00	3.00	0.00	1.47	0.00
11	5.00	3.00	8.00	0.00	1.47	0.00

NOTE 1: Loads given above exclude any external masonry leaf unless it is carried by the timber frame.
NOTE 2: Steel transfer grillages should be designed based upon a maximum deflection of L/360 or 14mm, whichever is the lesser, under total loads to prevent undue distress to the timber frame.

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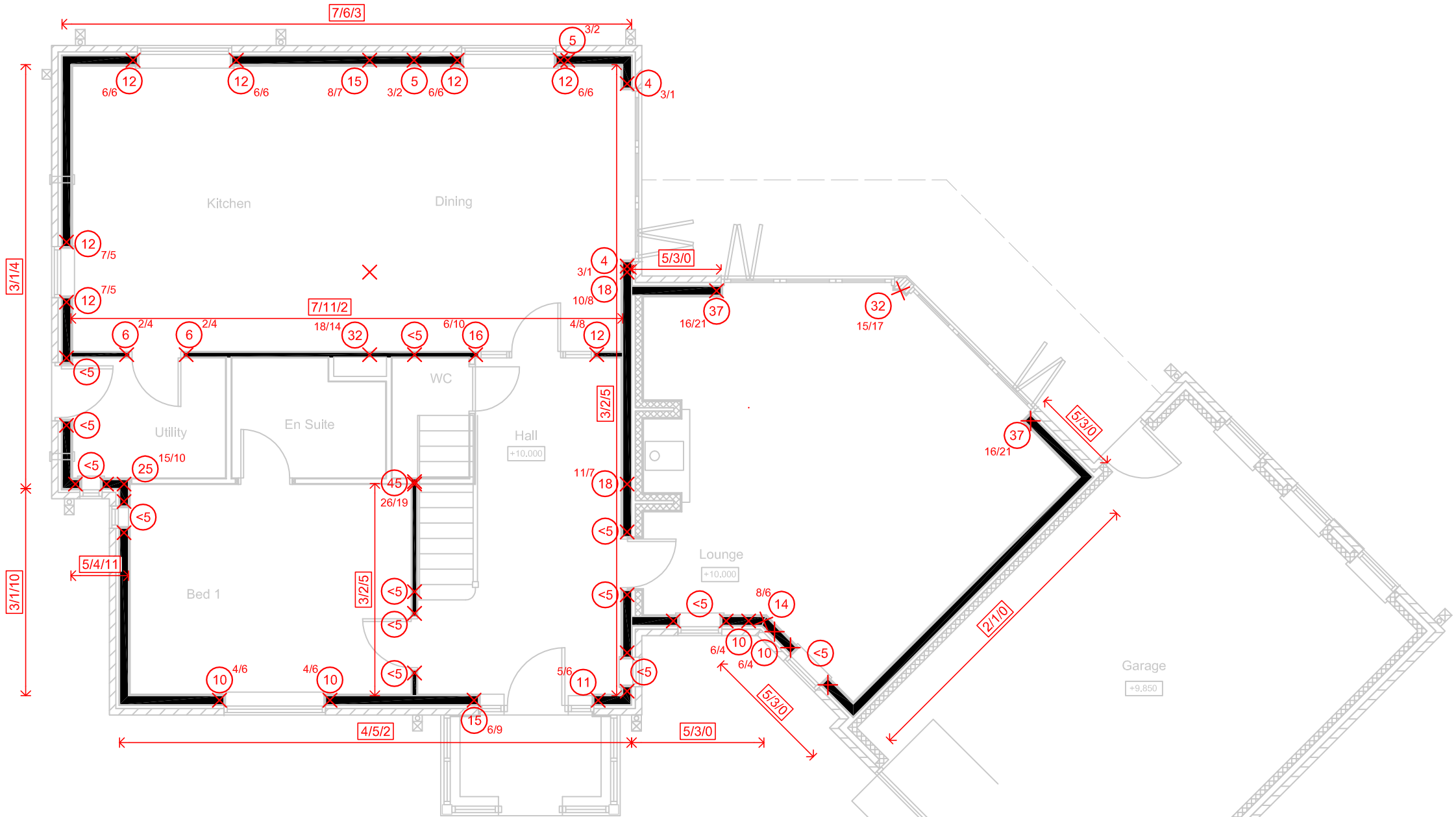
Project	Project no	CALCULATION SHEET
New Detached Dwelling on land to Read of	3081	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no FND 2

Cripple Stud Foundation Loads - Unfactored

Stud Ref	Dead kN	Live kN	Total kN
1	6.19	5.99	12.18
2	8.20	6.74	14.94
3	3.04	2.18	5.22
4	2.57	1.18	3.75
5	10.24	7.32	17.55
6	4.19	7.85	12.03
7	5.79	10.02	15.81
8	0.83	1.22	2.05
9	18.00	13.74	31.74
10	2.02	3.83	5.86
11	7.12	4.85	11.97
12	0.94	0.43	1.37
13	0.98	0.85	1.83
14	14.53	10.31	24.84
15	0.35	0.20	0.55
16	4.17	5.41	9.58
17	0.27	0.46	0.73
18	0.44	0.70	1.14
19	25.79	18.73	44.52
20	6.52	8.61	15.13
21	4.81	6.18	10.99
22	0.94	0.43	1.37
23	10.63	7.55	18.18
24	1.59	1.17	2.76
25	6.04	4.05	10.08
26	8.20	5.62	13.82
27	15.84	20.68	36.52
28	14.74	16.72	31.46

NOTE 1: Loads given above exclude any external masonry leaf unless it is carried by the timber frame.
NOTE 2: Steel transfer grillages should be designed based upon a maximum deflection of L/360 or 14mm, whichever is the lesser, under total loads to prevent undue distress to the timber frame.



Large section timber beam and post members forming structural support for external porch. Refer to spec notes.

Ground Floor Plan

NOTES:

5/2/1 Denotes (UNFACTORED DEAD/IMPOSED/ VERTICAL WIND) Line Loads IN kN/m run.
Minimum loads of 5kN/m Ommited for Clarity.
The wind load gives a reversible triangular load distribution of max.positive to max.negative.

25 9/16 Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads in kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight cladding, if present is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 5 kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings in both the internal and external loadbearing wall (refer to architects layouts for extent of all openings). these should be calculated from UDL and allowed for in the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR inner leafs. If masonry is included it will be denoted : M -
Ground floor loads are excluded. If a timber ground floor is included it will be denoted : GF -

SP- Steel post.The steel post has to be fixed to a pad stone designed to resist loads given. Fixing to block upstand only is NOT ADVISABLE. Additionally, moment of 10 kNm and horizontal force of 12kN to be resisted as well.

Rev.	Date	Details	Drawn
-	-	-	-

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Site Address: Holmwood House, Clayton Road, Newcastle upon Tyne	Description: Line & Point Loads
Drawing Number: 3081 - 001	
Date: 17-Feb-17	Scale: 1:75 @ A3
Status: CONSTRUCTION	
AutoCAD Reference: N.A.	
Drawn: R.G.	Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @600mm c/c
- Party = N/A
- ILB = 38x89mm C16 Studs @600mm c/c

Allgnment of studs wlth joists/trusses:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Tles:
- N/A

Wall Panel Fixings:
- Soleplate (s/p) =
  Fisher Hammerflx N8x120Z @ 300mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0 ϕx90mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 150mm c/c both gable and eaves directlons, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:

- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = 2/38x140 C16

Beams/Trimmers:
- N/A

Cripple/Full height Studs:
- N/A

Floor Joists:
- Open-web joists designed by ohers

F.A.O. Truss Designer:
- Plots considered to lie within Country
  Maximum dynamic pressure of: 0.945 kN/m².
- Truss rafters used throughout at 600mm c/c designed by others
- Truss/Loose rafters to align with wall studs:
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.333 kN/m²
	Imposed	= 1.000 kN/m²
Floor -	Dead	= 0.778 kN/m²
	Imposed	= 1.500 kN/m²
Walls -	External	= 0.348 kN/m²
	Internal	= 0.485 kN/m²

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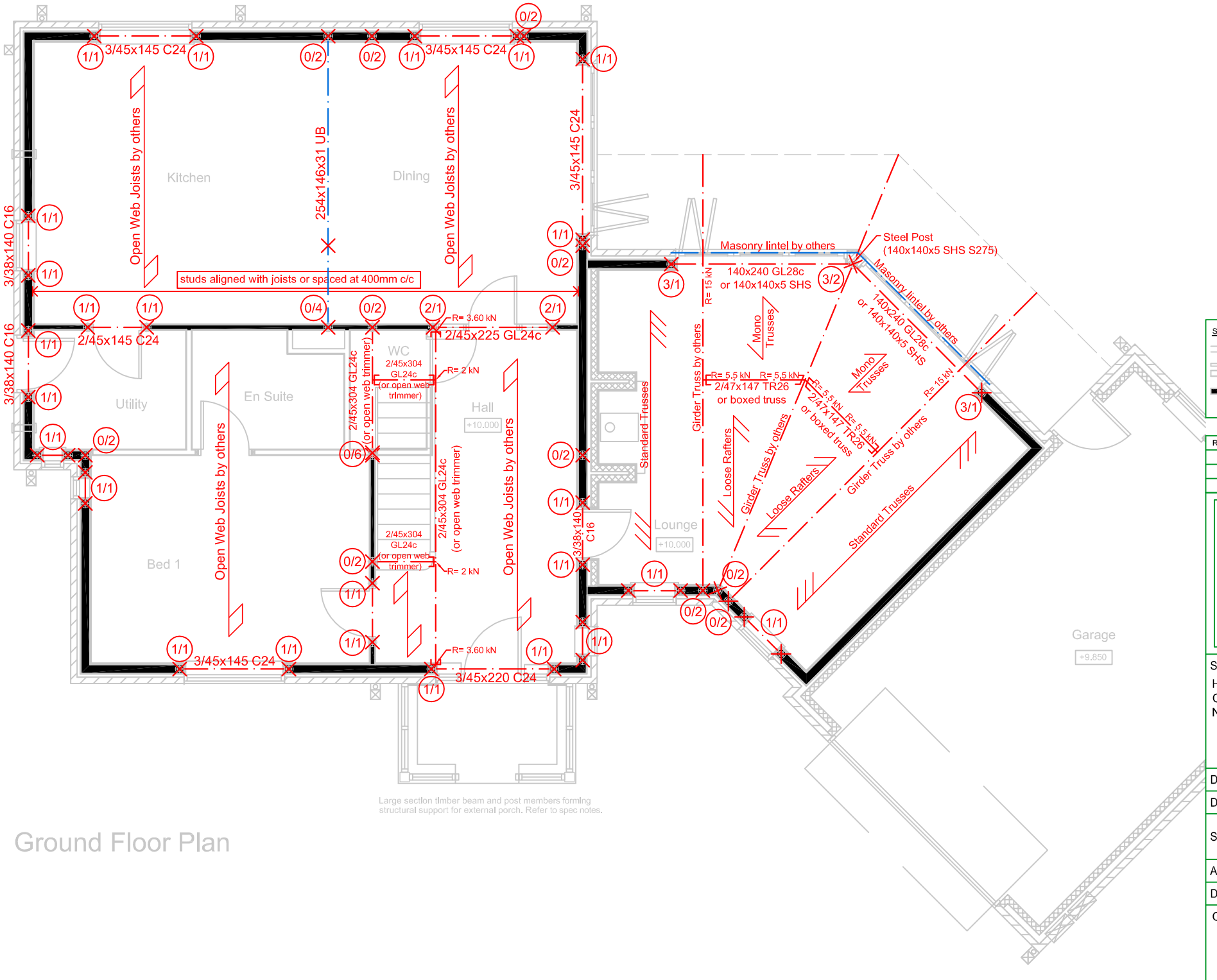

Large section timber beam and post members forming structural support for external porch. Refer to spec notes.

Ground Floor Plan

STRUCTURAL MARK-UPS LEGEND:

- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. No. Cripple Studs/No. Full Height Studs 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
-	-	-	-

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f: 01173 376702
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address:
Holmwood House,
Clayton Road,
Newcastle upon Tyne

Description:
Ground Floor
Structural Mark-Ups

Drawing Number: 3081 - 002

Date: 17-Feb-17 | Scale: 1:75 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G. | Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @600mm c/c
- Party = N/A
- ILB = 38x89mm C16 Studs @600mm c/c

Allgnment of studs wlth joists/trusses:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Tles:
- N/A

Wall Panel Fixings:
- Soleplate (s/p) =
  Fisher Hammerflx N8x120Z @ 300mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0 ϕx90mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 150mm c/c both gable and eaves directlons, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:

- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = 2/38x140 C16

Beams/Trimmers:
- N/A

Cripple/Full height Studs:
- N/A

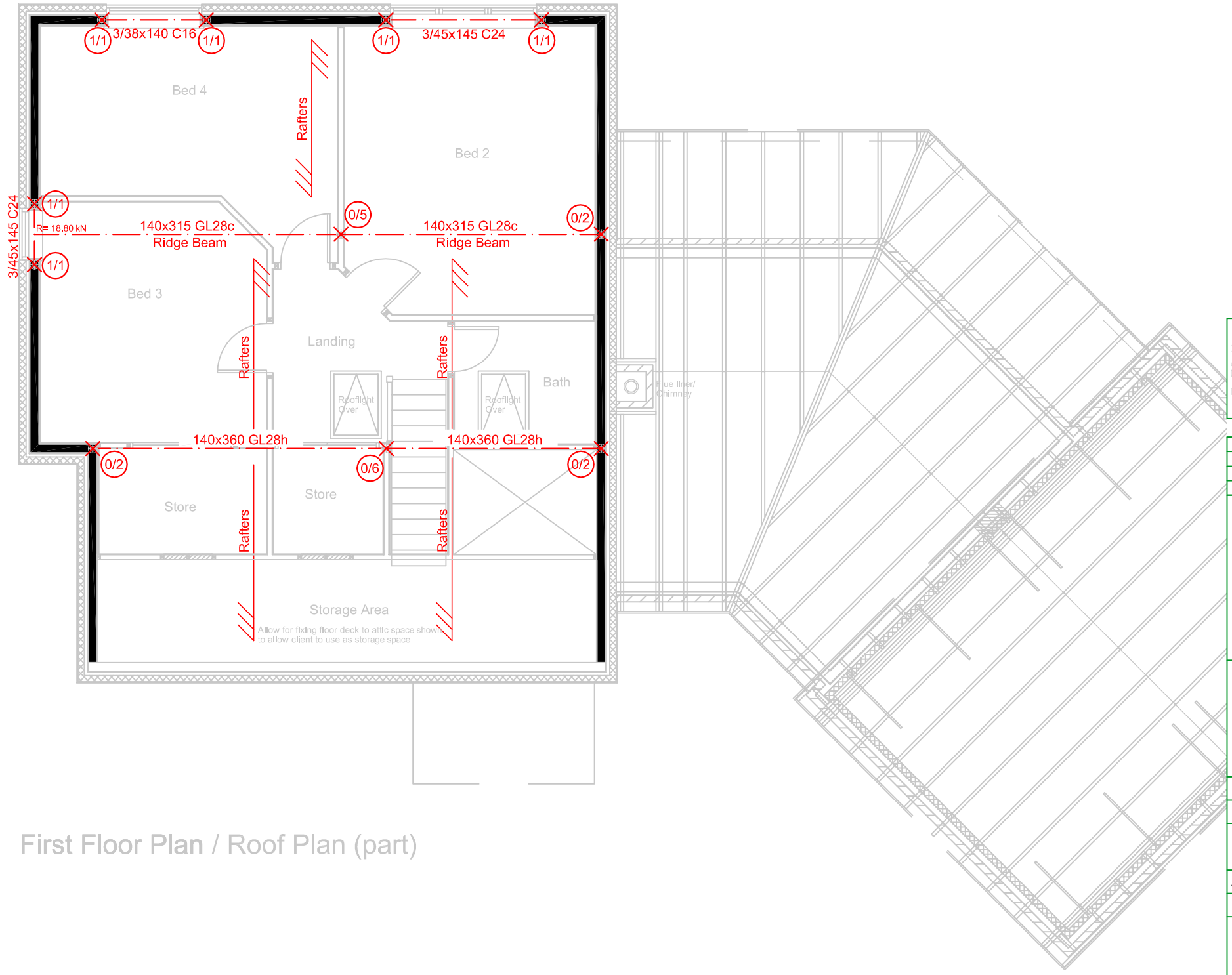
Floor Joists:
- Open-web joists designed by others

F.A.O. Truss Designer:
- Plots considered to lie within Country
Maximum dynamic pressure of: 0.945 kN/m².
- Truss rafters used throughout at 600mm c/c designed by others
- Truss/Loose rafters to align with wall studs:
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.333 kN/m²
	Imposed	= 1.000 kN/m²
Floor -	Dead	= 0.778 kN/m²
	Imposed	= 1.500 kN/m²
Walls -	External	= 0.348 kN/m²
	Internal	= 0.485 kN/m²

THIS DRAWING MUST NOT BE SCALED.
PRIOR TO THE COMMENCEMENT OF ANY WORKS, THE BUILDER IS TO CHECK AND/OR DETERMINE ALL CONSTRUCTION DETAILS, INCLUDING CHECKING EXISTING SITE LEVELS AND DIMENSIONS. THE DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS, CONSTRUCTION NOTES AND/OR PROJECT SPECIFICATION. ALL DISCREPANCIES SHOULD BE REPORTED IMMEDIATELY.



First Floor Plan / Roof Plan (part)

STRUCTURAL MARK-UPS LEGEND:
- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- 2/1 Structural Studs. No. Cripple Studs/No. Full Height Studs 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
-	-	-	-

ADEPT
Consulting(UK) Ltd

ADEPT Consulting(UK) Ltd
Riverside Court,
Beufort Park
Chepstow
Monmouthshire
NP16 5UH
t: 01291635522
m: 07515361138
f: 01173 376702
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address:
Holmwood House,
Clayton Road,
Newcastle upon Tyne

Description:
First Floor
Structural Mark-Ups

Drawing Number: 3081 - 003

Date: 17-Feb-17 Scale: 1:75 @ A3

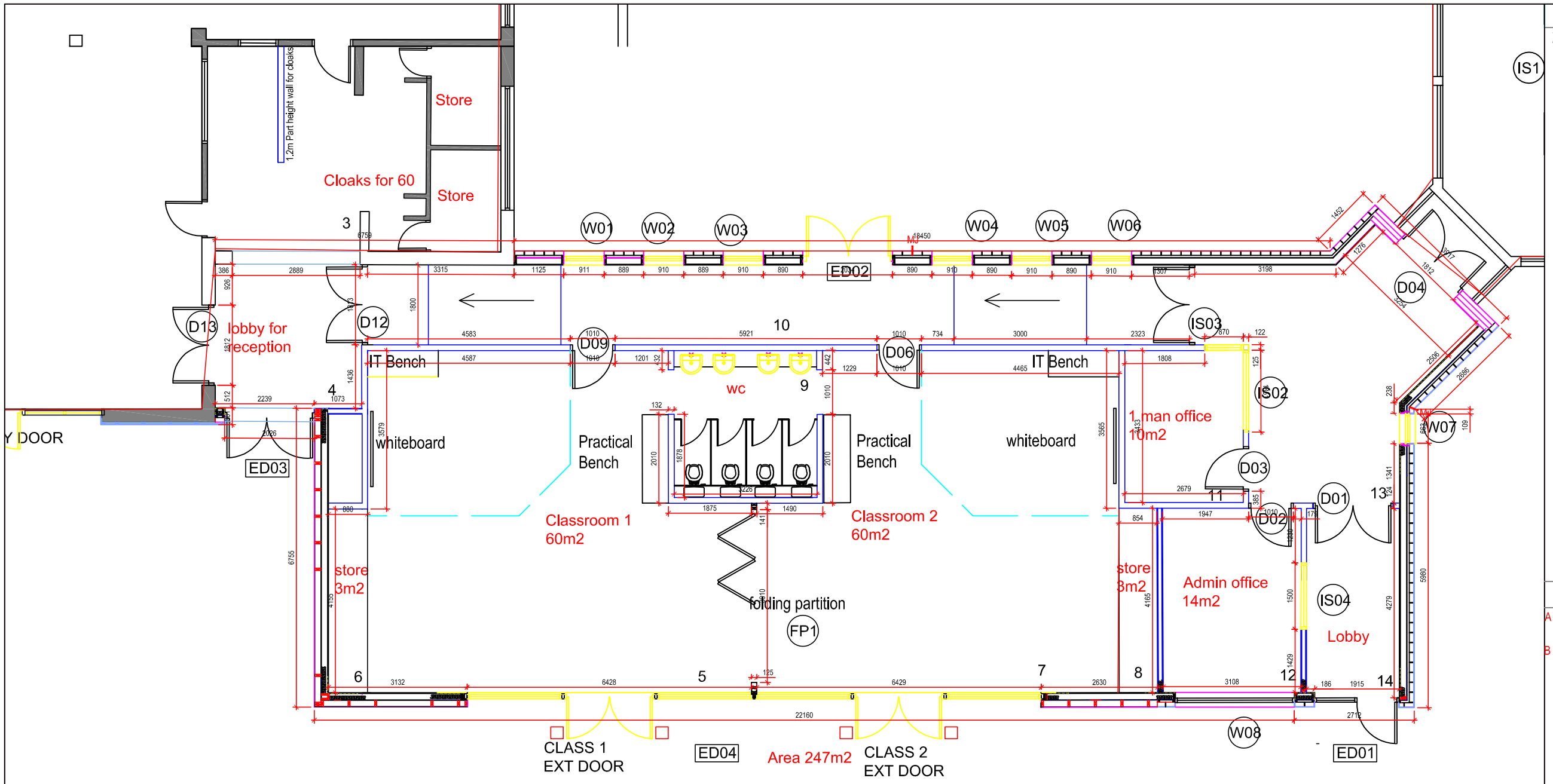
Status: CONSTRUCTION

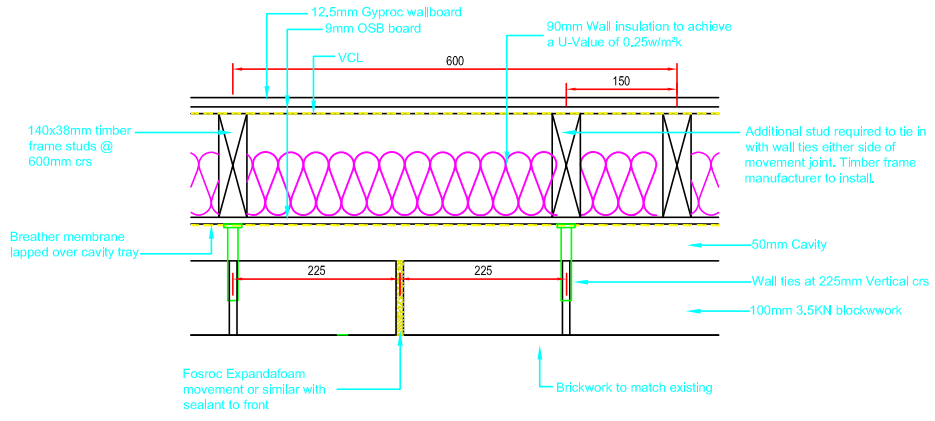
AutoCAD Reference: N.A.

Drawn: R.G. Checked: M.K.

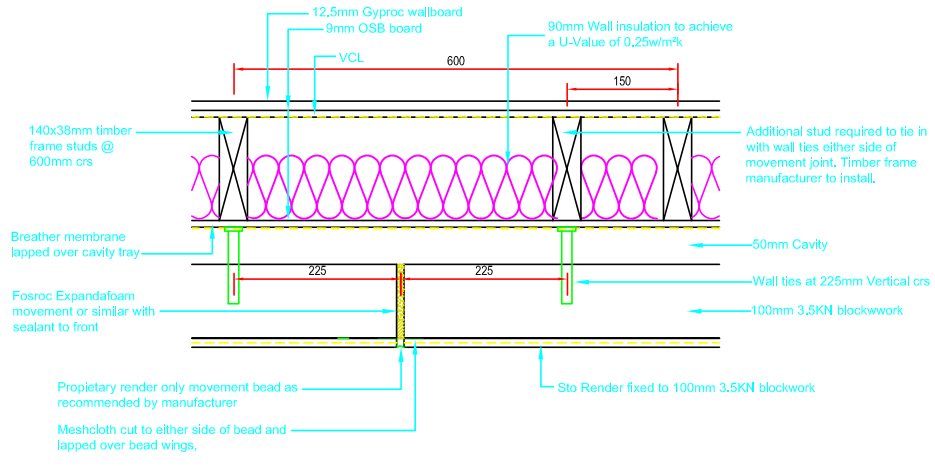
Client:

Karlin Timber Frame (NE) Ltd.





MOVEMENT JOINT THROUGH BRICKWORK - Scale 1:5



MOVEMENT JOINT THROUGH RENDER PANEL - Scale 1:5

NOTES

THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF DIMENSIONS ON THE SITE.

REVISIONS

A 10/01/17 Nursery canopy and nursery extension omitted

B 10/01/17 External dims added

Building Design Services
Technical Services, Neighbourhood Services,
Durham County Council,
St Johns Road, Meadowfield Industrial Estate,
Meadowfield, Durham, DH7 8XQ

ESTABLISHMENT

Lanchester EP Primary

UPRN. 3232

PROJECT

2no classroom extension and nursery extension

PROJECT No.

TITLE

plan of classroom extension

DRAWN SS EXT. 268124	SCALE 1:50
CHECKED	DATE Jan 17

INFORMATION☐ TENDER☐ CONSTRUCTION☒ AS BUILT☐

DRAWING No.	REVISION
A200-03	B

Name of the Client/ Timber Frame Fabricator:	
Karlin Timber Frame Ltd	
Contact Person:	Colin Lunn/Stephen Clark
Date Revised:	19/02/2015

ADEPT Consulting(UK)Ltd
Riverside Court
Beaufort Park Way
Chepstow, NP16 5UH
Tel.: 01291 635522
Fax.: 01173376702
email: info@adeptco.co.uk

Timber frame wall	External	Party Wall	Internal
Racking resistance preference	**fully sheathed**		
Wall sheathing preference	**9mm OSB**		
Contribution of plasterboard	**use full contribution - temporary bracing may be required**		
Nogging to unsheathed LB walls	**nogging @1/2 rather than extra sheathing**		
Timber studs @ centres	**38x140 C16@600**		**38x89 C16@600**
- other (please specify)			
Standard lintel size	**3/219x44 C24**		
- other (please specify)			
Lintel above openings	**Always min.specified**		

Floor (houses) - if not specified otherwise		Other (please specify)
- type of joists	**I-joist**	
- depth	**245mm**	as supplier design
- centres	**Min.required**	as supplier design
- type of decking	**22mm Chipboard**	
- spec of rim board/ beams	**Solid Timber**	As supplier design
- locating plate to upper floors	**Always required**	

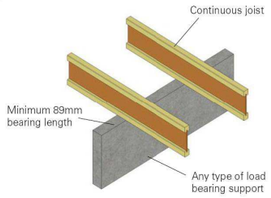
Floor (apartments) - if not specified otherwise		Other (please specify)
- type of joists		
- depth		
- centres		
- type of subdeck		
- spec of rim board/ beams		
- locating plate to upper floors		

Wall Sheathing Fixing			Other (please specify)
- nail diameter - standard	**o2.8x50MM**		
- nail diameter - maximum			
- centres - standard	**75/150**		
Vertical holding down straps	**only if required**		
Preferable fixings:	1st option	2nd option	Other(please specify)
- soleplate fixings	**Hammerfix screws**		
Preferred supplier of metalwork:	**No preference**		as joist supplier design

Set of standard details are	
NHBC HB353b/Part D Certification	**use Architects details only**

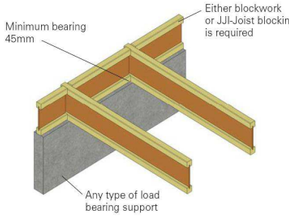
Details generally as architects design

F1 CONTINUOUS JOIST ON WALL



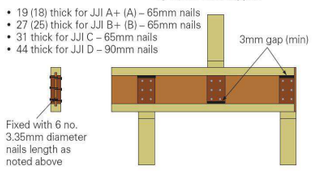
- Web stiffeners may be required, see F22

F6 TERMINATING JOIST ON WALL



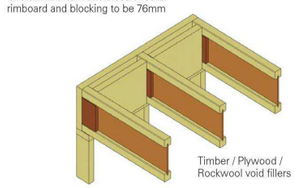
- Suitable detailing required if used on an external wall

F22 WEB STIFFENER



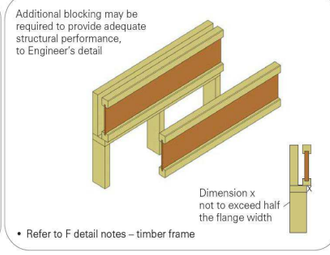
- 100mm wide plywood, OSB3 or kiln dried timber stiffener block fitted to both sides

F32 JOIST BEARING ON PARTY WALLS



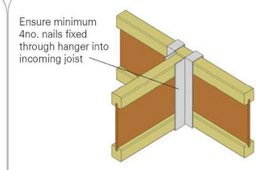
- Refer to F detail notes – timber frame

F36 JOIST PARALLEL TO EXTERNAL WALL



- Refer to F detail notes – timber frame

F41 BACKER FREE JOIST TO JOIST



- Approved backer free hanger secured through specified nail holes
- Refer to approved connector manufacturer's guidelines

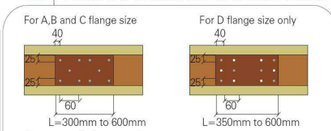
F20 FILLER AND BACKER BLOCK TABLE

JJI-Joist Depth (mm)	Filler and Backer Block Depth (mm)
195	100
220	125
235	145
245	150
300	200
350	125+125
400	150+150
450	200+150

JJI-Joist Flange Type	Backer Block / Web Stiffener Thickness (mm)	Filler Block Thickness (mm)
A+ (A)	19 (18)	38 (36)
B+ (B)	27 (25)	54 (50)
C	32	63
D	44	2x44

- Refer to details provided by the JJI-Joist supplier for required locations of filler and backer blocks
- Where a continuous filler block is used see detail F40
- Filler and backer blocks should be kiln dried timber, structural grade plywood or OSB3

F21 FILLER AND BACKER BLOCK NAILING DETAIL



All filler blocks and backer blocks for face fix hangers to be fixed tight to bottom flange with a minimum 3mm gap at the top

Backer blocks for top fix hangers to be fixed tight to the top flange with a minimum 3mm gap at the bottom

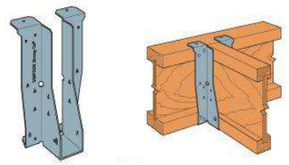
Nail lengths (mm)

Flange Spec	Backer Block	Filler Block
A+ (A)	65	65
B+ (B)	65	90
C	90	90
D	90	90

Minimum nail diameter 3.1mm

TIMBER FRAME DETAIL NOTES

1. See Table 5 and Table 13 for vertical load capacities
2. Rimboard thickness to timber frame kit manufacturer's Consulting Engineer's specification / approval
3. Rimboard fixed to bearing with 3.34x65mm nails at 150mm c/c
4. Secure rimboard to JJI-Joist with 2no 3.35x65mm ring shank nails, one each to top and bottom flanges
5. Fix JJI-Joist to bearing with 2no 3.35x65mm nails, 40mm from joist end
6. Minimum joist bearing length 45mm
7. Ensure the Building Designer is satisfied with fixing between the wall and floor



ITB - Timber Hanger

300mm deep JJI Joists @ 600mm c/S.

Please confirm and verify ALL dimensions and loadings.

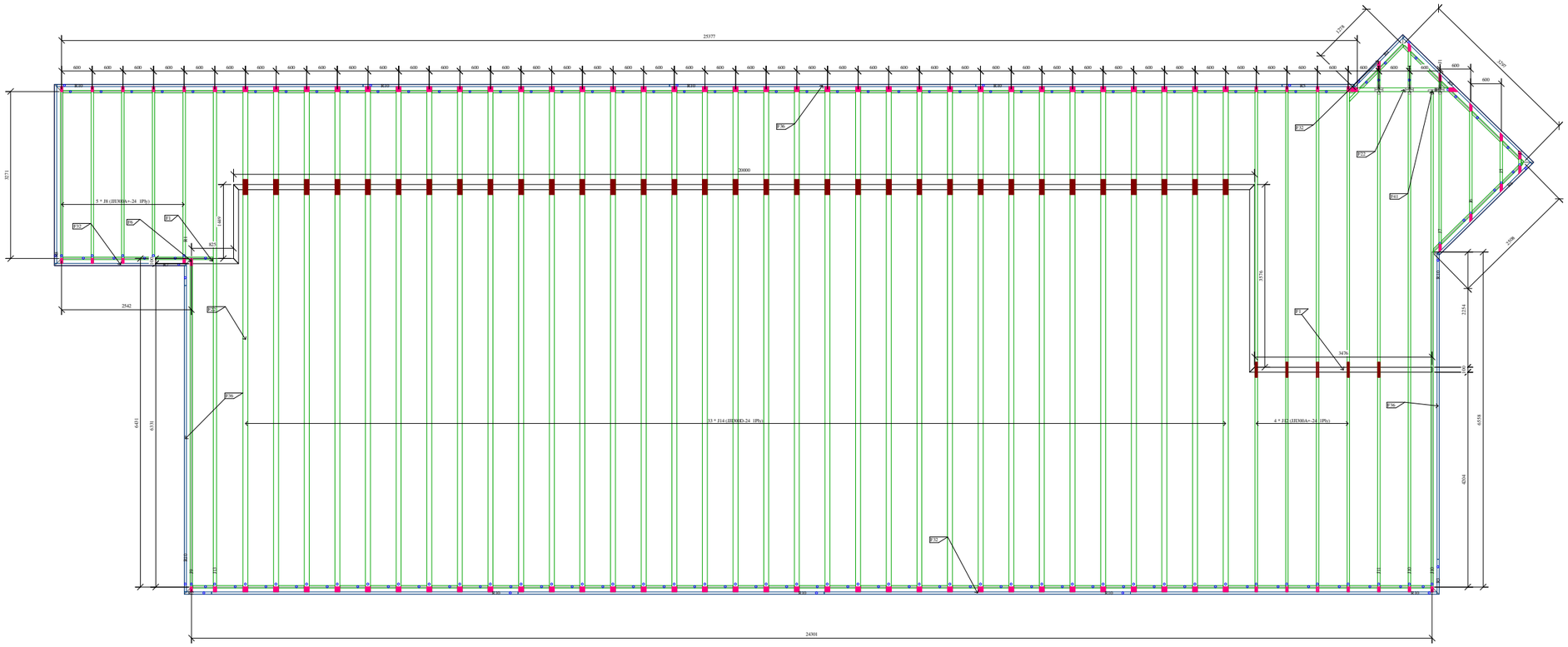
Please ensure ALL structual blocks are fitted as per James Jones Tech Guide.

All joists to be built into external block walls.

This Layout is for Member Design Only.

Overall stability and roof restraint remains responsibility of the Building Designer/Engineer.

No restraint straps vertical or lateral have been allowed/included.



Joist Requirements

Mark	Type	Size	Span	Ply	Weight(kg)	Qty	Makeup
J1	JJI300A+-24	47x300	287	1	0.91	1	
J2	JJI300A+-24	47x300	451	1	1.43	1	
J3	JJI300A+-24	47x300	520	1	1.65	1	
J4	JJI300A+-24	47x300	871	1	2.76	1	
J5	JJI300A+-24	47x300	1157	1	3.67	1	
J6	JJI300A+-24	47x300	2330	1	7.39	1	
J7	JJI300A+-24	47x300	3146	1	9.97	1	
J8	JJI300A+-24	47x300	3461	1	10.97	5	
J9	JJI300A+-24	47x300	6526	1	20.69	1	
J10	JJI300A+-24	47x300	9797	1	31.06	2	
J11	JJI300A+-24	47x300	9797	1	31.06	1	
J12	JJI300A+-24	47x300	9892	1	31.36	4	
J13	JJI300B+-24	63x300	9892	1	37.79	1	
J14	JJI300D-24	97x300	9892	1	51.44	33	
B1	JJI300C-24	72x300	2101	1	8.78	1	
R1	JJ-Rim	45x300	386	1	2.08	1	(1@45mm)
R2	JJ-Rim	45x300	536	1	2.89	1	(1@45mm)
R3	JJ-Rim	45x300	684	1	3.69	1	(1@45mm)
R4	JJ-Rim	45x300	1404	1	7.58	1	(1@45mm)
R5	JJ-Rim	45x300	1413	1	7.63	1	(1@45mm)
R6	JJ-Rim	45x300	2548	1	13.76	1	(1@45mm)
R7	JJ-Rim	45x300	2587	1	13.97	1	(1@45mm)
R8	JJ-Rim	45x300	3506	1	18.93	1	(1@45mm)
R9	JJ-Rim	45x300	3534	1	19.08	1	(1@45mm)
R10	JJ-Rim	45x300	6000	1	32.40	10	(1@45mm)
K1	JJI300A+-24	47x300	821	1	2.60	2	
K2	JJI300A+-24	47x300	818	1	2.59	1	
K3	JJI300A+-24	47x300	817	1	2.59	1	
K4	JJI300A+-24	47x300	669	1	2.12	1	
K5	JJI300A+-24	47x300	571	1	1.81	1	
K6	JJI300A+-24	47x300	553	1	1.75	16	
K7	JJI300A+-24	47x300	545	1	1.73	2	
K8	JJI300A+-24	47x300	528	1	1.67	2	
K9	JJI300A+-24	47x300	520	1	1.65	2	
K10	JJI300A+-24	47x300	508	1	1.61	1	
K11	JJI300A+-24	47x300	503	1	1.59	64	
K12	JJI300A+-24	47x300	489	1	1.55	1	
K13	JJI300A+-24	47x300	487	1	1.54	1	
K14	JJI300A+-24	47x300	403	1	1.28	1	
K15	JJI300A+-24	47x300	396	1	1.26	1	
K16	JJI300A+-24	47x300	276	1	0.87	1	
K17	JJI300A+-24	47x300	200	1	0.63	1	
K18	JJI300A+-24	47x300	192	1	0.61	1	
K19	JJI300A+-24	47x300	147	1	0.47	1	
K20	JJI300A+-24	47x300	145	1	0.46	1	
K21	JJI300A+-24	47x300	83	1	0.26	1	
K22	JJI300A+-24	47x300	55	1	0.17	1	

Block Requirements

Type	Size	Material	Qty
Web	200x300	19mm KD	10
Web	200x300	44mm KD	66
Void	210x100	19mm KD	44
Void	210x140	19mm KD	2
Void	210x155	19mm KD	6
Void	210x156	19mm KD	10
Void	210x159	19mm KD	2
Void	210x160	19mm KD	2
Void	210x100	27mm KD	4
Void	210x140	32mm KD	2
Void	210x173	32mm KD	2
Void	210x100	44mm KD	132

Metalwork Requirements

Mark	Type	Qty
A	ITB 300/47	7

Construction Notes

If in doubt ASK.

Do not scale this drawing.

Designed in accordance with BS 5268: Part2.

Plasterboard specification as per manufacturer's guidelines.

JJI-Joists at 600mm centres unless noted otherwise.

Loading: 1.000kN/m2 Dead Load, 0.000kN/m2 Imposed Load & 0.750kN/m2 Imposed Snow Load.

JJI-Joists maximum deflection limit = Roofs: span x 0.003 or 36mm

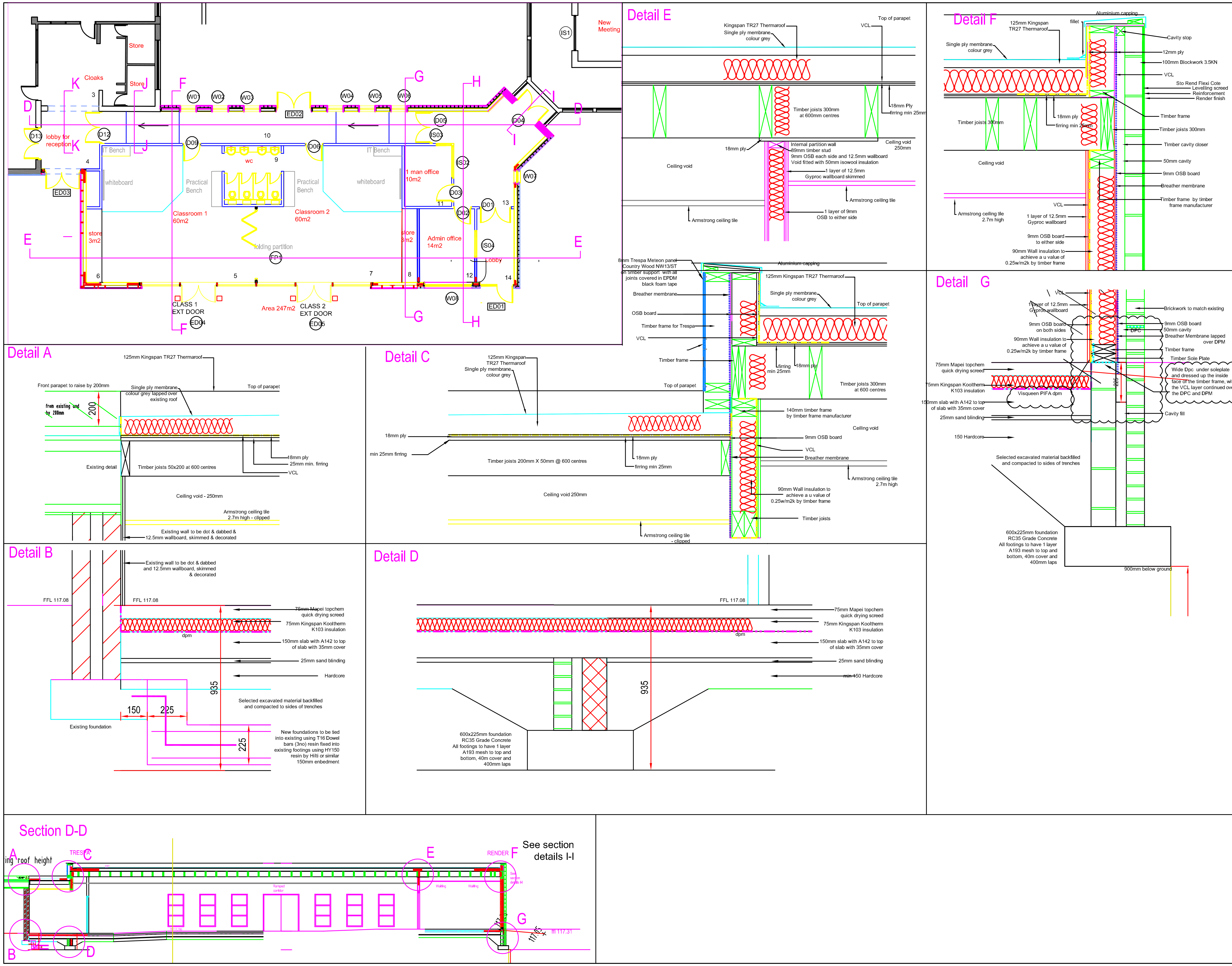
This layout is for a Flat Roof.

Rafter component design ONLY. This is NOT a Full Roof Design. No account for Wind Loading within rafter calculations.

Specification of Rim Joist, Header Joists, Blocking Pieces and Integral Beams is the responsibility of the Building Designer.

Any CO2e figures reported in this layout apply to the JJI-Joists only. No account has been made for any other products.

Client Karlin Timber Frame	House Type. Primary School Flat Roof	
Address Lanchester E.P. Primary School, Lanchester, Durham DH7 0HU	Designer. Steven Harrington	3.31.065 U
Site Lanchester E.P. Primary School, Lanchester, Durham DH7 0HU	20 February 2017 08:44:37	Scale 1:100
North Yorkshire Timber Standard House, Thurston Road, Northallerton Business Park, Northallerton, DL6 2NA	Revision	



NOTES

THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF DIMENSIONS ON THE SITE.

Note: All timber sizes etc to be designed by Timber Frame Manufacturer

Without the cavity tray included it is most important to make sure that cavities are kept clear - with very good workmanship and a robust site checking regime! - i.e. preventing mortar droppings falling down the cavity, accumulating and potentially causing a moisture ingress problem which may be detrimental to the soleplate and timber frame

REVISIONS

A	061217	Cavity tray note added dpcs and dpms amended

Building Design Services
Technical Services, Neighbourhood Services,
Durham County Council,
St Johns Road, Meadowfield Industrial Estate,
Meadowfield, Durham, DH7 8XQ

ESTABLISHMENT: Lanchester EP Primary

UPRN. 3232

PROJECT: Classroom extension

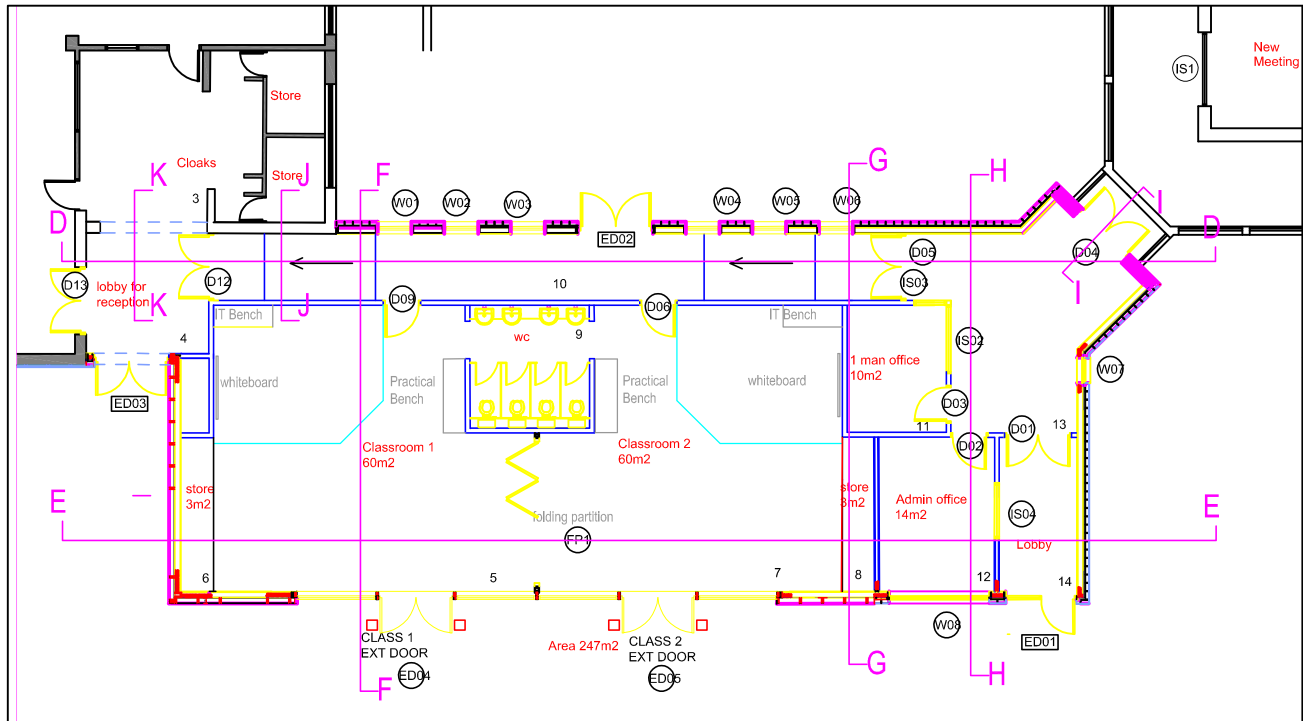
PROJECT No.

TITLE: Classroom extension Section D-D details

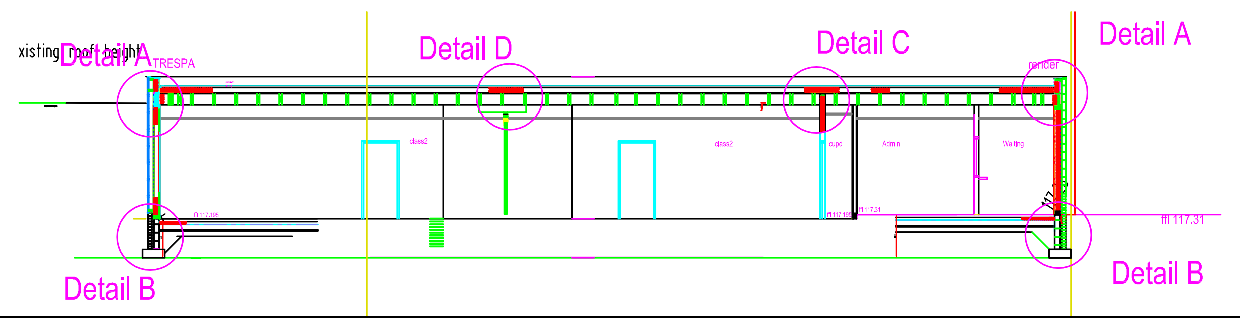
DRAWN SS EXT.	SCALE 1:10
CHECKED	DATE Jan 17

INFORMATION☐ TENDER☐ CONSTRUCTION☒ AS BUILT☐

DRAWING No.	REVISION
A600-02	A



Section E-E



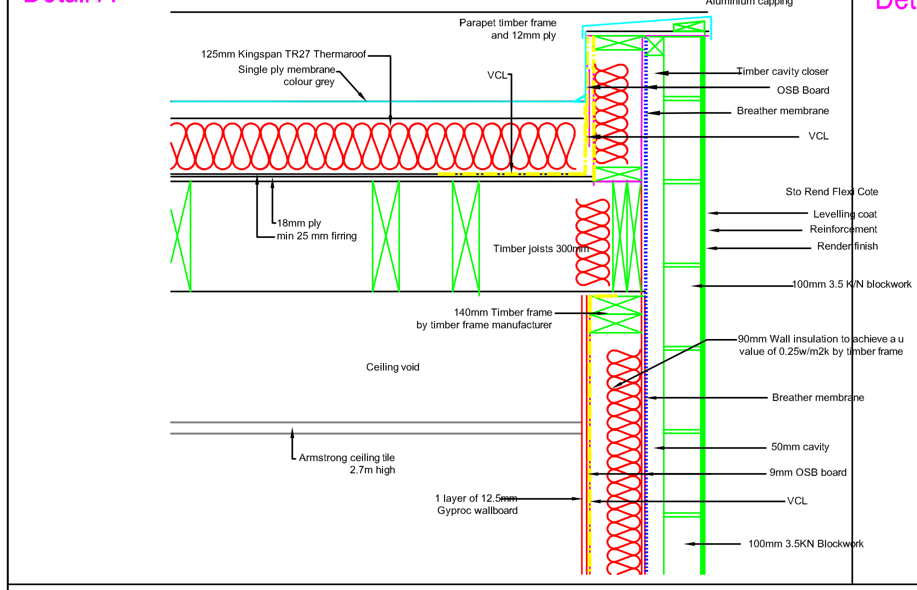
NOTES

THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF DIMENSIONS ON THE SITE.

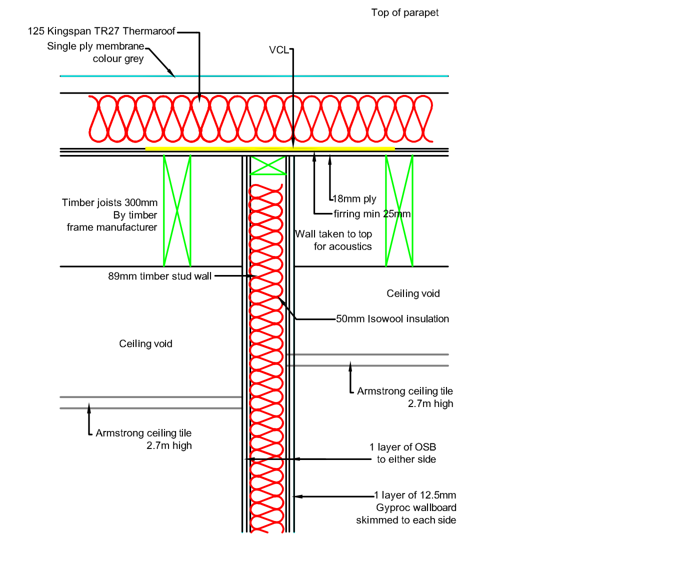
Note: All timber sizes etc to be deigned by Timber Frame Manufacturer

Without the cavity tray included it is most important to make sure that cavities are kept clear - with very good workmanship and a robust site checking regime! - i.e. preventing mortar droppings falling down the cavity, accumulating and potentially causing a moisture ingress problem which may be detrimental to the soleplate and timber frame

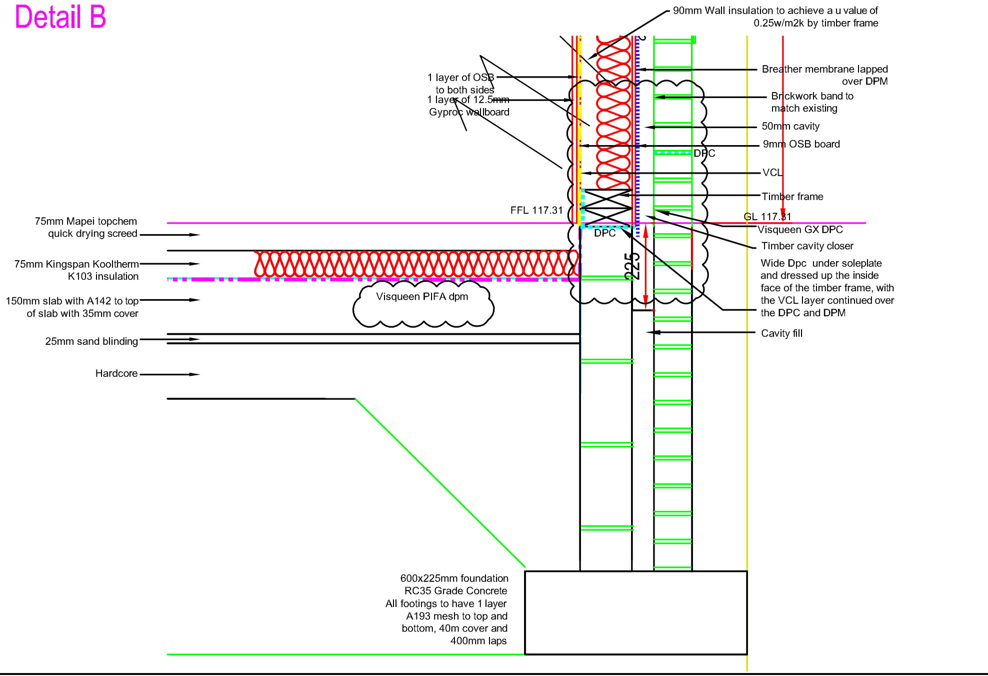
Detail A



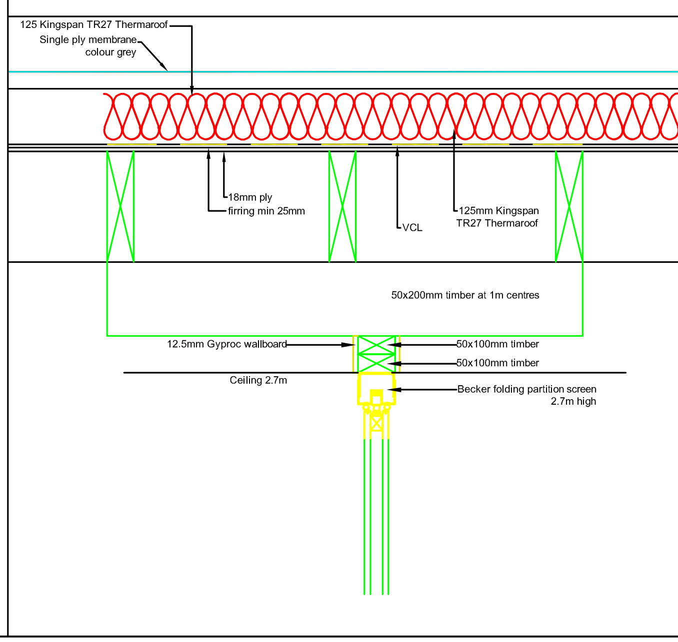
Detail C



Detail B



Detail F



REVISIONS

A	061217	Cavity tray note added dpcs and dpms amended

Building Design Services
Technical Services, Neighbourhood Services,
Durham County Council,
St Johns Road, Meadowfield Industrial Estate,
Meadowfield, Durham, DH7 8XQ

ESTABLISHMENT
Lanchester EP Primary

UPRN. 3232

PROJECT
Classroom extension

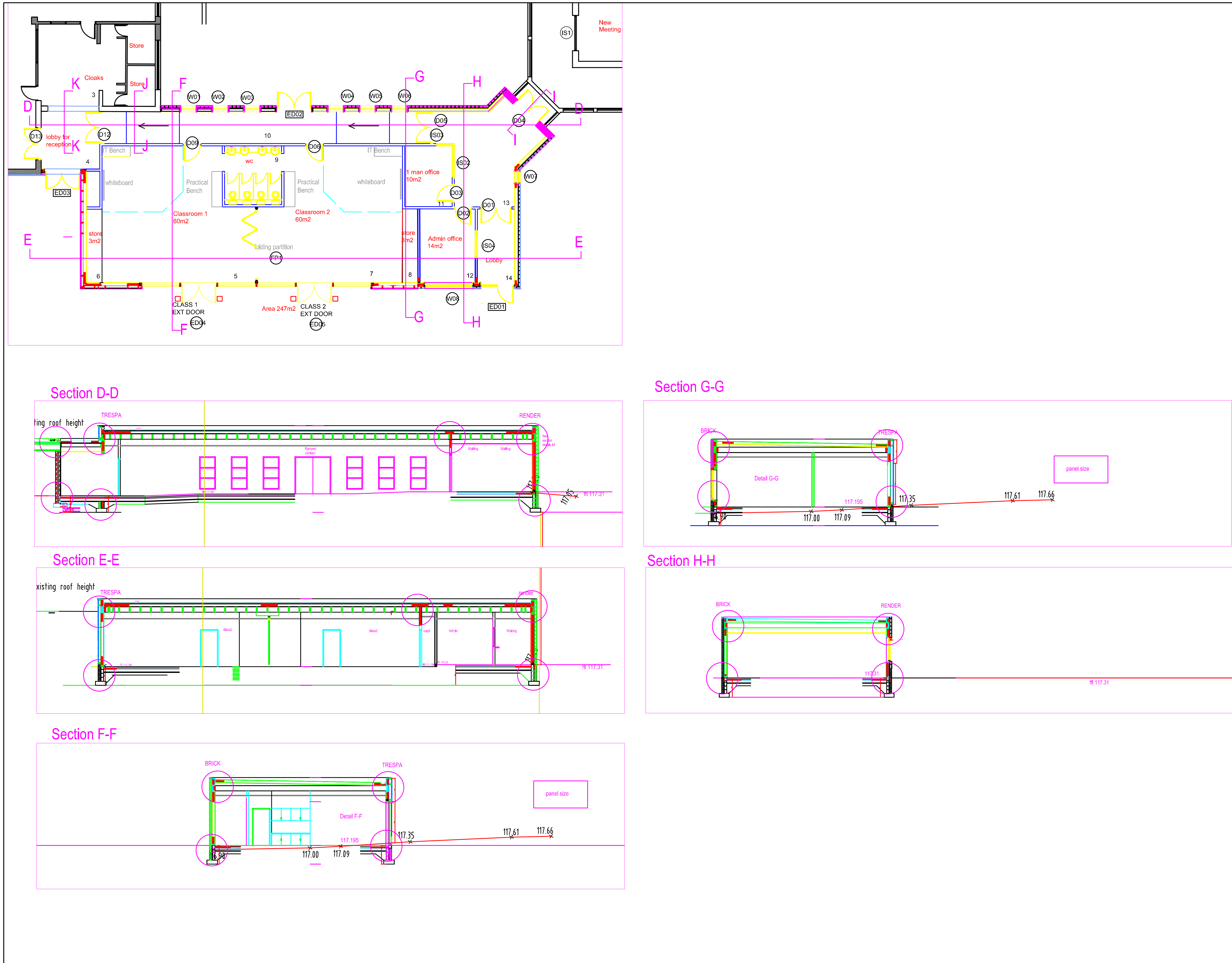
PROJECT No.

TITLE
Classroom extension section E-E details

DRAWN SS	EXT.	SCALE 1:10	
CHECKED		DATE Jan 17	

INFORMATION ☐ TENDER ☐ CONSTRUCTION ☒ AS BUILT ☐

DRAWING No. A600-03 | REVISION A



NOTES

THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF DIMENSIONS ON THE SITE.

REVISIONS

Building Design Services
Technical Services, Neighbourhood Services,
Durham County Council,
St Johns Road, Meadowfield Industrial Estate,
Meadowfield, Durham, DH7 8XQ

ESTABLISHMENT
Lanchester EP Primary

UPRN. 3232

PROJECT
Classroom extension

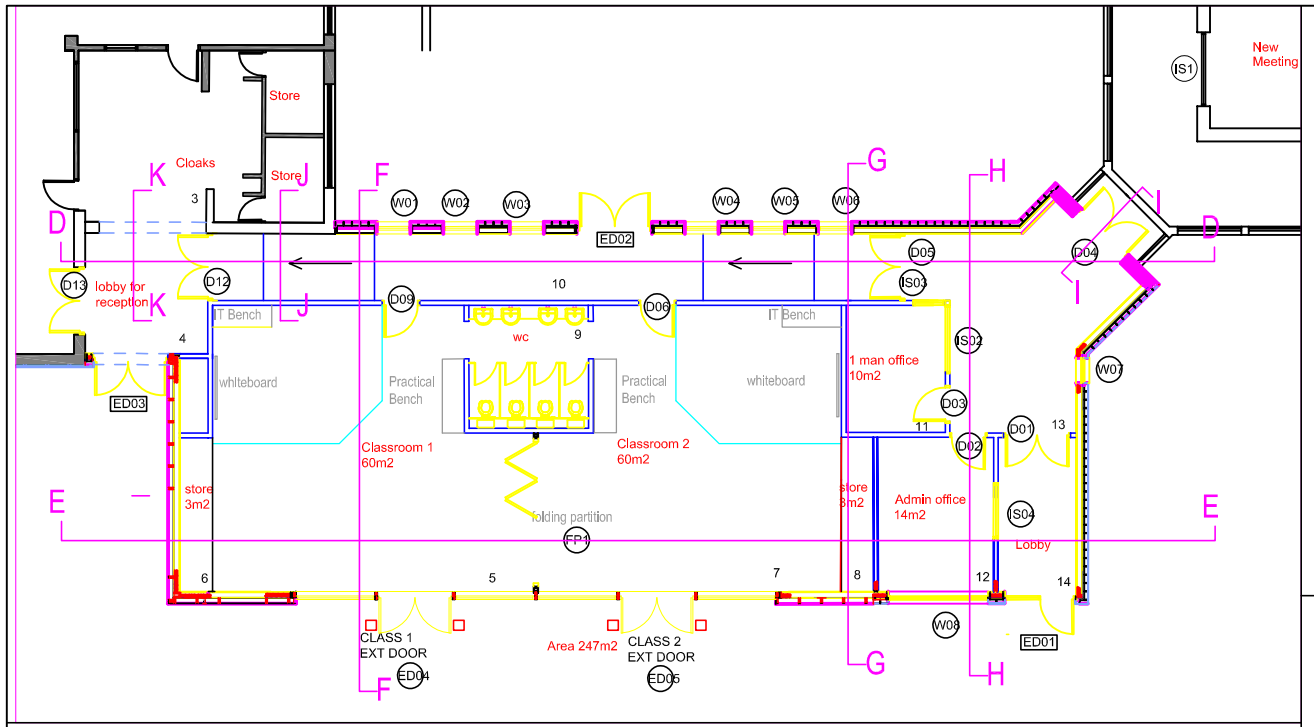
PROJECT No.

TITLE
Classroom extensions C-C to HH

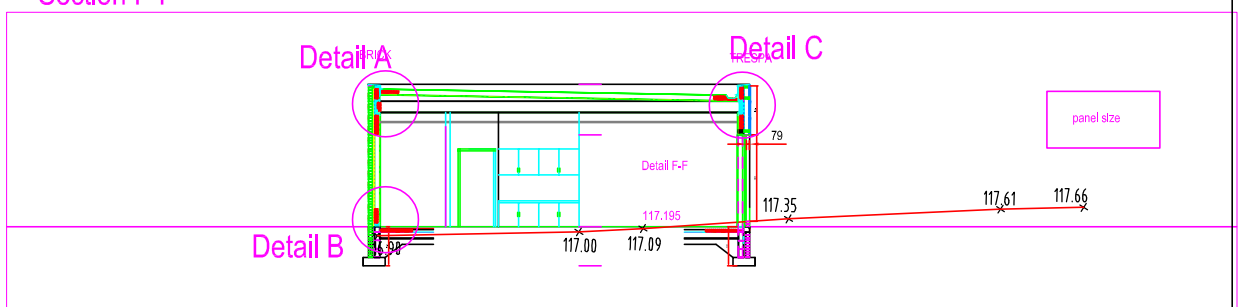
DRAWN SS EXT.	SCALE 1:100
CHECKED	DATE Jan 17

INFORMATION ☐ TENDER ☐ CONSTRUCTION ☒ AS BUILT ☐

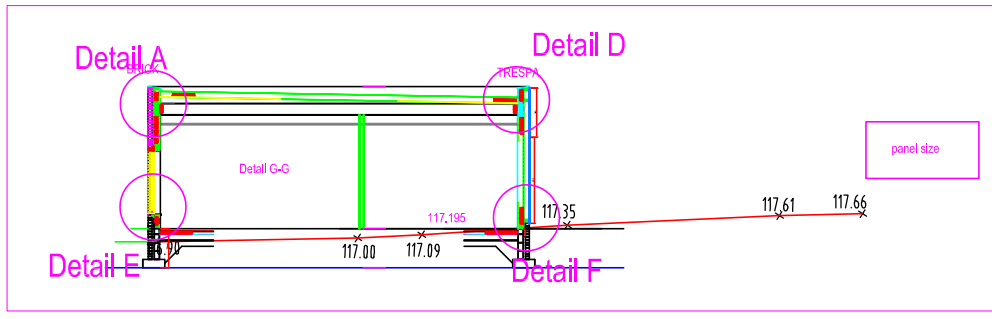
DRAWING No.	REVISION
A400-02	0



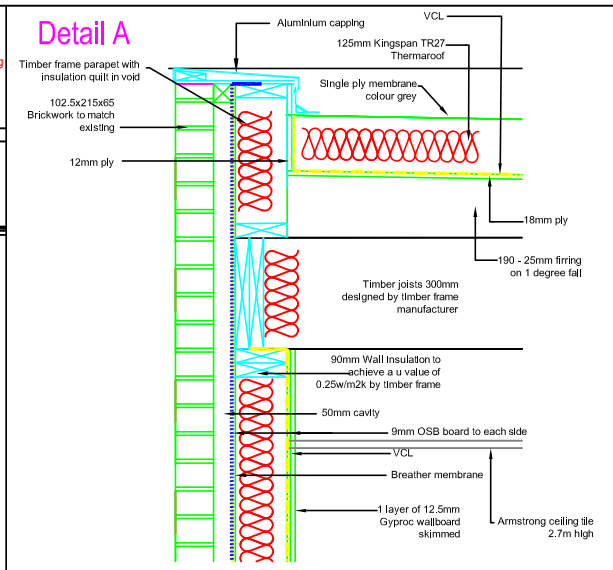
Section F-F



Section G-G



Detail A



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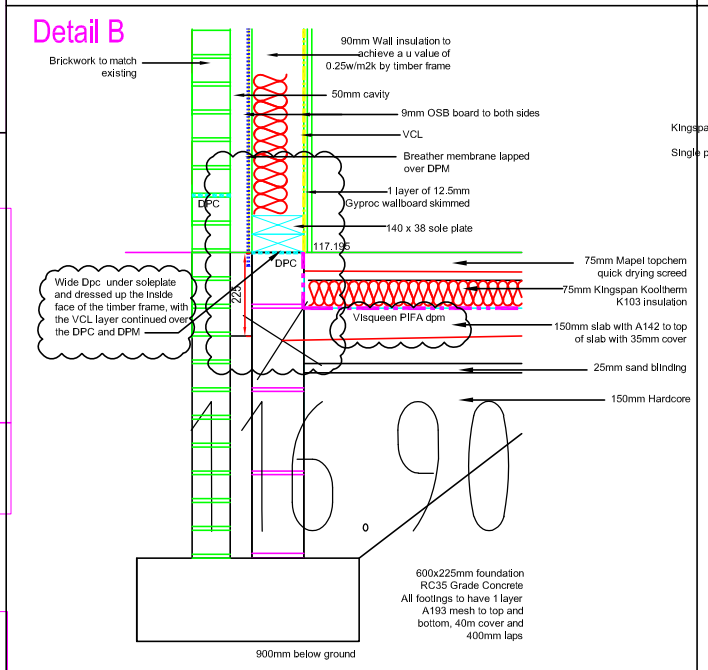

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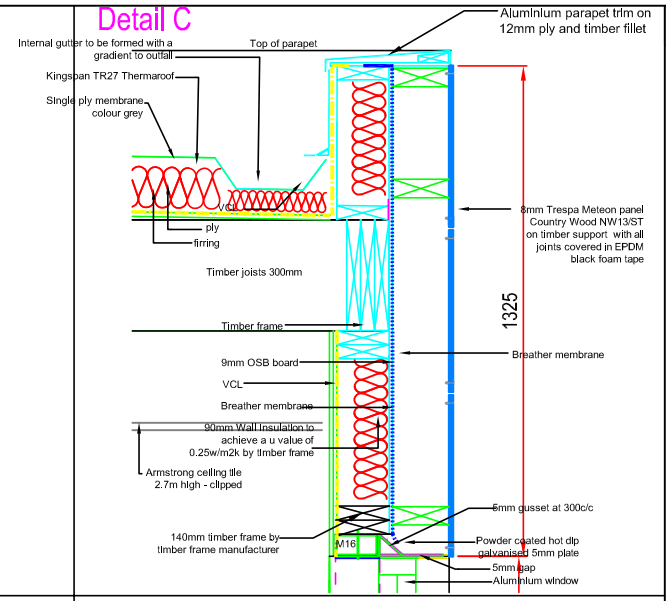

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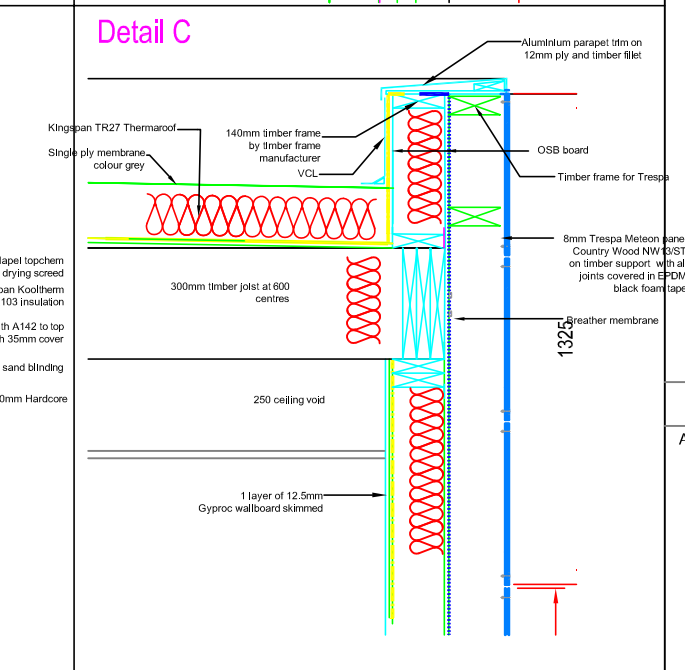

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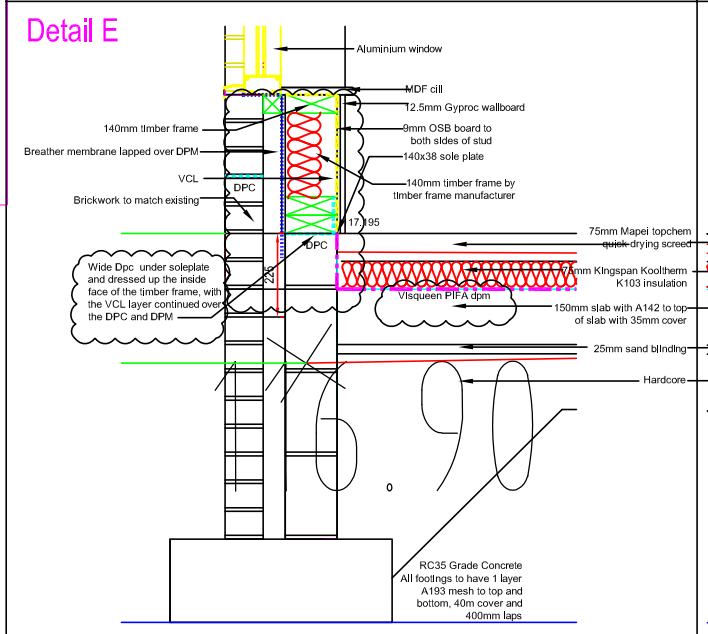
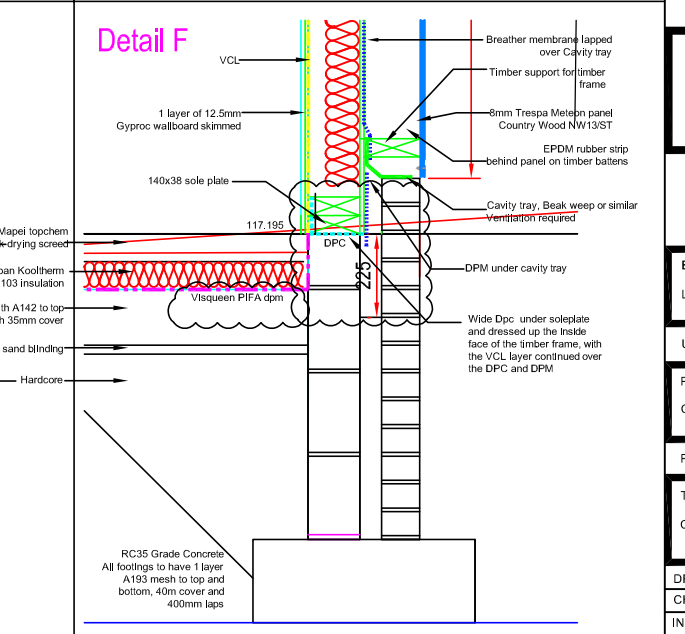


Detail F



NOTES

THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF DIMENSIONS ON THE SITE.

Note: All timber sizes etc to be deigned by Timber Frame Manufacturer

Without the cavity tray included it is most important to make sure that cavities are kept clear - with very good workmanship and a robust site checking regime! - i.e. preventing mortar droppings falling down the cavity, accumulating and potentially causing a moisture ingress problem which may be detrimental to the soleplate and timber frame

REVISIONS

A	061217	Cavity tray and weep vent added and visqueens amended at request of building control

Building Design Services
Technical Services, Neighbourhood Services,
Durham County Council,
St Johns Road, Meadowfield Industrial Estate,
Meadowfield, Durham, DH7 8XQ

ESTABLISHMENT
Lanchester EP Primary

UPRN. 3232

PROJECT
Classroom Extension

PROJECT No.

TITLE
Classroom extension section F-F and G-G details

DRAWN SS EXT.	SCALE 1:10
CHECKED	DATE Jan 17

INFORMATION ☐ TENDER ☐ CONSTRUCTION ☒ AS BUILT ☐

DRAWING No.	REVISION
A600-04	A

DRAWING REGISTER & ISSUE SHEET

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Chepstow NP16 5UH
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Job No.	3095	Sheet No.	1

Project Title:	**Extension to Lanchester EP Primary School, Lanchester, Durham DH7 0HU**

Drawing Description	Number	Size	Date of Issue														
			D	27													
			M	2													
			Y	17													
Line & Point Loads	001	A3		X													
GF Structural Mark-Ups	002	A3		X													
Structural Calculations	1x	A4		X													

Distribution	Number of copies													
Colin Lunn - Karlin Timber Frame		X												

P - Paper N - Negative CD - CD disk E - E-mail	Media		E														
B - Billing T - Tender A - Approval P - Preliminary I - Information C - Construction	Status		C														
	Issued By		RG														

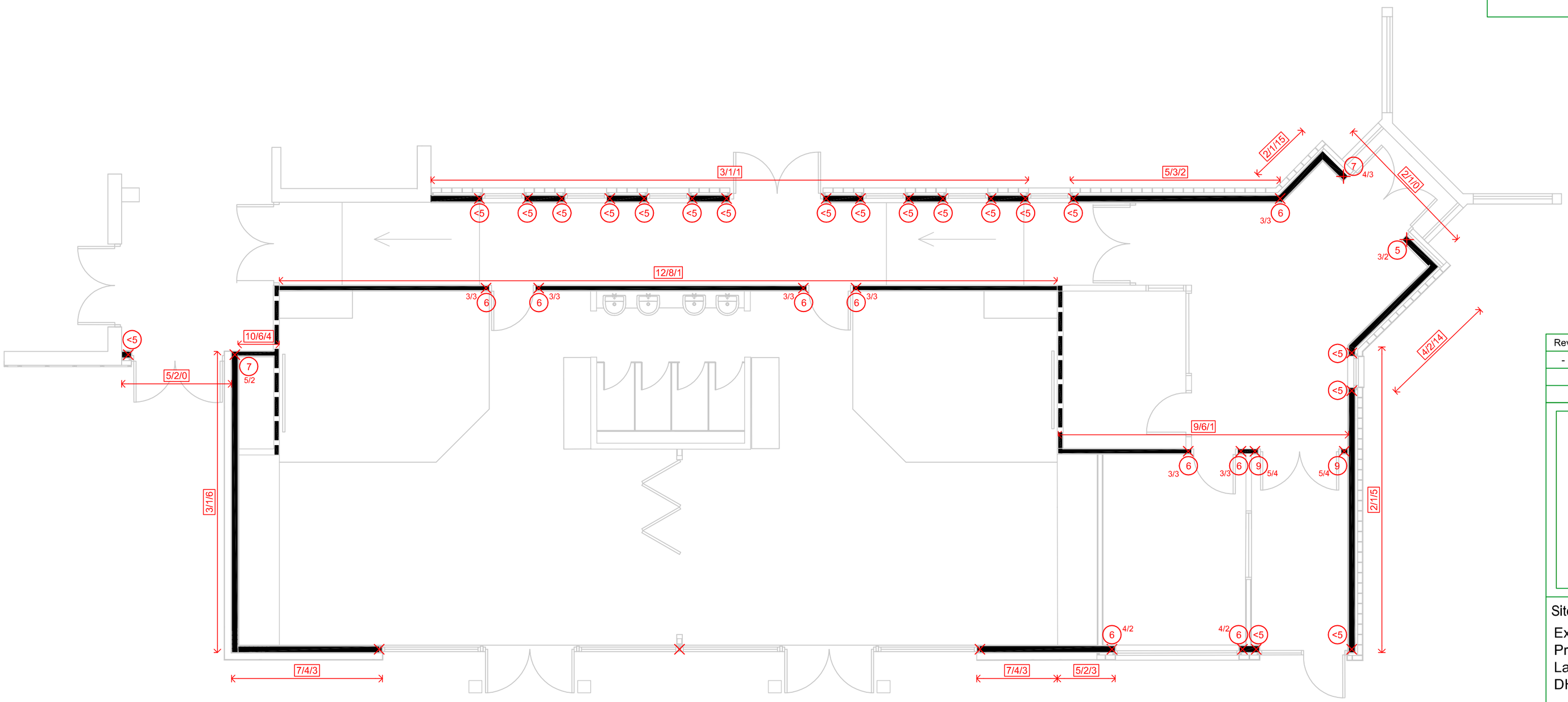
This sheet indicates the latest issue of registered drawings&calculations. Previous issues should be removed from circulation.

NOTES:

5/2/1 — Denotes (UNFACTORED DEAD/IMPOSED/ VERTICAL WIND) Line Loads IN kN/m run.
Minimum loads of 5kN/m Ommited for Clarity.
The wind load gives a reversible triangular load distribution of max.positive to max.negative.

25 9/16 — Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads in kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight cladding, if present is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 'x' kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings in both the internal and external loadbearing wall (refer to architects layouts for extent of all openings). these should be calculated from UDL and allowed for in the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR Inner leafs. if masonry is included it will be denoted : M -
Ground floor loads are excluded. if a timber ground floor is included it will be denoted : GF -



Rev.	Date	Details	Drawn
-	-	-	-

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e-mail: info@adeptco.co.uk
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Site Address:
Extension to Lanchester EP Primary School,
Lanchester, Durham
DH7 0HU

Description:
Line & Point Loads

Drawing Number: 3095 - 001

Date: 27-Feb-2017

Scale: 1:75 @ A2

Status: CONSTRUCTION

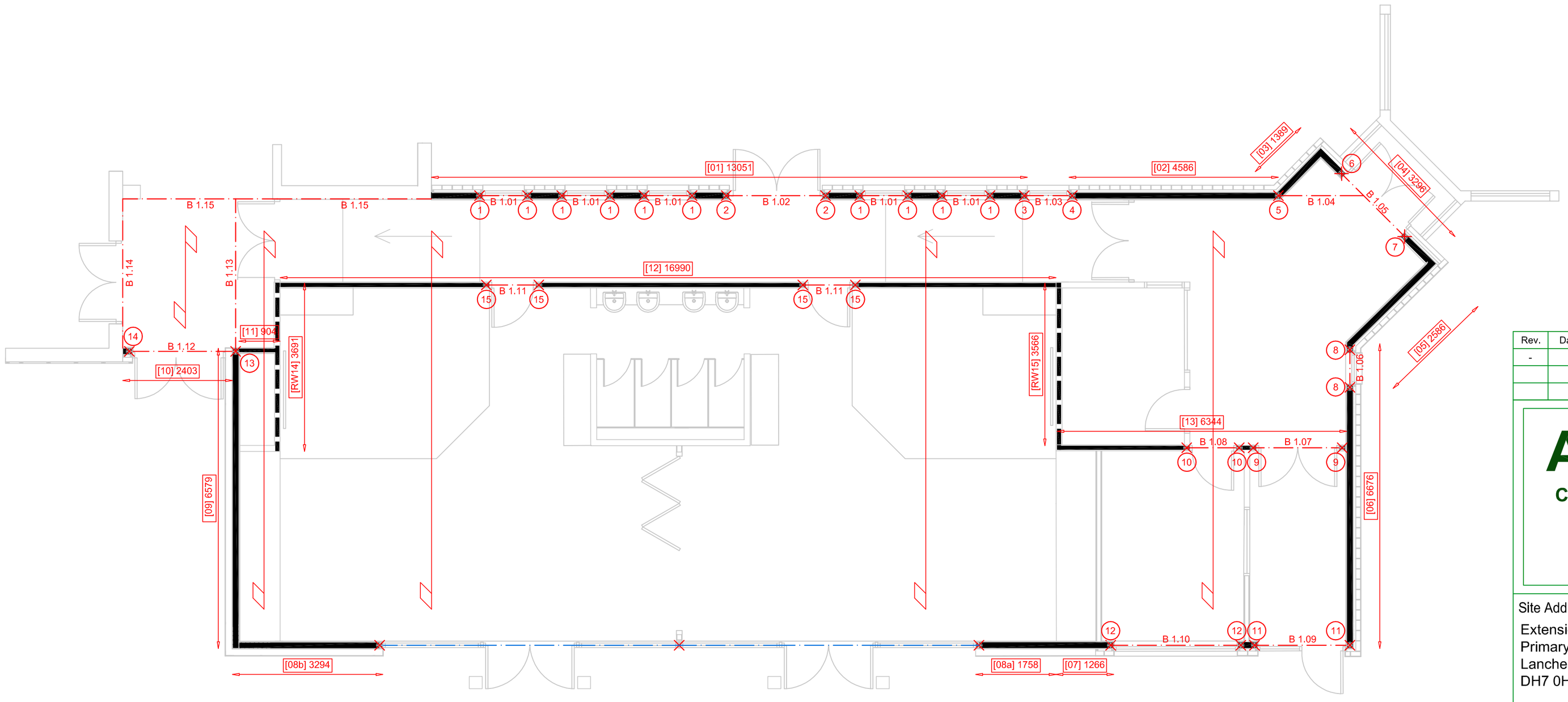
AutoCAD Reference: N.A.

Drawn: R.G

Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.



Rev.	Date	Details	Drawn
-	-	-	-

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www.adeptco.co.uk

Site Address:
Extension to Lanchester EP Primary School,
Lanchester, Durham
DH7 0HU

Description:
Ground Floor References

Drawing Number: 3095 - SK1

Date: 27-Feb-2017

Scale: 1:75 @ A2

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G

Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

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Tel: 01291 635522

0

ıary School

Structural Calculations

For

Timber Frame Superstructure

On

Extension to Lanchester EP Primary School

Lanchester, Durham DH7 0HU

-

These calculations have been prepared specifically for Karlin Timber Frame (NE) Ltd, and for the project refered to above.
No liability will be accpeted to any third party for the use of these calculations unless by prior agreement in writing.
Where repeat house types occur liability will only be accepted for the plots for which an agreed repeat fee has been paid.

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.

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Client:
Karlin Timber Frame (NE) Ltd
9 Maple Way
Aycliffe Industrial Park
Newton Aycliffe
County Durham
DL5 6BF
Tel: 01325 300250

Date: Feb-17

Project Reference: 3095
Project Engineer: RG
Checked By: MK
Date: 27/02/17

STRUCTURAL TIMBER ASSOCIATION
Building solutions in timber

TRADA member

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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: Index 1

Design philosophy

These calculations have been produced broadly in line with the recommendations made in the TRADA publication Timber Frame Housing – Structural Recommendations and the Structural Timber Association (previously UKTFA) publication STRUCTURAL GUIDANCE for Platform Timber Frame. The full texts of these documents are available on the www. Where reference is made to British Standards, this also include the appropriate section of the Eurocodes.

1 Loading on structural elements

1.1 Structural duties of timber frame elements

1.1.1 Timber frame wall panels

Timber frame panels used in house construction have three major structural duties to perform: support of vertical loading, resistance to deformations caused by horizontal loading in their plane and resistance to wind loading perpendicular to their plane.
Resistance to vertical loads is checked according to normal engineering principles, bearing in mind that in timber design the duration of each load (long-, medium-, short- or very short-term) has to be considered because the strength of the timber members depends on the duration of the loads. The racking or shear resistance of wall panels to horizontal load is calculated according to procedures set out in BS 5268-6.1 Structural use of timber –
Code of practice for timber frame walls – Dwellings not exceeding four storeys, which are based on data from tests on typical timber frame wall panels. Where there are insufficient racking walls, sway frames may be added and the derivation of forces applied in the 2D plane frame analysis is shown in the relevant sections of the calculations.

1.1.2 Horizontal diaphragms

The horizontal diaphragms formed by floor, ceiling and roof systems are usually required to take loads in their own plane. The illustration shows a floor and roof diaphragm resisting wind load on a gable wall. The ends of the gable wall are supported directly by the front and rear walls of the building, and the bottom edge by the foundation. The load on the rest of the wall is transferred via the horizontal diaphragms into the front and rear walls where their shear resistance can transfer it to the foundations. The first floor diaphragm takes half the net load on the ground floor walls plus half the net load on the first floor walls. The roof diaphragm takes half the net load on the first floor walls plus load from the roof. For wind parallel to the ridge it is usual to assume that half the net horizontal wind load on the spandrels or roof is transferred to the roof diaphragm; for wind perpendicular to the ridge all the net horizontal roof load is transferred to it. Where adjacent panel edges are fastened with nails or screws to the same timber members such as joists or blocking, the resulting connection between the panels enables shear forces to be transferred from one panel to the next. This is an essential part of the diaphragm action. It may be assumed that conventional floors and flat roofs, in which a wood based panel product is fastened to timber joists, have adequate strength and stiffness as horizontal diaphragms, provided that:
• the diaphragm span : depth ratio does not exceed 2:1 in either wind direction (BS 5268-6-2 Clause 6.5)
• the span does not exceed 12 m between supporting walls (BS 5268-6-2 Clause 6.5)
• the fixing around the edges of the panels complies with standard recommendations (eg 3.00 mm diameter ringed shank nails at 150 mm centres for plywood or 3.35 mm ringed shank nails at 300 mm

for wood particleboard and OSB, with a length equal to 2.5 times the board thickness)
• the perimeter of the diaphragm is attached to the walls with fastenings of equivalent strength.

Plasterboard ceilings in roofs that comply with BS 5268-3 Annex A may also be assumed to provide adequate diaphragm action provided that truss clips are used to secure every truss to a head binder and the fixing around the edges complies with standard recommendations (3.5 mm diameter plasterboard nails or screws 40 mm long at 150 centres). It is recommended that in areas of high wind load (eg with a dynamic wind pressure > 1500 N/m²), and always for horizontal diaphragms outside the range given above, the required fastener spacing should be calculated.

6 Multi-storey buildings

6.1 General design considerations

The Timber Frame 2000 project, begun in 1995, was carried out by the Building Research Establishment and TRADA Technology Ltd in collaboration with the British Government and the timber frame industry. It demonstrated beyond doubt that conventional timber frame construction can be used to build economical, safe and serviceable multi-storey dwelling units. The report Multi-storey timber frame buildings – a design guide concluded that the use of BS 5268-6 can be extended to the design of platform frame buildings up to eight storeys without excessive deflection.

Particular attention should be given to the following issues:
• each storey should have sufficient strength and stiffness to resist a horizontal long-term force of 2.5% of the vertical load + live load
• overturning forces should be carefully checked
• where party walls separate the structure into separate units, the engineer should ensure that horizontal forces can be taken by each unit independently or be transferred across the party walls
• where additional stiffness has to be provided, eg by the introduction of portal frames, the deflection limit should be appropriate for the structure and finishes, but may be no more than height/500
• resistance to disproportionate collapse should be checked.

6.2 Construction

The stability of the building during construction, ie before vertical loads are applied and plasterboard is fixed, must be considered as part of the design process. It is acceptable to reduce the wind load in accordance with BS 6399-2 for the construction process. Particular attention should be given to the buckling resistance of studs in party walls, which may have neither plasterboard nor sheathing attached during construction. Significant vertical loads can result from the storage of construction materials such as plasterboard packs, so normally it will be necessary to specify requirements for temporary bracing (see BS 5268-6.1).

6.3 Disproportionate collapse

While the Timber Frame 2000 project demonstrated that timber frame construction is remarkably resilient to disproportionate collapse, specific design checks against this possibility may be required under the Building Regulations. Guidance is expected in a planned revision to BS 5268-2: 2002. Meanwhile, guidance has been published in the UK Timber Frame Association Technical Bulletin 3 Design guidance for disproportionate collapse. This specifies minimum nailing between the lower rails of wall panels through the interfaces to the upper rails of the panels beneath as follows:
3.1 mm diameter nails at 300 mm centres for Class 1 and Class 2A buildings
3.1 mm diameter nails at 200 mm centres for Class 2B buildings.

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: L1

Loading Schedule - Floors

Compartment Floor With Integral Ceiling

Not applicable

Dead	Density	Thickness		kN/m2
	750	22		
	850	19		
	100	70		
	750	18		
	20	100		
	850	19		
	850	12.5		
	850	15		
	530	300	47	

Imposed

(Bedrooms)
(Communal)

For Eco joists:

Joist top chord dead load: 0.000 kN/m^2 + partitions
Joist bottom chord dead load: 0.000 kN/m^2

Total **0.00 KN/m^2**

Intermediate Floor

Not applicable

Dead	Density	Thickness		kN/m2
	2200	46		
	750	22		
	850	18		
	20	200		
	530	241	38	

Imposed

(Bedrooms)
(Communal)

For Eco joists:

Joist top chord dead load: 0.000 kN/m^2 + partitions
Joist bottom chord dead load: 0.000 kN/m^2

Total **0.00 KN/m^2**

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Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: L2

Floors - continued

Compartment Floor With Separate Ceiling *Not applicable*

Dead	Density	Thickness			kN/m2

Imposed

(Bedrooms)
(Communal)

Total	**0.00 KN/m²**

Roof Constructions

Flat Roof *Applicable*

Dead	Density	Thickness			KN/m2	
Membrane	825	20			0.165	
Insulation	85	300			0.255	
Plywood deck	530	18			0.095	
Sub deck					0.000	
Insulation	85	300			0.255	
Plasterboard	850	12.5			0.106	
				centres		
Joists	530	300	47	600	0.125	
					1.001	1.001

Imposed

all	0.750	

Effective Snow Drift Loads

Total	**1.75 KN/m²**

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Project: Extension to Lanchester EP Primary School | Project no: 3095.00 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: L3

Roof Constructions - continued

Pitched / Curved Roof *Not applicable* Slope / Average Slope: degrees

Dead (on slope area)	**Density**	**Thickness**		**centres**	**KN/m2** (on slope area)	
	2000	35				
	530	25	30			
	530	47	450			
	50	200				
	850	15				
	750	22				
	530	47	222	600		
	850	18				
				On Slope		
				On Plan - Attic	0.000	**0.000**
Imposed **Roof area**			m²	On Plan - Other		
External roof slope						
Internal Truss type:						
For attic trusses only: *Truss span:*			*m*			
Dim'n between verticals:			*m*	**Total - Attic**	**0.00**	**KN/m²**
Average imposed load:			*kN/m²*	**Total -Other**	**0.00**	**KN/m²**

External Balcony *Not applicable*

Dead	**Density**	**Thickness**		**KN/m2**
	3000	25		
	750	4		
	150	85		
	530	18		
	530	25	50	
	20	150		
	850	25		
	850	25		
	530	235	38	

Imposed
all

Total **0.00** **KN/m²**

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no L4

Wall Constructions

Party Wall *Not applicable*

	Density	Thickness	width	centres	KN/m2

Value for 1 Leaf **0.000 KN/m²**

Ht= 2.4 m gives **Total** **0.00 KN/m run**

Load-bearing Internal walls

			width	centres	KN/m2
Plasterboard *(optional)*					0.000
Plasterboard	850	25			0.213
Studs	530	89	38	600	0.030
No sheathing	0	9			0.000
Insulation	20	150			0.030
Plasterboard	850	25			0.213
Plasterboard *(optional)*					0.000
					0.485 KN/m2

Non Load-bearing Internal walls *(Partitions)*

Build up as Load Bearing walls but with only 1 layer 12.5mm plasterboard e.f.

Ht= 3 m, this is: **1.45 KN/m run** over 1.6m **0.91 KN/m²**

If this value is deemed inappropriate use, enter new value: **0.27** **0.27 KN/m²**

External Wall	Density	Thickness	width	centres	KN/m2	Eccentricity *(If applicable)*	
Plasterboard	850	25			0.213		
					0.000		
Studs	530	140	38	400	0.070		
OSB	750	9			0.068		
Insulation	20	105			0.021		
					0.000		mm
					0.000		mm
Trespa	2260	10	1000	1000	0.226	160	mm
					0.597 KN/m²		

Note: the eccentricities are from face of stud NOT the sheathing.

Ht= 3 m gives 1.79 KN/m run

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: WL1

Summary of Design Wind Loads

	Wind on long elevation	Wind on short gable
For Building Stability Checks Use Wind Pressure:	**0.70 kN/m²**	**0.46 kN/m²**
Wind Uplift:	**-0.51 kN/m²**	

	General Condition	Zone A
For Panel Design Checks Use Wind Presssure / Suction:	**0.54 kN/m²**	**0.99 kN/m²**
Wind Uplift:	**-0.60 kN/m²**	

In order to avoid confusion on panel design use a common design wind pressure for all panels of: 0.54 kN/m² for General conditions and 0.99 kN/m² for Zone A

Refer to overall stability sheets for applicable k100 factors.

Site Location Map

National Grid Reference:

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: WL2

Wind Loading - Building Parameters

Permanent Condition

This calculation is based upon the guidelines of BS 6399: Part 2: 1997

Standard Method or Hybrid Method *as noted below*

Dynamic Classification

Building Height, Hr:	Ridge:	3.84 m	Eaves:	3.84 m
Building Type Factor, Kb		0.5	*(Timber Framed Buildings)*	
Dynamic Augmentation Factor, Cr		0.006		

Standard Method Calculation

Location	Lanchester		
Basic Wind Speed,Vb	24.8	m/s	*(see fig. 6)*
Site Altitude	123.00	m	*(Base Altitude for Hybrid Method - - refer to cl. 3.2.3.4.10)*
Altitude Factor, Sa	1.12		
Direction Factor, Sd	1.00		
Season Factor, Ss	1.00		
Probability Factor, Sp	1.00		

Effective Height

Reference Height, Hr	3.84	m	
Terrain	Country		*(see Note 1 below)*
Average Roof Top Height, Ho		m	
Building Upwind Spacing, Xo		m	
Effective Height, He	3.84	m	

Effective Wind Speed

Closest Distance to Sea	26	km	*(see Note 1 below)*
Site Wind Speed, Vs	27.85	m/s	*(see table 4 for Standard Method)*
Terrain Factor, Sb	1.329		***Sb is taken from table 4 without interpolation.***
Effective Wind Speed, Ve	37.03	m/s	
Interpolated Value of Sb (*if reqd*.)			***Enter interpolated value if reqd.***
Dynamic Pressure - No wind angle	**0.840**	**kN/m²**	
			Wind at 0⁰ **0.840 kN/m**
Building reference angle	**60**		***Wind at 90⁰*** **0.565 kN/m**

Additional Details to BS 6399: Part 2: 1997 - ***Hybrid Method -*** (*Cl. 1.8.4 option b*)

Direction Factor, Sd for angle	240	1.00	(*Worst case*)	**Hybrid method: Yes**
Gust Peak Factor, g_t		3.44		*(see page WL5 for topographical data used.)*
Fetch Factor, S_c (*Table 22*)		0.776		
Fetch Adjustment Factor, T_c (*Table 23*)		1.000		
Turbulance Factor, S_t (*Table 22*)		0.207		
Fetch Adjustment Factor, T_t (*Table 23*)		1.000		
Distance to edge of town at worst case direction		0.000	km	*(see Note 1 below)*
Distance to sea at worst case direction		123.000	km	
Topographic Increment, S_h (*Table25*)		0.000	*(clause 3.2.3.4.10)*	

Note 1: If using the Hybrid Method, the Terrain and Closest Distance to the sea should be in the direction being considered.

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: WL3

Wind Loading - Pressure Co-efficients for Overall Stability

Size Effect Factors

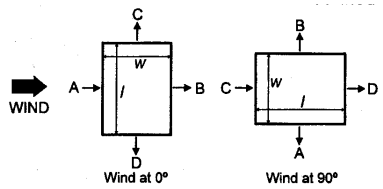
Surface	Dimn a		Ca *(see fig 4, Graph Line)* B
Gable	10.85		0.95
Elevation	27.33		0.88
Roof	29.01		0.87
Int Vol of 1 Apt.(m^3)	760.0	91.26	0.79

External Pressure Coefficients - Walls

Building Width, W (*Gable*)	10.23	m
Building Length, L (*Elevation*)	28.80	m
Building Height, H	3.84	m
Exposure Case	Funnelling	

Dimn to between bldgs: 5.0
Adjacent faces: L
Result: ***Funnelling***

(see table 5)



Wind @ 0
D/H (*W/H*): 2.66
Wind @ 90
D/H (*L/H*): 7.50

Cpe Values

		Wind at 0^0			Wind at 90^0
Surface A		0.73	Surfaces	Zone A	-1.60
Surface B		-0.50	A & B	Zone B	-0.90
Surfaces	Zone A	-1.30		Zone C	-0.90
C & D	Zone B	-0.80	Surface C		0.60
	Zone C	-0.50	Surface D		-0.50

(see table 5 and fig 12)

External Pressure Coefficients - Roof (*assuming equal pitches*) *(see tables 8-11incl. and figs. 12, 20 & 21)*

Roof Type / Pitch	Flat	0
Wind Normal to Eaves	***Case 1***	***Case 2***
Zone C	-0.70	-0.70
Zone G	0.00	0.00
Wind Normal to Gable		
Zone C (*Zone B if hip roof*)	-0.70	-0.70
Zone D (*Zone E if hip roof*)	0.00	0.00

Component forces (*kN/m*)

Horizontal	***Vertical***	
0.000	-0.506	Max
	-1.517	Min
0.000	-2.02324197	Max
	-2.02	Min

Wind Pressure For Building Stability
(by observation stability against overturning will be critical with wind on the longest face) as cl 2.1.3.6

Wind at 0^0 on Elevation **0.70 kN/m²**

Wind at 90^0 on Gable **0.46 kN/m²**

Wind Suction On Roof For Building Stability **-0.51 kN/m²**
Max downward pressure for roof designs: 0.00 kN/m²

For these two cases the effects of internal conditions can be ignored.

Use wind pressure based on eaves level for long elevation based on BRE Digest 436 Part 1
Yes
Also applies to hip end buildings

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Calculation sheet/revision no: WL4

Wind Loading - Pressure Co-efficients for Panel Design

Internal Pressure Coefficients

Cpi	0.2	(int pressure)	Cpi x Ca:	0.16
Cpi	-0.3	(int suction)	Cpi x Ca:	-0.24

Size Effect Factor Ca taken as 1.0 for a max diagonal 'a' of 5m.

Analysis Results for Cpi + 0.2 in kN/m^2

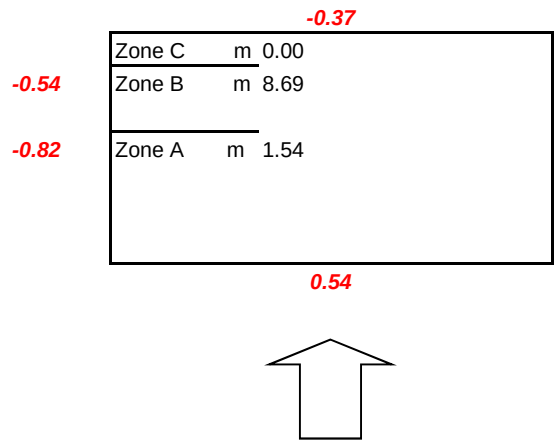
		Wind at 0^0			Wind at 90^0
Surface A		0.32	Surfaces	Zone A	-0.99
Surface B		-0.37	A & B	Zone B	-0.60
Surfaces	Zone A	-0.82		Zone C	-0.60
C & D	Zone B	-0.54	Surface C		0.25
	Zone C	-0.37	Surface D		-0.37

Analysis Results for Cpi - 0.3 in kN/m2

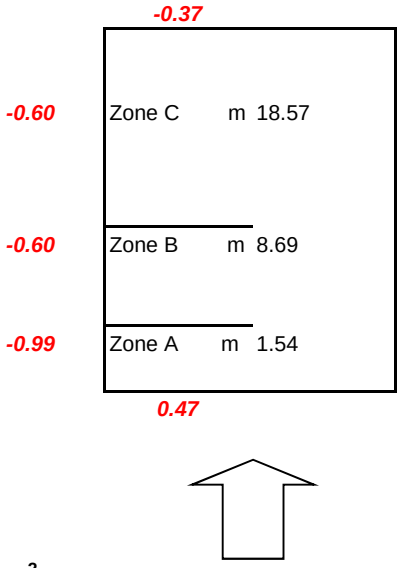
		Wind at 0^0			Wind at 90^0
Surface A		0.54	Surfaces	Zone A	-0.77
Surface B		-0.15	A & B	Zone B	-0.37
Surfaces	Zone A	-0.60		Zone C	-0.37
C & D	Zone B	-0.32	Surface C		0.47
	Zone C	-0.15	Surface D		-0.15

Diagramtic Summary of Wind Loads

Wind at 0^0



Wind at 90^0



Results Summary

General Condition	**0.54**	**kN/m^2**
Zone A	**0.99**	**kN/m^2**
Wind Uplift For Roof Design	**-0.60**	**kN/m^2**

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Wind Loading - Building Parameters

Temporary Condition - During Erection

This calculation is based upon the guidelines of BS 6399: Part 2: 1997

Dynamic Classification			
Building Height	3.84	m	
Building Type Factor, Kb	0.5		*(Timber Framed Buildings)*
Dynamic Augmentation Factor, Cr	0.006		
Standard Method Calculation			
Location	Lanchester		
Basic Wind Speed,Vb	24.80	m/s	*(see fig. 6)*
Site Altitude	123.00	m	
Altitude Factor, Sa	1.12		
Direction Factor, Sd	1.00		
Season Factor, Ss	0.98		*(see Annex D, cl D.2 & table D.1)*
Probability Factor, Sp	0.749		*(see Annex D, cl D.1)*
Effective Height			
Reference Height, Hr	3.84	m	
Terrain	Country		
Average Roof Top Height, Ho	0.00	m	
Building Upwind Spacing, Xo	0.00	m	
Effective Height, He	3.84	m	
Effective Wind Speed			
Closest Distance to Sea	26	km	
Site Wind Speed, Vs	20.44	m/s	
Terrain Factor, Sb	1.329		*(see table 4)*
Effective Wind Speed, Ve	27.18	m/s	
Dynamic Pressure	**0.45**	**kN/m²**	

Topograhical data used

Wind Direction	Distance to Sea (km)	Dist. to edge of town (km)	Obstruction height H_o(m)	Obstruction spacing X_o(m)	Dyn. Press. q (kN/m²)
0	90	0.00	0	0	0.57
30	32	0.00	0	0	0.50
60	29	0.00	0	0	0.51
90	28	0.00	0	0	0.53
120	47	0.00	0	0	0.50
150	239	0.00	0	0	0.54
180	453	0.00	0	0	0.61
210	170	0.00	0	0	0.73
240	123	0.00	0	0	0.84
270	108	0.00	0	0	0.82
300	226	0.00	0	0	0.70
330	148	0.00	0	0	0.57

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Overall Stability:

Finished & lined

K_{100} from BS 5268-6.1:1996

	Eaves elevation	Gable elevation
Grnd to 3rd	0.84	0.80
4th flr & above	1.00	1.00

Min brick buttress dimensions
Up to 3 storeys min 550mm
Up to 4 storeys min 950mm
Above 4 storeys min 1200mm

Design Wind Load for O/A Stability:

	Wind on long elevation	Wind on short gable
Grnd to 3rd	0.584 kN/m²	0.367 kN/m²
4th flr & above	0.696	0.459

	General Condition	Zone A
Design Wind Load for Stud Design:	0.544 kN/m²	0.993 kN/m²

Calculate Total Dead Load

	Construction	Area	
Roof Area	Flat Roof	257.83	m²
5th Floor Area	N.A.		m²
4th Floor Area	N.A.		m²
3rd Floor Area	N.A.		m²
2nd Floor Area	N.A.		m²
1st Floor Area	N.A.		m²

5th Floor Length of Int. Walls		m
4th Floor Length of Int. Walls		m
3rd Floor Length of Int. Walls		m
2nd Floor Length of Int. Walls		m
1st Floor Length of Int. Walls		m
Gnd Floor Length of Int. Walls	24.26	m
5th Floor Length of Party Walls		m
4th Floor Length of Party Walls		m
3rd Floor Length of Party Walls		m
2nd Floor Length of Party Walls		m
1st Floor Length of Party Walls		m
Gnd Floor Length of Party Walls		m
5th Floor Length of Ext. Walls		m
4th Floor Length of Ext Walls		m
3rd Floor Length of Ext Walls		m
2nd Floor Length of Ext Walls		m
1st Floor Length of Ext Walls		m
Gnd Floor Length of Ext Walls	46.89	m

Total Roof Load	258.14	kN
Total Floor Loads	0.00	kN
Total Int. Wall loads	39.99	kN
Total Party Wall Load	0.00	kN
Total Ext. Wall Load	69.50	kN
Total Dead Load	**367.63**	**kN**

Loads (kN/m2)

Flat Roof	1.001
Pitched / Curved Roof - Attic	0.000
Pitched / Curved Roof - Other	
Compartment Floor	0.000
Intermediate Floor	-0.270
Perimeter Wall	0.371
Compartment Wall	0.000
Load-bearing Internal Wall	0.485

5th Floor Storey Ht		m
4th Floor Storey Ht		m
3rd Floor Storey Ht		m
2nd Floor Storey Ht		m
1st Floor Storey Ht		m
Grnd Floor Storey Ht	3.40	m

Note 1 : Non-loadbearing stud walls are to be excluded from the length of internal walls. Reference to ground floor is the lowest level of timber frame which may not be the literal ground floor.

Note 2 : External walls are calculated on the basis that that the cladding weight is excluded. To increase the building weight to account for the cladding attched to the timber frame make the following adjustment.

Gross external wall area with cladding:
45.5 m²
0.226 kN/m²

10.27 kN additional dead load due to cladding.
(*Included in the value for Ext walls* .)

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Building Dimensions

Roof Type: Flat

O/A Length (*Eaves*) (m)	28.80	Eaves Height (m)	3.84	(*this value is to be the same as the overall height if it is a flat roof*)
O/A Width (*Gable*) (m)	10.23	Roof Slope Length (m)		(*includes 0.5m eaves o/h*)
O/A Height (*Ridge*) (m)	3.84	Top storey inset (m)		

Wind Forces Acting on Building (*including the reduction for wind shielding*)

Total wind on the gable of building:	12.77 kN	*when building considered as a complete unit*	(1)
Total wind on the gable of building:	7.66 kN	*when building considered as an end of terrace unit*	(2)
Total wind on the elevation of bldg.:	57.22 kN	***Use option:***	***(1)***

Racking Forces Acting on Ground Floor Walls

Total racking force on the gable of building:	6.39 kN	*(Wind on gable Elevation)*
Total racking force on the elevation of building:	28.61 kN	*(Wind on Elevation)*

Sliding Check

Sliding Force	57.22 kN	**Sliding O.K.**
Co-efficient of friction taken as :	0.4 *(with a DPC)*	
Resistance to sliding: *from frictional resistance*	85.06 kN	
Resistance to sliding: *from additional fixings*	163.29 nails	
Factor of Safety against sliding:	4.34	
Required:	1.4	

Overturning Check

Ref BS 5268 - 6.1 cl. 4.4.2.2 - based on total dead load acting at half the building **dim'n**

Values displayed for all buildings, but refer to page OS5 for a more rigorous analysis

Overturning O.K.

	Front / Rear	***Left / Right***	
Overturning Moment:	889.97	2256.16	kNm
Resistance to overturning: *dead load*	1880.44	5293.91	kNm
Height of masonry mobilised:			m
Resistance to overturning: *masonry*	0.00	0.00	kNm
Factor of Safety against overturning:	2.11	2.35	
Required:	1.4		
Masonry HD straps required:	N.A.	N.A.	

Based on Cullen HD straps with a SWL of 3kN

Uplift Check

External Roof Uplift:	-0.60	kN/m^2
Total Uplift Force	-154.97	kN
Resistance to uplift:	367.63	kN
Factor of Safety against uplift:	2.37	**Uplift O.K.**
Required:	1.4	

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Top Storey Stability:

K100 applicable to top storey: No

Applicable to all buildings irrespective of number of storeys and assumes cl 4.4.2.2. principles

For this check the values are based upon the data for the top storey height entered above.

Sliding Check

Sliding Force	68.12	kN
Co-efficient of friction taken as :	0.4	
Resistance to sliding: *from frictional resistance*	80.95	kN
Resistance to sliding: *from additional fixings*		nails
Factor of Safety against sliding: Required:	1.4	

Overturning Check

Ref BS 5268 - 6.1 cl. 4.4.2.2 - based on total dead load acting at half the building **width**

	Front / Rear	
Overturning Moment:	908.50	**Overturning O.K.**
Resistance to overturning: *from dead load*	1827.89	
Resistance to overturning: *from strapping*	0.00	
Factor of Safety against overturning: *no strapping*	2.01	
Factor of Safety against overturning: *with strapping*	2.01	
Required:	1.4	

Uplift Check

Roof type: Flat Roof

External Roof Uplift:	-0.60	kN/m^2	
Roof Dead Load:	1.001	kN/m^2	**Roof Uplift O.K.**
Required:	1.4		

To maintain a F.o.S specified on overturning and uplift, provide additional strapping to the value of **0.00 kN/m**

This force can be resisted by any of the following strapping arrangements, between the top storey and the adjacent lower storey, with an equal number of nails either side of the floor zone.

at 600 c/c	No. nails either side of floor zone
at 1200 c/c	No. nails either side of floor zone
at 1800 c/c	No. nails either side of floor zone
at 2400 c/c	No. nails either side of floor zone

Using 3.75mm x 30mm long square twist nails.
Basic load = 0.258kN *K 44 = 1.2*
Red.= 30/45=0.66 *k46 = 1.25*
k48=1.25
F = 0.258 x 1.2 x 1.25 x 1.25 x 0.66 = 0.319kN / nail.

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Racking Resistance With Wind on Gable Elevation

BS 5268: section 6.1 (1996)

Ground floor only

Wall Ref	**01**	**02**	**07**	**08a**	**08b**	**11**
Length (m)	13.05	4.59	1.27	1.76	3.29	0.90
Height (m) (MAX 2.7m)	2.70	2.70	2.70	2.70	2.70	2.70
Agg.area of openings (M^2)	12.67	0.00	0.00	0.00	0.00	0.00
UDL (kN/m)	2.24	3.99	4.13	5.98	5.98	8.29
Masonry Length (m)	5.63	4.59	0.00	0.00	0.00	0.00
Tie Density (x/M^2)	3.70	3.70	None	None	None	None
Basic Masonry Resistance	**2.25**	**1.83**	**0.00**	**0.00**	**0.00**	**0.00**
Primary Board						
Material	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)
Category	1	1	1	1	1	1
Thickness (mm)	9.00	9.00	9.00	9.00	9.00	9.00
Nail Diameter (mm)	2.8	2.8	2.8	2.8	2.8	2.8
Perimeter Nail Spacing (mm)	150	150	150	150	150	150
Basic Racking Rest.,Rb	1.68	1.68	1.68	1.68	1.68	1.68
K101	0.93	0.93	0.93	0.93	0.93	0.93
K102	1.00	1.00	1.00	1.00	1.00	1.00
K103	1.00	1.00	1.00	1.00	1.00	1.00
Modified Resist., Rb x Km	**1.57**	**1.57**	**1.57**	**1.57**	**1.57**	**1.57**
Secondary Board						
Material	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard
Category	4	4	4	4	4	4
Thickness (mm)	12.50	12.50	12.50	12.50	12.50	12.50
Nail Diameter (mm)	2.65	2.65	2.65	2.65	2.65	2.65
Perimeter Nail Spacing (mm)	150	150	150	150	150	150
Basic Racking Rest.,Rb	0.18	0.18	0.18	0.18	0.18	0.18
K101	1.00	1.00	1.00	1.00	1.00	1.00
K102	1.00	1.00	1.00	1.00	1.00	1.00
K103	1.00	1.00	1.00	1.00	1.00	1.00
Modified Resist., Rb x Km	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**
Wall anchorage / nailing	**No**	**No**	**No**	**No**	**No**	**No**
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	0.89	0.89	0.89	0.89	0.89	0.89
K105	1.32	1.30	0.53	0.73	1.14	0.38
K106	0.28	1.00	1.00	1.00	1.00	1.00
K107	1.10	1.26	1.45	1.55	1.43	1.95
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	8.23	11.47	1.48	3.06	8.18	1.02
Secondary	0.94	1.32	0.17	0.35	0.94	0.12
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	8.23	11.47	1.48	3.06	8.18	1.02
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	0.94	1.32	0.17	0.35	0.94	0.12
Masonry (<25%of P+S)	2.25	1.83	0.00	0.00	0.00	0.00
Total Resistance kN	**11.42**	**14.62**	**1.65**	**3.41**	**9.12**	**1.14**

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Racking Resistance With Wind on Eaves Elevation

BS 5268: section 6.1 (1996)

Ground floor only

Wall Ref	**03**	**05**	**06**	**09**	**RW14**	**RW15**
Length (m)	1.39	2.59	6.68	6.58	3.69	3.57
Height (m) (MAX 2.7m)	2.70	2.70	2.70	2.70	2.70	2.70
Agg.area of openings (M^2)	0.00	0.00	1.52	0.00	0.00	0.00
UDL (kN/m)	1.64	2.84	1.52	2.23	1.00	1.00
Masonry Length (m)	1.39	2.59	5.99	0.00	0.00	0.00
Tie Density (x/M^2)	3.70	3.70	3.70	None	None	None
Basic Masonry Resistance	**0.56**	**1.03**	**2.40**	**0.00**	**0.00**	**0.00**
Primary Board						
Material	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	OSB (Type 3/4)	N'd Plasterboard	N'd Plasterboard
Category	1	1	1	1	4	4
Thickness (mm)	9.00	9.00	9.00	9.00	12.50	12.50
Nail Diameter (mm)	2.8	2.8	2.8	2.8	2.65	2.65
Perimeter Nail Spacing (mm)	150	150	150	150	150	150
Basic Racking Rest.,Rb	1.68	1.68	1.68	1.68	0.60	0.60
K101	0.93	0.93	0.93	0.93	1.00	1.00
K102	1.00	1.00	1.00	1.00	1.00	1.00
K103	1.00	1.00	1.00	1.00	1.00	1.00
Modified Resist., Rb x Km	**1.57**	**1.57**	**1.57**	**1.57**	**0.60**	**0.60**
Secondary Board						
Material	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard	N'd Plasterboard
Category	4	4	4	4	4	4
Thickness (mm)	12.50	12.50	12.50	12.50	12.50	12.50
Nail Diameter (mm)	2.65	2.65	2.65	2.65	2.65	2.65
Perimeter Nail Spacing (mm)	150	150	150	150	150	150
Basic Racking Rest.,Rb	0.18	0.18	0.18	0.18	0.30	0.30
K101	1.00	1.00	1.00	1.00	1.00	1.00
K102	1.00	1.00	1.00	1.00	1.00	1.00
K103	1.00	1.00	1.00	1.00	1.00	1.00
Modified Resist., Rb x Km	**0.18**	**0.18**	**0.18**	**0.18**	**0.30**	**0.30**
Wall anchorage / nailing	2.52kN / 8	2.81kN / 9	0.72kN / 3	**No**	0.97kN / 4	1kN / 4
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	0.89	0.89	0.89	0.89	0.89	0.89
K105	0.58	1.03	1.32	1.32	1.19	1.17
K106	1.00	1.00	0.79	1.00	1.00	1.00
K107	1.18	1.24	1.09	1.13	1.07	1.08
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	1.45	5.05	11.67	15.04	2.76	2.64
Secondary	0.17	0.58	1.34	1.73	1.38	1.32
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	1.45	5.05	11.67	15.04	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	0.17	0.58	1.34	1.73	4.15	3.95
Masonry (<25%of P+S)	0.40	1.03	2.40	0.00	0.00	0.00
Total Resistance kN	**2.02**	**6.66**	**15.40**	**16.76**	**4.15**	**3.95**

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Project: Extension to Lanchester EP Primary School | Project no: 3095 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: R 5

Design Summary

Ground floor only

Racking Resistance With Wind on Gable Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
01	1	8.23	0.00	0.94	2.25	11.42	over 72	0.21
02	1	11.47	0.00	1.32	1.83	14.62	over 72	0.75
07	1	1.48	0.00	0.17	0.00	1.65	over 72	0.31
08a	1	3.06	0.00	0.35	0.00	3.41	over 72	0.46
08b	1	8.18	0.00	0.94	0.00	9.12	over 72	0.65
11	1	1.02	0.00	0.12	0.00	1.14	over 72	0.30
Additional values from page 6		0.00	0.00	19.78	0.00	17.24		
Total Resistances		33.43	0.00	16.72	4.08	**54.23** kN		
Total Required						6.39 kN		

Proportion of Cat 4 to 1: 50.00% **Proportions Adequate**

Factor of safety required: 1

Adequate Resistance
CSF = 0.12
<1.0 O.K.

Any shortfall is to be provided by a steel sway frames. Use sway frame/s each with a capacity of: 0 — 0.00 kN

Racking Resistance With Wind on Eaves Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
03	0.707	1.45	0.00	0.17	0.40	1.43	over 72	1.80
05	0.707	5.05	0.00	0.58	1.03	4.71	over 72	3.18
06	1	11.67	0.00	1.34	2.40	15.40	over 72	2.84
09	1	15.04	0.00	1.73	0.00	16.76	over 72	3.14
RW14	1	0.00	0.00	4.15	0.00	4.15	over 72	1.38
RW15	1	0.00	0.00	3.95	0.00	3.95	over 72	1.37
Additional values from page 6		0.00	0.00	0.00	0.00	0.00		
Total Resistances		31.30	0.00	11.69	3.41	**46.41** kN		
Total Required						28.61 kN		

Proportion of Cat 4 to 1: 37.36% **Proportions Adequate**

Factor of safety required: 1

Adequate Resistance
CSF = 0.62
<1.0 O.K.

Any shortfall is to be provided by a steel sway frames. Use sway frame/s each with a capacity of: 0 — 0.00 kN

Racking Resistance In the Temporary Condition

Ground floor only

Consider the racking resistance of the building in the temporary condition before the plasterboard is fixed, and contributes to the overall resistance. If resistance is inadequte provision of temporary bracing will be required.
In order to establish the temporary racking resistance, only cat 1 materials will be mobilised. The racking forces causing the disturbing effects will be based upon a pro rata of temporary wind load to design wind load and multiplied by the long term resistance required.

Design Wind Pressure:	**0.57**	**kN/m^2**
Temporary Wind Pressure:	**0.45**	**kN/m^2**

So Temporary Resistance to be: 80.13% of Design Resistance.

Racking Resistance With Wind on Gable Elevation

Design Resistance Required:	6.39	kN
Temporary Resistance Required:	5.12	kN
Temporary Resistance Provided:	33.43	kN

Therefore: **Temporary Bracing Is Not Required**

Racking Resistance With Wind on Eaves Elevation

Design Resistance Required:	28.61	kN
Temporary Resistance Required:	22.93	kN
Temporary Resistance Provided:	31.30	kN

Therefore: **Temporary Bracing Is Not Required**

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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no R 2

Additional

Racking Resistance With Wind on Gable Elevation

Ground floor only

BS 5268: section 6.1 (1996)

Wall Ref	**12**	**13**				
Length (m)	16.99	6.34				
Height (m) (MAX 2.7m)	2.70	2.70				
Agg.area of openings (M^2)	4.83	6.30				
UDL (kN/m)	10.57	7.79				
Masonry Length (m)	0.00	0.00				
Tie Density (x/M^2)	None	None				
Basic Masonry Resistance	**0.00**	**0.00**				
Primary Board						
Material	N'd Plasterboard	N'd Plasterboard	None	None	None	None
Category	4	4				
Thickness (mm)	12.50	12.50	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.65	2.65				
Perimeter Nail Spacing (mm)	150	150				
Basic Racking Rest.,Rb	0.60	0.60				
K101	1.00	1.00				
K102	1.00	1.00				
K103	1.00	1.00				
Modified Resist., Rb x Km	**0.60**	**0.60**	**0.00**	**0.00**	**0.00**	**0.00**
Secondary Board						
Material	N'd Plasterboard	N'd Plasterboard	None	None	None	None
Category	4	4				
Thickness (mm)	12.50	12.50	1.00	1.00	1.00	1.00
Nail Diameter (mm)	2.65	2.65				
Perimeter Nail Spacing (mm)	150	150				
Basic Racking Rest.,Rb	0.30	0.30				
K101	1.00	1.00				
K102	1.00	1.00				
K103	1.00	1.00				
Modified Resist., Rb x Km	**0.30**	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**
Wall anchorage / nailing	**No**	**No**				
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104	0.89	0.89				
K105	1.32	1.32	0.00	0.00	0.00	0.00
K106	0.74	0.27				
K107	1.36	1.41	1.00	1.00	1.00	1.00
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary	13.29	1.89				
Secondary	6.65	0.94				
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	19.94	2.83	0.00	0.00	0.00	0.00
Masonry (<25%of P+S)	0.00	0.00	0.00	0.00	0.00	0.00
Total Resistance kN	**19.94**	**2.83**	**0.00**	**0.00**	**0.00**	**0.00**

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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no R 4

Additional

Racking Resistance With Wind on Eaves Elevation

Ground floor only

BS 5268: section 6.1 (1996)

Wall Ref						
Length (m)						
Height (m) (MAX 2.7m)						
Agg.area of openings (M^2)						
UDL (kN/m)						
Masonry Length (m)						
Tie Density (x/M^2)						
Basic Masonry Resistance						
Primary Board						
Material	None	None	None	None	None	None
Category						
Thickness (mm)	1.00	1.00	1.00	1.00	1.00	1.00
Nail Diameter (mm)						
Perimeter Nail Spacing (mm)						
Basic Racking Rest.,Rb						
K101						
K102						
K103						
Modified Resist., Rb x Km	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Secondary Board						
Material	None	None	None	None	None	None
Category						
Thickness (mm)	1.00	1.00	1.00	1.00	1.00	1.00
Nail Diameter (mm)						
Perimeter Nail Spacing (mm)						
Basic Racking Rest.,Rb						
K101						
K102						
K103						
Modified Resist., Rb x Km	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Wall anchorage / nailing						
Add. dead UDL (kN/m)						
Length mobilised (m)						
K104						
K105	0.00	0.00	0.00	0.00	0.00	0.00
K106						
K107	1.00	1.00	1.00	1.00	1.00	1.00
K108	1.10	1.10	1.10	1.10	1.10	1.10
Primary						
Secondary						
Wall overturning stability	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**N.A.**
Category 1 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 2 & 3 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Category 4 Materials	0.00	0.00	0.00	0.00	0.00	0.00
Masonry (<25%of P+S)	0.00	0.00	0.00	0.00	0.00	0.00
Total Resistance kN	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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Project: Extension to Lanchester EP Primary School | Project no: 3095 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: R 6

Additional Design Summary

Ground floor only

Racking Resistance With Wind on Gable Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
12	1	0.00	0.00	16.95	0.00	14.41	63	0.21
13	1	0.00	0.00	2.83	0.00	2.83	over 72	0.75
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
Total Resistances		0.00	0.00	19.78	0.00	**17.24** kN		

values carried to main summary page

Racking Resistance With Wind on Eaves Elevation

Wall Ref	No. Off	Cat 1	Cat 2 & 3	Cat 4	Masonry	Total	Red. If 63mm Stud Size	Act. kN/m
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
0		0.00	0.00	0.00	0.00	0.00	over 72	0.00
Total Resistances		0.00	0.00	0.00	0.00	**0.00** kN		

values carried to main summary page

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no DS 1

Stud Design Summary

Ground Floor Walls

Wall Ref	Calc Page	Dead kN/m	Total kN/m	Stud Width	Stud Depth	Centres / Grade	Fire Ratio	CSI
1	1	2.24	3.14	38	140	600 / C16 / E	0.30	0.30
2	2	3.99	7.73	38	140	600 / C16 / E	0.35	0.35
3	3	1.64	15.16	38	140	600 / C16 / E	0.47	0.47
4	4	1.64	1.96	38	140	600 / C16 / E	0.26	0.26
5	5	2.84	16.59	38	140	600 / C16 / E	0.49	0.49
6	6	1.52	6.09	38	140	600 / C16 / E	0.32	0.32
7	7	4.13	8.23	38	140	600 / C16 / E	0.43	0.43
8	8	5.98	10.96	38	140	600 / C16 / E	0.51	0.51
9	9	2.23	7.25	38	140	600 / C16 / E	0.44	0.44
10	10	3.70	4.96	38	140	600 / C16 / E	0.40	0.40
11	11	8.29	16.60	38	89	400 TB / C16 / I	0.53	0.53
12	12	10.57	17.42	38	89	400 TB / C16 / I	**0.66**	0.66
13	13	7.79	12.61	38	89	600 TB / C16 / I	**0.68**	0.70

Note: 'TB' against the stud centres indicates that temporary bracing is required to prevent the stud buckling during construction

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Project	Project no	CALCULATION SHEET
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Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
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			CDS 1

Cripple Stud Design Summary

Ground Floor Walls

						No. of Studs		
Stud Ref	**Calc Page**	**Dead kN**	**Total kN**	**Stud Width**	**Stud Depth**	**CS/FH**	**Grade**	**CSI**
1	1	0.56	0.94	38	140	1 / 1	C16	0.33
2	2	1.15	1.95	38	140	1 / 1	C16	0.33
3	3	0.72	1.23	38	140	1 / 1	C16	0.33
4	4	1.37	2.36	38	140	1 / 1	C16	0.33
5	5	3.10	5.33	38	140	1 / 0	C16	0.34
6	6	3.55	6.08	38	140	1 / 1	C16	0.38
7	7	2.63	4.49	38	140	1 / 1	C16	0.31
8	8	0.16	0.25	38	140	1 / 1	C16	0.31
9	9	4.89	8.49	38	89	1 / 1	C16	0.87
10	10	2.88	5.01	38	89	1 / 1	C16	0.56
11	11	2.34	4.04	38	140	1 / 1	C16	0.31
12	12	3.27	5.58	38	140	1 / 1	C16	0.35
13	13	4.60	6.68	38	140	1 / 1	C16	0.42
14	14	2.04	3.50	38	140	1 / 1	C16	0.33
15	15	2.89	5.01	38	89	1 / 1	C16	0.59

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: TBD 1

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Timber Beam Design

Ref: 1.01 Span (m): 1.05 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	1.96	0.98	0.73	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 1(	-	0.08	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	0.56	0.56	D
	0.39	0.39	I
	0.94	0.94	Total
	0.00	0.00	W
	0.94	**0.94**	**Max**

Start dim'n	End dim'n
0.00	1.05
0.00	1.05
0.00	1.05

Floor joists continuous over beam: **No**

Maximum Bending Moment: **0.25** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.25 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.08	360	2.92	**Deflection O.K.**
Total:	0.20	250	4.20	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	0.94	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.09	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.25	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	0.94	kN		
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	5	mm		
Min.bearing l. for c/s on panel rail:	5	mm	on 1	38 x 89 stud/s

Charring: 0 mm

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	4	mm		

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no TBD 2

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Timber Beam Design

Ref: 1.02 Span (m): 2.18 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Reactions (kN):

	LHS	RHS	Ser
	1.15	1.15	D
	0.80	0.80	I
	1.95	1.95	Total
	0.00	0.00	W
	1.95	**1.95**	**Max**

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)	Start dim'n	End dim'n
UDL 1	Flat Roof	1.96	0.98	0.73	0.00	0.00	2.18
UDL 2	0.00	0.00	0.00	0.00	0.00	0.00	2.18
UDL 3	Wall 1000 & 1(	-	0.08	0.00	*(inc. swt)*	0.00	2.18

Floor joists continuous over beam: **No**

Maximum Bending Moment: **1.06** **kNm**

Enter bending moment if a more accuarate analysis has been made: 1.06 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	1.24	360	6.04	**Deflection O.K.**
Total:	3.04	250	8.70	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	1.95	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.18	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	1.06	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*	
K8	*1.10*	
K9	*1.21*	

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	1.95	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	10	mm		
Min.bearing l. for c/s on panel rail:	10	mm	on 1	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	8	mm		

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no: TBD 3

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Timber Beam Design

Ref: 1.03 Span (m): 1.05 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	1.96	0.98	0.73	0.00
UDL 2	Flat Roof	5.52	2.76	2.07	0.00
UDL 3	Wall 1000 & 1(	-	0.08	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):		
LHS	**RHS**	**Ser**
0.72	1.37	D
0.51	0.99	I
1.23	2.36	Total
0.00	0.00	W
1.23	**2.36**	**Max**
Start dim'n	End dim'n	
0.00	1.05	
0.00	1.05	
0.00	1.05	

Maximum Bending Moment: **0.46** **kNm**
Enter bending moment if a more accuarate analysis has been made: 0.42 kNm
Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:		
D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.15	360	2.92	**Deflection O.K.**
Total:	0.34	250	4.20	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	2.36	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.22	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.42	kNm	*K7*	*1.09*
Basic bending stress:	5.3	N/mm2	*K8*	*1.10*
Adm.bending stress:	6.34	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	2.36	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	2.36	kN			Charring: 0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2			
Minimum bearing length for beam:	12	mm			
Min.bearing l. for c/s on panel rail:	12	mm	on	1	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	9	mm		

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Drawing no	Calculation by	Checked by	Date
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Calculation sheet/revision no: TBD 4

Timber Beam Design

Ref: 1.04 Span (m): 1.87 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	5.52	2.76	2.07	0.00
UDL 2	Flat Roof	0.85	0.42	0.32	0.00
UDL 3	Wall 1000 & 1(	-	0.14	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

LHS	RHS	Ser
3.10	3.10	D
2.23	2.23	I
5.33	5.33	Total
0.00	0.00	W
5.33	**5.33**	**Max**

Start dim'n	End dim'n
0.00	1.87
0.00	1.87
0.00	1.87

Maximum Bending Moment: **2.49** **kNm**

Enter bending moment if a more accuarate analysis has been made: 2.49 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 300 x 45 Glu** **Grade:** **C18**
Glulam: **Yes**

Beam Properties:

D	*300*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	

GL24c

Axis of bending (relative to D & B): *X-X*

Service class: 1

K3 1.00

Wt	*13.77*	*kg/m*
Ixx	*20250.00*	*cm4*
Zxx	*1350.00*	*cm3*
A	*270.00*	*cm2*

Deflection Check: Limits: L/x Limit Value:

Live:	0.23	360	5.19	**Deflection O.K.**
Total:	0.56	250	7.47	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	5.33	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	2.01	N/mm2
Maximum Shear Stress:	0.30	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	2.49	kNm	*K7*	*1.01*
Basic bending stress:	5.8	N/mm2	*K8*	*1.10*
Adm.bending stress:	8.91	N/mm2	*K9*	*1.00*
Maximum Adm. Bending Moment:	12.03	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	5.33	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	16	mm		
Min.bearing l. for c/s on panel rail:	27	mm on	1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	27	mm

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Project	Project no	CALCULATION SHEET
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Timber Beam Design

Ref: 1.05 Span (m): 1.95 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	1.04	0.69	3.10	2.23
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	2.95	1.48	1.11	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 1(	-	0.10	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	3.55	2.63	D
	2.53	1.86	I
	6.08	4.49	Total
	0.00	0.00	W
	6.08	**4.49**	**Max**
	Start dim'n	End dim'n	
	0.00	1.95	
	0.00	1.95	
	0.00	1.95	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **3.65** **kNm**

Enter bending moment if a more accuarate analysis has been made: 3.52 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 145 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*145*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*9.98*	*kg/m*
Ixx	*3429.70*	*cm4*
Zxx	*473.06*	*cm3*
A	*195.75*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	2.19	360	5.42	**Deflection O.K.**
Total:	5.07	250	7.81	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	6.08	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.47	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	3.52	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	8.94	N/mm2
Maximum Adm. Bending Moment:	4.23	kNm

K7	*1.08*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	6.08	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2		
Minimum bearing length for beam:	28	mm		
Min.bearing l. for c/s on panel rail:	31	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	20	mm

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Drawing no	Calculation by	Checked by	Date
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Timber Beam Design

Ref: 1.06 Span (m): 0.83 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	0.60	0.30	0.23	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 1(	-	0.08	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	0.16	0.16	D
	0.09	0.09	I
	0.25	0.25	Total
	0.00	0.00	W
	0.25	**0.25**	**Max**

Start dim'n	End dim'n
0.00	0.83
0.00	0.83
0.00	0.83

Maximum Bending Moment: **0.05** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.05 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.01	360	2.29	**Deflection O.K.**
Total:	0.03	250	3.30	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	0.25	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.02	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.05	kNm
Basic bending stress:	5.3	N/mm2
Adm.bending stress:	6.34	N/mm2
Maximum Adm. Bending Moment:	2.36	kNm

K7	*1.09*
K8	*1.10*
K9	*1.21*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	0.25	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2		
Minimum bearing length for beam:	1	mm		
Min.bearing l. for c/s on panel rail:	1	mm on	1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	1	mm

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Project	Project no	CALCULATION SHEET
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Timber Beam Design

Ref: 1.07 Span (m): 1.95 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	4.33	2.17	1.62	0.00
UDL 2	Flat Roof	5.52	2.76	2.07	0.00
UDL 3	Wall 1000 & 1(	-	0.09	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	4.89	4.89	D
	3.60	3.60	I
	8.49	8.49	Total
	0.00	0.00	W
	8.49	**8.49**	**Max**
	Start dim'n	End dim'n	
UDL 1	0.00	1.95	
UDL 2	0.00	1.95	
UDL 3	0.00	1.95	

Maximum Bending Moment: **4.14** **kNm**
Enter bending moment if a more accuarate analysis has been made: 4.14 kNm
Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 195 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*195*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*8.95*	*kg/m*
Ixx	*5561.16*	*cm4*
Zxx	*570.38*	*cm3*
A	*175.50*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	1.75	360	5.42	**Deflection O.K.**
Total:	4.11	250	7.80	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	8.49	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.73	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	4.14	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	8.65	N/mm2
Maximum Adm. Bending Moment:	4.93	kNm

K7	*1.05*
K8	*1.10*
K9	*1.14*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	8.49	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2		
Minimum bearing length for beam:	40	mm		
Min.bearing l. for c/s on panel rail:	43	mm	on 2	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	43	mm		

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Project	Project no	CALCULATION SHEET
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Timber Beam Design

Ref: 1.08 Span (m): 1.15 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	4.33	2.17	1.62	0.00
UDL 2	Flat Roof	5.52	2.76	2.07	0.00
UDL 3	Wall 1000 & 1(	-	0.09	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

LHS	RHS	Ser
2.88	2.88	D
2.12	2.12	I
5.01	5.01	Total
0.00	0.00	W
5.01	**5.01**	**Max**

Start dim'n	End dim'n
0.00	1.15
0.00	1.15
0.00	1.15

Maximum Bending Moment: **1.44** **kNm**

Enter bending moment if a more accuarate analysis has been made: 1.44 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 195 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*195*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	
Axis of bending (relative to D & B):		
	x-x	
Service class:	1	
K3	1.00	
Wt	*8.95*	*kg/m*
Ixx	*5561.16*	*cm4*
Zxx	*570.38*	*cm3*
A	*175.50*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.26	360	3.19	**Deflection O.K.**
Total:	0.62	250	4.60	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	5.01	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.43	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	1.44	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	8.65	N/mm2
Maximum Adm. Bending Moment:	4.93	kNm

K7	*1.05*
K8	*1.10*
K9	*1.14*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	5.01	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2		
Minimum bearing length for beam:	23	mm		
Min.bearing l. for c/s on panel rail:	26	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	25	mm

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Timber Beam Design

Ref: 1.09 Span (m): 2.09 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	4.33	2.17	1.62	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 1(	-	0.08	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	2.34	2.34	D
	1.69	1.69	I
	4.04	4.04	Total
	0.00	0.00	W
	4.04	**4.04**	**Max**
Start dim'n	0.00	2.09	
End dim'n	0.00	2.09	

Maximum Bending Moment: **2.11** **kNm**

Enter bending moment if a more accuarate analysis has been made: 2.11 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):		
	X-X	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	2.35	360	5.80	**Deflection O.K.**
Total:	5.60	250	8.36	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	4.04	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.38	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	2.11	kNm	*K7*	*1.09*
Basic bending stress:	5.3	N/mm2	*K8*	*1.10*
Adm.bending stress:	6.34	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	2.36	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	4.04	kN		Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2			
Minimum bearing length for beam:	21	mm			
Min.bearing l. for c/s on panel rail:	21	mm	on 1	38 x 89 stud/s	

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	16	mm

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Project	Project no	CALCULATION SHEET
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Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no TBD 10

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Timber Beam Design

Ref: 1.10 Span (m): 2.85 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)	Start dim'n	End dim'n
UDL 1	Flat Roof	4.33	2.17	1.62	0.00	0.00	2.85
UDL 2	0.00	0.00	0.00	0.00	0.00	0.00	2.85
UDL 3	Wall 1000 & 1(	-	0.13	0.00	*(inc. swt)*	0.00	2.85

Reactions (kN):

	LHS	RHS	Ser
	3.27	3.27	D
	2.31	2.31	I
	5.58	5.58	Total
	0.00	0.00	W
	5.58	**5.58**	**Max**

Floor joists continuous over beam: **No**

Maximum Bending Moment: 3.98 kNm

Enter bending moment if a more accuarate analysis has been made: 3.98 kNm
Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 195 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*195*	*mm*
Total B	*135*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*13.43*	*kg/m*
Ixx	*8341.73*	*cm4*
Zxx	*855.56*	*cm3*
A	*263.25*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	2.06	360	7.92	**Deflection O.K.**
Total:	4.97	250	11.40	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	5.58	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.32	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	3.98	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	8.65	N/mm2
Maximum Adm. Bending Moment:	7.40	kNm

K7	*1.05*	
K8	*1.10*	
K9	*1.21*	

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	5.58	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2		
Minimum bearing length for beam:	26	mm		
Min.bearing l. for c/s on panel rail:	29	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	19	mm

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Project	Project no	CALCULATION SHEET
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Drawing no	Calculation by	Checked by	Date
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			Calculation sheet/revision no TBD 11

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Timber Beam Design

Ref: 1.11 Span (m): 1.15 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	7.89	3.95	2.96	0.00
UDL 2	Flat Roof	1.96	0.98	0.73	0.00
UDL 3	Wall 1000 & 1(	-	0.09	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

LHS	RHS	Ser
2.89	2.89	D
2.12	2.12	I
5.01	5.01	Total
0.00	0.00	W
5.01	**5.01**	**Max**

Start dim'n	End dim'n
0.00	1.15
0.00	1.15
0.00	1.15

Maximum Bending Moment: **1.44** **kNm**

Enter bending moment if a more accuarate analysis has been made: 1.44 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 195 x 45** **Grade:** **C24** **Glulam:** **No**

Beam Properties:

D	*195*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	

Axis of bending (relative to D & B): *x-x*

Service class: 1

K3	1.00	
Wt	*8.95*	*kg/m*
Ixx	*5561.16*	*cm4*
Zxx	*570.38*	*cm3*
A	*175.50*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	0.26	360	3.19	**Deflection O.K.**
Total:	0.62	250	4.60	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	5.01	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	0.78	N/mm2
Maximum Shear Stress:	0.43	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	1.44	kNm
Basic bending stress:	7.5	N/mm2
Adm.bending stress:	8.65	N/mm2
Maximum Adm. Bending Moment:	4.93	kNm

K7	*1.05*
K8	*1.10*
K9	*1.14*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	5.01	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	2.40	N/mm2		
Minimum bearing length for beam:	23	mm		
Min.bearing l. for c/s on panel rail:	26	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	25	mm

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Project	Project no	CALCULATION SHEET
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Timber Beam Design

Ref: 1.12 Span (m): 2.33 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)	Start dim'n	End dim'n
UDL 1	Flat Roof	3.34	1.67	1.25	0.00	0.00	2.33
UDL 2	0.00	0.00	0.00	0.00	0.00	0.00	2.33
UDL 3	Wall 1000 & 1(	-	0.08	0.00	*(inc. swt)*	0.00	2.33

Reactions (kN):

	LHS	RHS	Ser
	2.04	2.04	D
	1.46	1.46	I
	3.50	3.50	Total
	0.00	0.00	W
	3.50	**3.50**	**Max**

Floor joists continuous over beam: **No**

Maximum Bending Moment: **2.03** **kNm**

Enter bending moment if a more accuarate analysis has been made: 2.03 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **3 / 140 x 38** **Grade:** **C16** **Glulam:** **No**

Beam Properties:

D	*140*	*mm*
Total B	*114*	*mm*
No. of Timbers	3	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*8.14*	*kg/m*
Ixx	*2606.80*	*cm4*
Zxx	*372.40*	*cm3*
A	*159.60*	*cm2*

Deflection Check: Limits: L/x Limit Value: .

Live:	2.76	360	6.47	**Deflection O.K.**
Total:	6.62	250	9.31	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	3.50	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	0.74	N/mm2
Maximum Shear Stress:	0.33	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	2.03	kNm	*K7*	*1.09*
Basic bending stress:	5.3	N/mm2	*K8*	*1.10*
Adm.bending stress:	6.34	N/mm2	*K9*	*1.21*
Maximum Adm. Bending Moment:	2.36	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	3.50	kN		Charring:	0 mm
Adm Comp p to g on u/s beam:	2.20	N/mm2			
Minimum bearing length for beam:	18	mm			
Min.bearing l. for c/s on panel rail:	18	mm	on 1	38 x 89 stud/s	

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	14	mm		

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Timber Beam Design

Ref: 1.13 Span (m): 3.34 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	0.60	0.30	0.23	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 114 & 100	-	1.23	0.15	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	2.56	2.56	D
	0.63	0.63	I
	3.18	3.18	Total
	0.00	0.00	W
	3.18	**3.18**	**Max**
	Start dim'n	End dim'n	
	0.00	3.34	
	0.00	3.34	
	0.00	3.34	

Maximum Bending Moment: **2.66** **kNm**

Enter bending moment if a more accuarate analysis has been made: 2.66 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **2 / 300 x 45 Glu** **Grade:** **C18**
Glulam: **Yes**

Beam Properties:

D	*300*	*mm*
Total B	*90*	*mm*
No. of Timbers	2	

GL24c

Axis of bending (relative to D & B): *X-X*

Service class: 1

K3 1.00

Wt 13.77 kg/m
Ixx 20250.00 cm4
Zxx 1350.00 cm3
A 270.00 cm2

Deflection Check: Limits: L/x Limit Value:

Live:	0.31	360	9.28	**Deflection O.K.**
Total:	1.58	250	13.36	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	3.18	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	2.01	N/mm2
Maximum Shear Stress:	0.18	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	2.66	kNm
Basic bending stress:	5.8	N/mm2
Adm.bending stress:	8.91	N/mm2
Maximum Adm. Bending Moment:	12.03	kNm

K7 1.01
K8 1.10
K9 1.00

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	3.18	kN	Charring:	0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	10	mm		
Min.bearing l. for c/s on panel rail:	16	mm	on 1	38 x 89 stud/s

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	16	mm

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Timber Beam Design

Ref: 1.14 Span (m): 3.27 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	0.00	0.00	0.00	0.00
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	0.60	0.30	0.23	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 1(	-	0.07	0.00	*(inc. swt)*

Floor joists continuous over beam: **No**

Reactions (kN):

	LHS	RHS	Ser
	0.60	0.60	D
	0.37	0.37	I
	0.97	0.97	Total
	0.00	0.00	W
	0.97	**0.97**	**Max**

	Start dim'n	End dim'n
UDL 1	0.00	3.27
UDL 2	0.00	3.27
UDL 3	0.00	3.27

Maximum Bending Moment: **0.79** **kNm**

Enter bending moment if a more accuarate analysis has been made: 0.79 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **1 / 300 x 45 Glu** **Grade: C18** **Glulam: Yes**

Beam Properties:

D	*300*	*mm*
Total B	*45*	*mm*
No. of Timbers	1	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*6.89*	*kg/m*
Ixx	*10125.00*	*cm4*
Zxx	*675.00*	*cm3*
A	*135.00*	*cm2*

Deflection Check: Limits: L/x Limit Value: *GL24c*

Live:	0.34	360	9.08	**Deflection O.K.**
Total:	0.91	250	13.08	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	0.97	kN
Basic Shear Stress	0.67	N/mm2
Adm Shear Stress	1.83	N/mm2
Maximum Shear Stress:	0.11	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	0.79	kNm
Basic bending stress:	5.8	N/mm2
Adm.bending stress:	8.10	N/mm2
Maximum Adm. Bending Moment:	5.47	kNm

K7	*1.01*
K8	*1.00*
K9	*1.00*

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	0.97	kN		
Adm Comp p to g on u/s beam:	3.72	N/mm2		
Minimum bearing length for beam:	6	mm		
Min.bearing l. for c/s on panel rail:	5	mm	on 1	38 x 89 stud/s

Charring: 0 mm

Panel rail grade: C16 Stud size (w x d): 38 89

Adm Comp p to g on bottom rail:	2.20	N/mm2
Minimum bearing length:	10	mm

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Timber Beam Design

Ref: 1.15 Span (m): 3.38 m
Location: 0.00

Point Load Details

	Reference	Position (m)	Dead (kN)	Live (kN)
PL 1	1.13	2.47	2.56	0.63
PL 2	0.00	0.00	0.00	0.00
PL 3	0.00	0.00	0.00	0.00

Uniform Load Details - including partial UDL's

	Reference	Span (m)	Dead (kN/m)	Live (kN/m)	Wind (kN/m)
UDL 1	Flat Roof	3.34	1.67	1.25	0.00
UDL 2	0.00	0.00	0.00	0.00	0.00
UDL 3	Wall 1000 & 1(	-	0.07	0.00	*(inc. swt)*

Reactions (kN):

	LHS	RHS	Ser
	3.63	4.81	D
	2.29	2.58	I
	5.91	7.39	Total
	0.00	0.00	W
	5.91	**7.39**	**Max**
	Start dim'n	End dim'n	
	0.00	3.38	
	0.00	3.38	
	0.00	3.38	

Floor joists continuous over beam: **No**

Maximum Bending Moment: **6.39** **kNm**

Enter bending moment if a more accuarate analysis has been made: 5.84 kNm

Enter max shear force if a more accuarate analysis has been made: kN

Consider design as a trimmer: **No**

.

Beam Section Used: **1 / 300 x 45 Glu** **Grade:** **C24** **Glulam:** **Yes**

GL24h / GL28c

Beam Properties:

D	*300*	*mm*
Total B	*45*	*mm*
No. of Timbers	1	
Axis of bending (relative to D & B):	*x-x*	
Service class:	1	
K3	1.00	
Wt	*6.89*	*kg/m*
Ixx	*10125.00*	*cm4*
Zxx	*675.00*	*cm3*
A	*135.00*	*cm2*

Deflection Check: Limits: L/x Limit Value:

Live:	2.47	360	9.39	**Deflection O.K.**
Total:	6.54	250	13.52	**Deflection O.K.**

Shear Capacity Check:

Maximum Shear Force:	7.39	kN
Basic Shear Stress	0.71	N/mm2
Adm Shear Stress	1.66	N/mm2
Maximum Shear Stress:	0.82	N/mm2

Shear O.K.

Bending Moment Check:

Maximum Applied Bending Moment:	5.84	kNm	*K7*	*1.01*
Basic bending stress:	7.5	N/mm2	*K8*	*1.00*
Adm.bending stress:	10.48	N/mm2	*K9*	*1.00*
Maximum Adm. Bending Moment:	7.07	kNm		

Bending Moment O.K.

Minimum Bearing Length: Bearing detail: Panel rail Fire rating: N.A.

Maximum reaction:	7.39	kN			Charring: 0 mm
Adm Comp p to g on u/s beam:	3.72	N/mm2			
Minimum bearing length for beam:	44	mm			
Min.bearing l. for c/s on panel rail:	38	mm	on	2	38 x 89 stud/s

Panel rail grade:	C16	Stud size (w x d):	38	89
Adm Comp p to g on bottom rail:	2.20	N/mm2		
Minimum bearing length:	75	mm		

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Project: Extension to Lanchester EP Primary School

Project no: ######

CALCULATION SHEET

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: TBDS 1

Trimmer Beam Design Summary

Design Data		Bearing Length (mm)		Unfactored Reactions in kN				*Calc page*
Beam Ref	Section	& No. of Cripple studs	Grade / No. Off	LHS D	LHS I	RHS D	RHS I	*no.*
1.15	1 / 300 x 45 Glu	75 / 2	GL24h / GL28c	3.63	2.29	4.81	2.58	TBD15
1.14	1 / 300 x 45 Glu	10 / 1	GL24c	0.60	0.37	0.60	0.37	TBD14
1.13	2 / 300 x 45 Glu	17 / 1	GL24c	2.56	0.63	2.56	0.63	TBD13
1.12	3 / 140 x 38	14 / 1	C16	2.04	1.46	2.04	1.46	TBD12
1.11	2 / 195 x 45	26 / 1	C24	2.89	2.12	2.89	2.12	TBD11
1.10	3 / 195 x 45	19 / 1	C24	3.27	2.31	3.27	2.31	TBD10
1.09	3 / 140 x 38	17 / 1	C16	2.34	1.69	2.34	1.69	TBD9
1.08	2 / 195 x 45	26 / 1	C24	2.88	2.12	2.88	2.12	TBD8
1.07	2 / 195 x 45	43 / 2	C24	4.89	3.60	4.89	3.60	TBD7
1.06	3 / 140 x 38	1 / 1	C16	0.16	0.09	0.16	0.09	TBD6
1.05	3 / 145 x 45	21 / 1	C24	3.55	2.53	2.63	1.86	TBD5
1.04	2 / 300 x 45 Glu	27 / 1	GL24c	3.10	2.23	3.10	2.23	TBD4
1.03	3 / 140 x 38	10 / 1	C16	0.72	0.51	1.37	0.99	TBD3
1.02	3 / 140 x 38	8 / 1	C16	1.15	0.80	1.15	0.80	TBD2
1.01	3 / 140 x 38	4 / 1	C16	0.56	0.39	0.56	0.39	TBD1

Headbinder Design

It is usual in timber frame construction to have a headbinder above the top rail of the panel. This is used so that the joists do not have to coincide with the stud below. It is generally accepted that where a headbinder is present no design checks are required on the capacity on the two rails to carry the joist reaction to the adjacent studs.
Where no headbinder is present the maximum offset between joist and stud is half the joist width.
However, provided the Designer can demonstate that a single top panel rail is adequate there is no other design requirement for a headbinder.

One considerations to be made before omitting the headbinder is the practical issue of being able to align the panels. Where single panels generally intersect at corners or at incoming walls there is less of a requierment than where long walls are constructed from numerous panels.

One advantage in omitting the headbinder is that it reduces the potential for cross grain shrinkage.

Consider the following conditions for headbinder designs.

1. Party wall		mm studs
2. External wall	140	mm studs
3. Internal wall	89	mm studs
4. Internal wall	89	mm studs
5. Roofs	89	mm studs

Not all combinations may occur on this project.
Since the joist reaction can be applied at any point check for maximum shear stress in addition to bending. Other materials in addition to CLS may be used and there shear stress values are listed below.
If the headbinder should fail in either shear or bending then the studs must be positioned below the joist reaction to negate this condition.

Note: The reference to headbinder also includes the top rail to the panel. It is the timber rail/s which carry the joist reactions.

The bending moment and shear force coefficients have been taken from the Timber Designers Manual, and also cross checked against the design rules for crane beams.

Bending overstress of up to 40% against calculation methods have been permitted on the basis of the report by the Eastern Forest Products Laboratory, Ottawa titled 'The Strength of Top Plates on Wood Stud Walls' dated 1975. This report concludes that 2 x 38 x 89 rails will safely support 8.0kN.
Engineers must satisfy themselves as to the validity of this report due to changes within the industry.

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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no HB2

Headbinder Design - Condition 1 - Party wall

Floor type:					
Total Load:		kN/m^2			
Joist Span:		m			
Joist Spacing:		mm			
Stud - Spacing:		mm			
Headbinder Depth:	38	mm			
Headbinder Width:	0	mm			
Number of rails:	2	No. (*Top panel rail counts as 1*)			
Timber Grade:	C16			*Mmt coeff.:*	
Basic Bending Stress:	5.30	N/mm^2	K_3 1.00	*Shear coeff.:*	
Adm Bending Stress:	6.12	N/mm^2			
Joist Reaction:		kN		Max Shear Force:	kN
Max Bending Moment in headbinder:		kNm			
Section Modulus of Headbinder:	0	mm^3			
Adm Bending Moment:	0.000	kNm			
Adm Shear Stress:	0.74	N/mm^2			
Max Shear Stress:		N/mm^2			

Headbinder Design - Condition 2 - External wall

Floor type:	Flat Roof				
Total Load:	1.75	kN/m^2			
Joist Span:	7.89	m			
Joist Spacing:	600	mm			
Stud Spacing:	600	mm			
Headbinder Depth:	38	mm			
Headbinder Width:	140	mm			
Number of rails:	2	No. (*Top panel rail counts as 1*)			
Timber Grade:	C16			*Mmt coeff.:*	*0.08*
Basic Bending Stress:	5.30	N/mm^2	K_3 1.00	*Shear coeff.:*	*0.715*
Adm Bending Stress:	6.12	N/mm^2			
Joist Reaction:	4.15	kN		Max Shear Force:	2.96 kN
Max Bending Moment in headbinder:	0.199	kNm			
Section Modulus of Headbinder:	67387	mm^3		.	
Adm Bending Moment:	0.413	kNm	48.25%	**Bending Adequate**	
Adm Shear Stress:	0.74	N/mm^2		.	
Max Shear Stress:	0.42	N/mm^2	56.71%	**Shear Adequate**	
				.	

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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: HB3

Headbinder Design - Condition 3 - Internal wall

Floor type:	Flat Roof					
Total Load:	1.75	kN/m^2				
Joist Span 1:	7.89	m	Joist Span 2:		1.96	m
Joist Spacing:	600	mm				
Stud Spacing:	400	mm				
Joists continuous over headbinder:	Yes					
Headbinder Depth:	38	mm				
Headbinder Width:	89	mm				
Number of rails:	2	No. (*Top panel rail counts as 1*)			*Mmt coeff.:*	*0.08*
Timber Grade:	C16				*Shear coeff.:*	*0.57*
Basic Bending Stress:	5.30	N/mm^2	K_3	1.00		
Adm Bending Stress:	6.12	N/mm^2				
Joist Reaction:	6.47	kN	Max Shear Force:	3.69	kN	
Max Bending Moment in headbinder:	0.207	kNm				
					40% overstress permitted	
Section Modulus of Headbinder:	42839	mm^3			**Bending Adequate**	
Adm Bending Moment:	0.262	kNm	78.91%		.	
Adm Shear Stress:	0.74	N/mm^2			**Shear Adequate**	
Max Shear Stress:	0.82	N/mm^2	**110.91%**		.	

Headbinder Design - Condition 4 - Internal wall

Floor type:	Flat Roof					
Total Load:	1.75	kN/m^2				
Joist Span 1:	4.33	m	Joist Span 2:		5.52	m
Joist Spacing:	600	mm				
Stud Spacing:	400	mm				
Joists continuous over headbinder:	Yes					
Headbinder Depth:	38	mm				
Headbinder Width:	89	mm				
Number of rails:	2	No. (*Top panel rail counts as 1*)			*Mmt coeff.:*	*0.08*
Timber Grade:	C16				*Shear coeff.:*	*0.57*
Basic Bending Stress:	5.30	N/mm^2	K_3	1.00		
Adm Bending Stress:	6.12	N/mm^2				
Joist Reaction:	6.47	kN	Max Shear Force:	3.69	kN	
Max Bending Moment in headbinder:	0.207	kNm				
					40% overstress permitted	
Section Modulus of Headbinder:	42839	mm^3			**Bending Adequate**	
Adm Bending Moment:	0.262	kNm	78.91%		.	
Adm Shear Stress:	0.74	N/mm^2			**Shear Adequate**	
Max Shear Stress:	0.82	N/mm^2	**110.91%**		.	

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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095.00	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: HB4

Headbinder Design - Condition 5 - Roof

Roof type: Flat Roof

Dead Load:	1.00 kN/m² (*LT*)	External Imposed:	0.75	kN/m² (*ST*)	
		Internal Imposed:	0.00	kN/m² (*MT*)	
Truss Span:	8.00 m		0.00	kN/m² (*LT*)	
Truss Spacing:	600 mm	Max attic floor span:		m	
Stud Spacing:	600 mm				

Headbinder Depth:	38 mm		
Headbinder Width:	89 mm		
Number of rails:	2 No. (*Top panel rail counts as 1*)	*Mmt coeff.:*	*0.08*
Timber Grade:	C16	*Shear coeff.:*	*0.715*
Basic Bending Stress:	5.30 N/mm²		
Adm Bending Stress (*LT*)	6.12 N/mm²		
Adm Bending Stress (*MT*)	7.65 N/mm²		
Adm Bending Stress (*ST*)	9.18 N/mm²		

Truss Reaction (*LT*):	2.40 kN	Max Shear Force:	1.72 kN
Truss Reaction (*MT*):	2.40 kN	Max Shear Force:	1.72 kN
Truss Reaction (*ST*):	4.20 kN	Max Shear Force:	3.01 kN

Max Bending Moment in headbinder (*LT*)	0.115 kNm		
Max Bending Moment in headbinder (*MT*)	0.115 kNm		
Max Bending Moment in headbinder (*ST*)	0.202 kNm		
Section Modulus of Headbinder:	42839 mm³		
Adm Bending Moment (*LT*):	0.262 kNm	43.98%	.
Adm Bending Moment (*MT*):	0.328 kNm	35.19%	**Bending Adequate**
Adm Bending Moment (*ST*):	0.393 kNm	51.29%	.
Adm Shear Stress (*LT*):	0.70 N/mm²		
Adm Shear Stress (*MT*):	0.88 N/mm²		
Adm Shear Stress (*ST*):	1.06 N/mm²		
Max Shear Stress (*LT*):	0.38 N/mm²	54.16%	.
Max Shear Stress (*MT*):	0.38 N/mm²	43.33%	**Shear Adequate**
Max Shear Stress (*LT*):	0.67 N/mm²	63.15%	.

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: PF 1

Horizontal Shear Between Panels & Soleplate or Between Multiple Soleplates

This also satisfies the Disproportionate Collapse requirements of 2A structures

Check there is adequate nailing at these interfaces to transmit the racking forces down through the structure, utilizing a friction coefficient of friction of: 0.40

The **average** dead load taken for this frictional resistance is: Ground floor only 2.23 kN/m; First floor and above kN/m

The following maximums occur based upon racking wall calculations:

Ground floor only 3.18 kN/m less frict. rest. of: 0.89 kN/m

First floor and above 0.00 kN/m less frict. rest. of: kN/m

Factor of safety required: 1 *(See racking calculations pages R1 Et. Seq.)*

If anchorage is based upon shortfall in sliding capacity (*see page OS1*) then the resulant shear force per m run of load bearing internal, external and party wall is: 0.00 kN/m

Base shear calculation on using: racking wall values

Therefore use the the following values: Ground floor only 2.29 kN/m; First floor and above kN/m

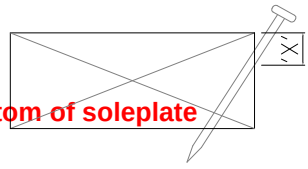
Consider the worst case of panel base or head for material build up:

Panel rail thickness:	38		
Soleplate / headbinder thickness:	38 mm	x wide:	89 mm
Angle of skew screw (*from vertical*):	0 °	Sheathing thickness:	mm
Lowest timber grade:	C16		
Nail diameter used:	3 mm	.	
Nail length used:	90 mm	*Edge dist. 5d:*	*15.00 mm*
Dimension 'x' :	0	*Spacing perp to grain 10d:*	*30.00 mm*

Values from BS 5268-2:2002 (Table 61)

Standrard Penetration: 36 mm

Basic Shear Load: 306 N



Caution! - Nail protrudes out of bottom of soleplate

Pointside penetration into soleplate: 38 mm

Ratio of actual to standard thickness of headside member: 1.056 .

Ratio of actual penetration to standard pointside thickness: 1.056 .

.

Therefore reduction factor for sub-standard penetration is: 1.000 . .

Factor, K_{48} Load duration: 1.25

Factor, K_{50} number of fixings in line: 0.9

Admisable load per nail: 344.25 N

Note: If a factor of safety of 1.0 is used above, this is because the UKTFA technical guidance states that there is already a factor of 1.4 built into the values in BS 5268

Ground floor only

Nail arrangement: Single

Nail Spacing: 150 mm

Shear Capacity: 2.30 kN/m

Nailing Specification Adequate

3 mm dia x 90mm long nails at 150 mm

First floor and above

Nail arrangement:

Nail Spacing: mm

Shear Capacity: kN/m

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: PF 2

Horizontal Shear Between Soleplate & Rim Beam

Check there is adequate nailing at these interfaces to transmit the racking forces down through the structure, utilizing a friction coefficient of friction of: 0.40

The dead load that has been taken for this frictional resistance is: Ground to third: 2.23 kN/m
Third to Sixth: kN/m

The following maximums occur: *(See racking calculations pages R1 Et. Seq.)*

Ground floor only 3.18 kN/m less frict. rest. of: 0.89 kN/m
First floor and above 0.00 kN/m less frict. rest. of: kN/m

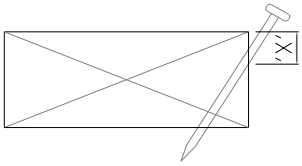
Therefore use the the following values for Ground floor only 2.29 kN/m
First floor and above kN/m

Consider the worst case of panel base or head for material build up:

Angle of skew screw (*from vertical*) :	0 °	Sheathing thickness:	mm
Soleplate / headbinder thickness:	38 mm	x wide: 89 mm	
Structural deck thickness:	22 mm		
Lowest timber grade:	C16		
Nail diameter used:	3 mm	.	
Nail length used:	90 mm	*Edge dist. 5d:*	*15.00 mm*
Dimension 'x' :	0	*Spacing perp to grain 10d:*	*30.00 mm*

Values from BS 5268-2:2002 (Table 61)

Standrard Penetration: 36 mm
Basic Shear Load: 306 N



Pointside penetration into rim beam: 30 mm
Ratio of actual to standard thickness of headside member: 1.056 .
Ratio of actual penetration to standard pointside thickness: 0.833 .
.

Therefore reduction factor for sub-standard penetration is: 0.833 . .

Factor, K_{48} Load duration: 1.25
Factor, K_{50} number of fixings in line: 0.9

Admisable load per nail: 286.88 N

Ground floor only *This check only applicable for timber ground floors.*

Nail arrangement: Single
Nail Spacing: 125 mm
Shear Capacity: 2.30 kN/m

Nailing Specification Adequate
3 mm dia x 90mm long nails at 125 mm

First floor and above

Nail arrangement:
Nail Spacing: mm
Shear Capacity: kN/m

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Project: Extension to Lanchester EP Primary School | Project no: 3095.00 | **CALCULATION SHEET**

Drawing no | Calculation by: RG | Checked by | Date: Feb-17 | Calculation sheet/revision no: PF 3

Horizontal Shear Between Soleplate & Concrete Slab

Check there is adequate fixing at these interfaces to transmit the racking forces down through the structure, based upon screw fixings.

The following maximums occur: *(See racking calculations pages R1 Et. Seq.)*

Ground floor only 3.18 kN/m less frict. rest. of: 0.89 kN/m

If anchorage is based upon shortfall in sliding capacity (*see page OS1*) then the resulant shear force per m run of load bearing internal, external and party wall is: 0.00 kN/m

Base shear calculation on using: racking wall values

Therefore use the the following values between ground & third floor level: 2.29 kN/m

This shear value has no f.o.s. on the basis that the fixing s.w.l. has approx f.o.s. of 3.3.

Consider the worst case of panel base or head for material build up:

Fixing type: Tapcon masonry fastener | Substrate: 7N Block

Upper Soleplate thickness (*if more than 1*): 38 mm x wide: 89 mm

Lowest timber grade: C16

Screw diameter used: 6 mm

Screw length used: 95 mm

Edge dist. 5d: *30.00 mm*

Spacing perp to grain 3d: *18.00 mm*

Values from BS 5268-2:2002 (Table 66)

Standrard Penetration: 21 mm (*Headside*)

Basic Shear Load: 765 N

Pointside penetration into slab: 57 mm

Ratio of actual to standard thickness of headside member: 1.810

Therefore reduction factor for sub-standard penetration is: 1.000

Factor, K_{52} Load duration: 1.25

Factor, K_{54} number of fixings in line: 0.9

Admisable load per fixing in timber: 860.63 N

Admisable load per fixing in substrate: 1180.00 N

Soleplete Fixings

Screw arrangement: Single

Screw Spacing: 350 mm

Shear Capacity: 2.46 kN/m

Fixing Specification Adequate

Other alternatives are:

1. Masonry nails at 175mm centres with a 0.4kN SWL capacity to all load bearing walls.

Check edge distances. Hilti ref: NK64/S12 for a 38mm soleplate thickness

2. Soleplate anchors at 525mm centres fixed to the slab with 3no. masonry nails each having 0.4kN SWL capacity and to the soleplate with 3no. 3.75 x 30 sq twist nails.

Anchors to be fixed to all load bearing walls.

MASONRY NAILS ARE NOT SUITABLE FOR BEAM AND BLOCK FLOORS.

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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no PF 4

Horizontal Shear Between beam & block floor and masonry substructure

Check there is adequate shear strength between the beam and block floor and the masonry substructure.
This calc is provided for assurance to the client that all is in order but is strictly beyond the control of the timber frame fabricator.
It is based on the strength of the block work being 7N minimum and the beam and block floor bedded on a mortar joint and NOT laid on a dry joint.

Horizontal longitudinal force taken from page PF3: 3.18 kN/m unfactored

Partial safety factor for wind load = 1.4. 4.45 kN/m factored

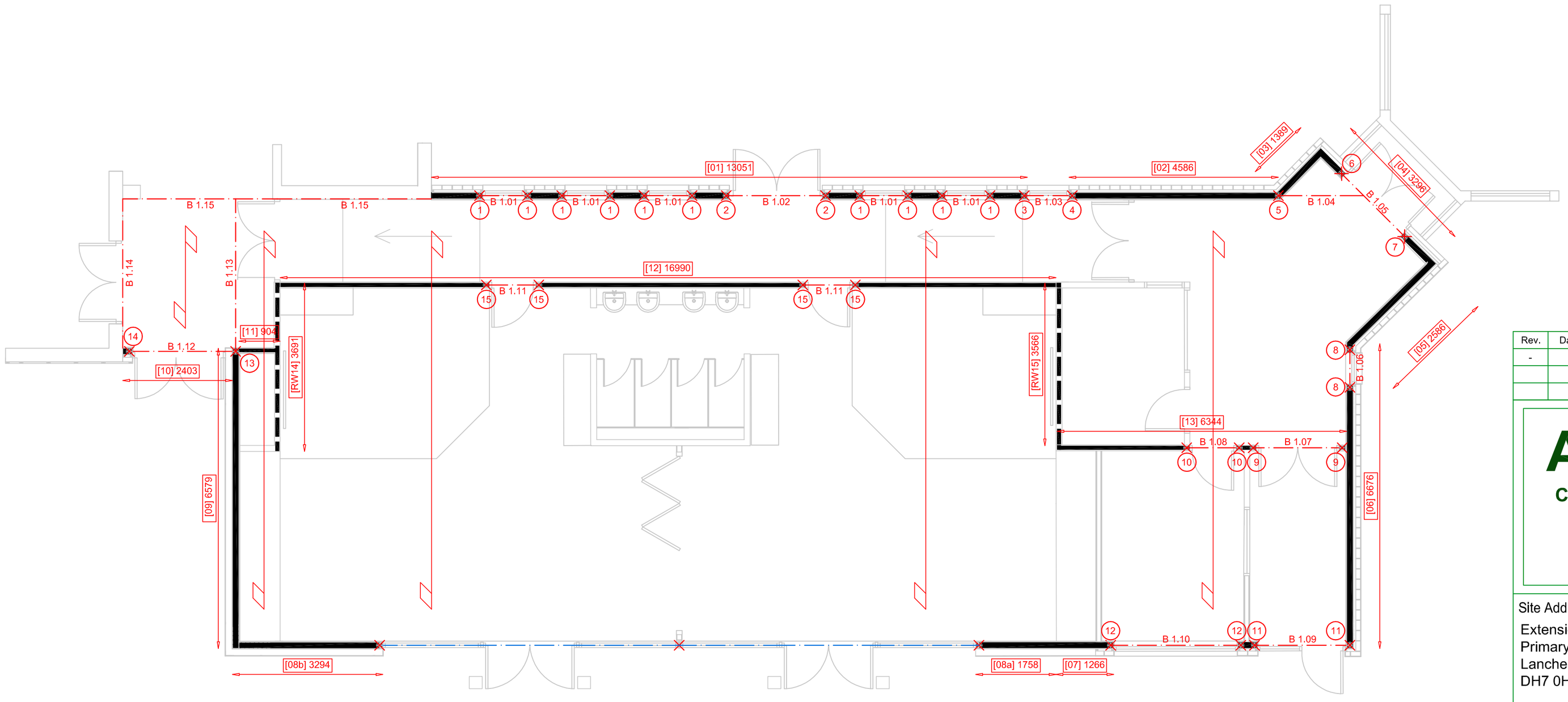
Resulting shear stress in bed joint based block width of: 100 mm
is 0.04 N/mm^2

Assuming class iii mortar, characteristic shear strength from BS5628 is

$fv = 0.15 + 0.6gA$, with a maximum value of $1.4N/mm^2$
$\gamma mv = 2.5$ (Clause 27.4)

Assuming an average dead load of:	2.23	kN/m
gA then =:	0.022	N/mm^2
& 0.6gA=:	0.013	N/mm^2
fv=:	0.163	N/mm^2
fv / γm =:	0.065	N/mm^2

Masonry shear stress O.K.
68.07%



Rev.	Date	Details	Drawn
-	-	-	-

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Site Address:
Extension to Lanchester EP Primary School,
Lanchester, Durham
DH7 0HU

Description:
Ground Floor References

Drawing Number: 3095 - SK1

Date: 27-Feb-2017

Scale: 1:75 @ A2

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G

Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @ 600mm c/c
- Party = N/A
- ILB = 38x89mm C16 Studs @ 600mm c/c

Alignment of studs with joists:
- External = N/A
- Party = N/A
- ILB = As noted on drawing

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Ties:
- N/A

Wall Panel Fixings:
- Soleplate (s/p) =
  Tapcon fasteners 6.35Φx95mm @ 350mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0Φx90mm nails @ 150mm c/c
- Panel-Deck where Soleplate omitted (w/p) =
  N/A

Sheathing:
9mm OSB @ 150mm c/c both gable and eaves directions, used throughout on all external walls as standard.

Lintels:
- External Walls = N/A
- Party Walls = N/A
- ILB = N/A

Beams/Trimmers:
- N/A

Cripple/Full height Studs:
- N/A

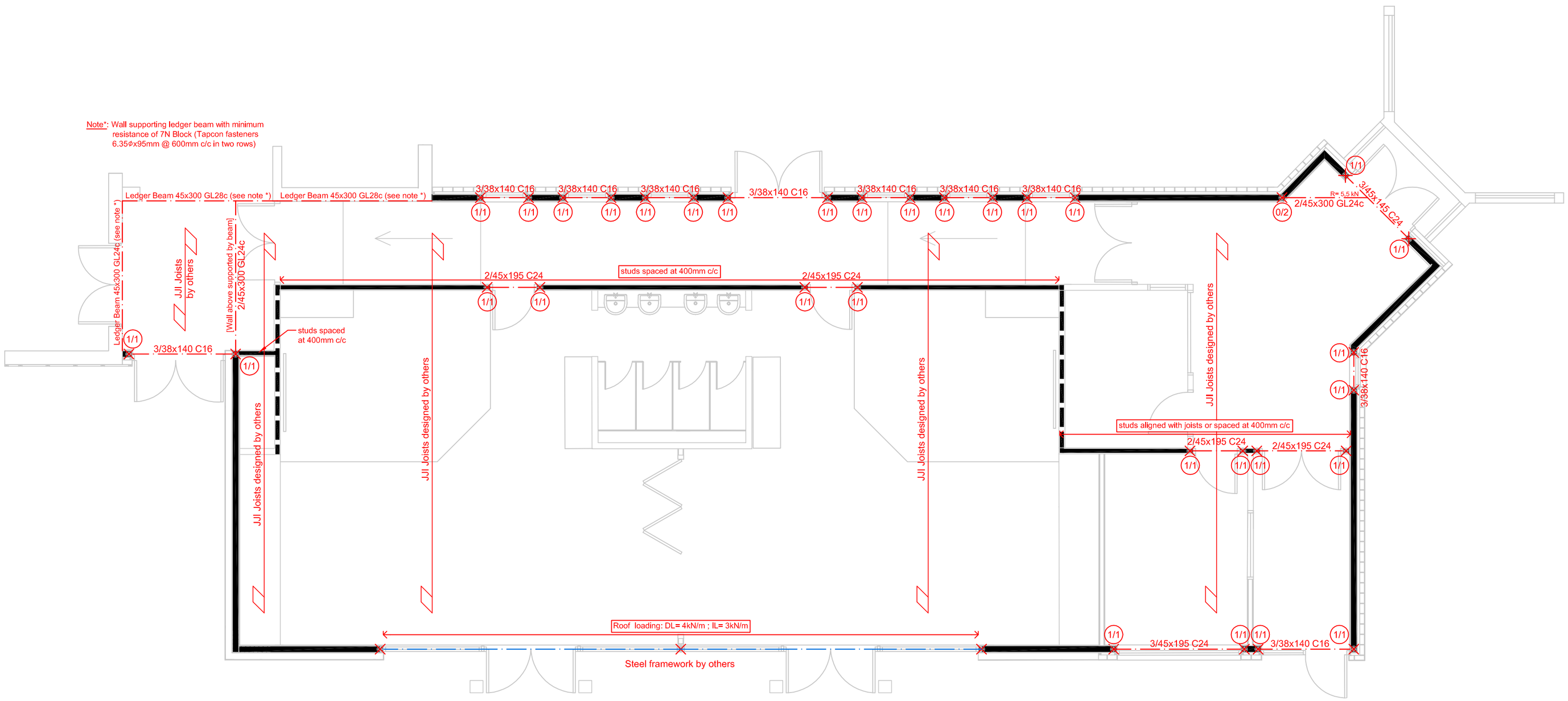
Roof Joists:
- JJI joists designed by others
- Floor Joists to align with wall studs
  - External = N/A
  - Party = N/A
  - ILB = N/A

F.A.O. Truss Designer:
- Plots considered to lie within open country
- Plots considered outside of Long Horn Beetle Area
- Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 0.840 kN/m².
- JJI-joists used throughout at maximum 600mm c/c
- Roof joists to align with wall studs;
  - External = N/A
  - Party = N/A
  - ILB = As noted on drawing
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.000 kN/m²
	Imposed	= 0.750 kN/m²
Floor -	Dead	= N/A
	Imposed	= N/A
Walls -	External	= 0.597 kN/m²
	Party	= N/A
	ILB	= 0.485 kN/m²

THIS DRAWING MUST NOT BE SCALED.
PRIOR TO THE COMMENCEMENT OF ANY WORKS, THE BUILDER IS TO CHECK AND/OR DETERMINE ALL CONSTRUCTION DETAILS, INCLUDING CHECKING EXISTING SITE LEVELS AND DIMENSIONS. THE DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS, CONSTRUCTION NOTES AND/OR PROJECT SPECIFICATION. ALL DISCREPANCIES SHOULD BE REPORTED IMMEDIATELY.



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STRUCTURAL MARK-UPS LEGEND:
- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. (No. Cripple Studs/No. Full Height Studs) 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
-	-	-	-

Site Address:
Extension to Lanchester EP Primary School,
Lanchester, Durham
DH7 0HU

Description:
Ground Floor
Structural Mark-Ups

Drawing Number: 3095 - 002

Date: 27-Feb-2017 Scale: 1:75 @ A2

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G Checked: M.K.

Client:
Karlin Timber Frame (NE) Ltd.

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ADEPT Consulting (UK) Ltd
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Chepstow, Monmouthshire NP16 5UH
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Project	Project no	**CALCULATION SHEET**
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17

Calculation sheet/revision no: FND 1

Wall Foundation Loads - Unfactored

				Wind kN/m +/-		
Wall Ref	**Dead kN/m**	**Live kN/m**	**Total kN/m**	**Longitudinal**	**Lateral**	**Vertical**
1	3.00	1.00	5.00	0.23	1.02	1.00
2	5.00	3.00	10.00	0.83	0.98	2.00
3	2.00	1.00	18.00	1.98	0.98	15.00
4	2.00	1.00	3.00	0.00	0.98	0.00
5	4.00	2.00	20.00	3.50	0.98	14.00
6	2.00	1.00	8.00	3.13	0.98	5.00
7	5.00	2.00	10.00	0.34	0.98	3.00
8	7.00	4.00	14.00	0.72	1.02	3.00
9	3.00	1.00	10.00	3.45	1.02	6.00
10	5.00	2.00	7.00	0.00	1.02	0.00
11	10.00	6.00	20.00	0.33	0.00	4.00
12	12.00	8.00	21.00	0.23	0.00	1.00
13	9.00	6.00	16.00	0.83	0.00	1.00

NOTE 1: Loads given above exclude any external masonry leaf unless it is carried by the timber frame.
NOTE 2: Steel transfer grillages should be designed based upon a maximum deflection of L/360 or 14mm, whichever is the lesser, under total loads to prevent undue distress to the timber frame.

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Project	Project no	CALCULATION SHEET
Extension to Lanchester EP Primary School	3095	

Drawing no	Calculation by	Checked by	Date
	RG		Feb-17
			Calculation sheet/revision no
			FND 2

Cripple Stud Foundation Loads - Unfactored

Stud Ref	Dead kN	Live kN	Total kN
1	0.61	0.42	1.04
2	1.27	0.88	2.14
3	0.79	0.56	1.35
4	1.51	1.09	2.60
5	3.41	2.45	5.87
6	3.91	2.78	6.69
7	2.89	2.05	4.94
8	0.17	0.10	0.27
9	5.38	3.96	9.34
10	3.17	2.34	5.51
11	2.58	1.86	4.44
12	3.60	2.54	6.14
13	5.06	2.29	7.35
14	2.24	1.60	3.85
15	3.17	2.34	5.51
0			

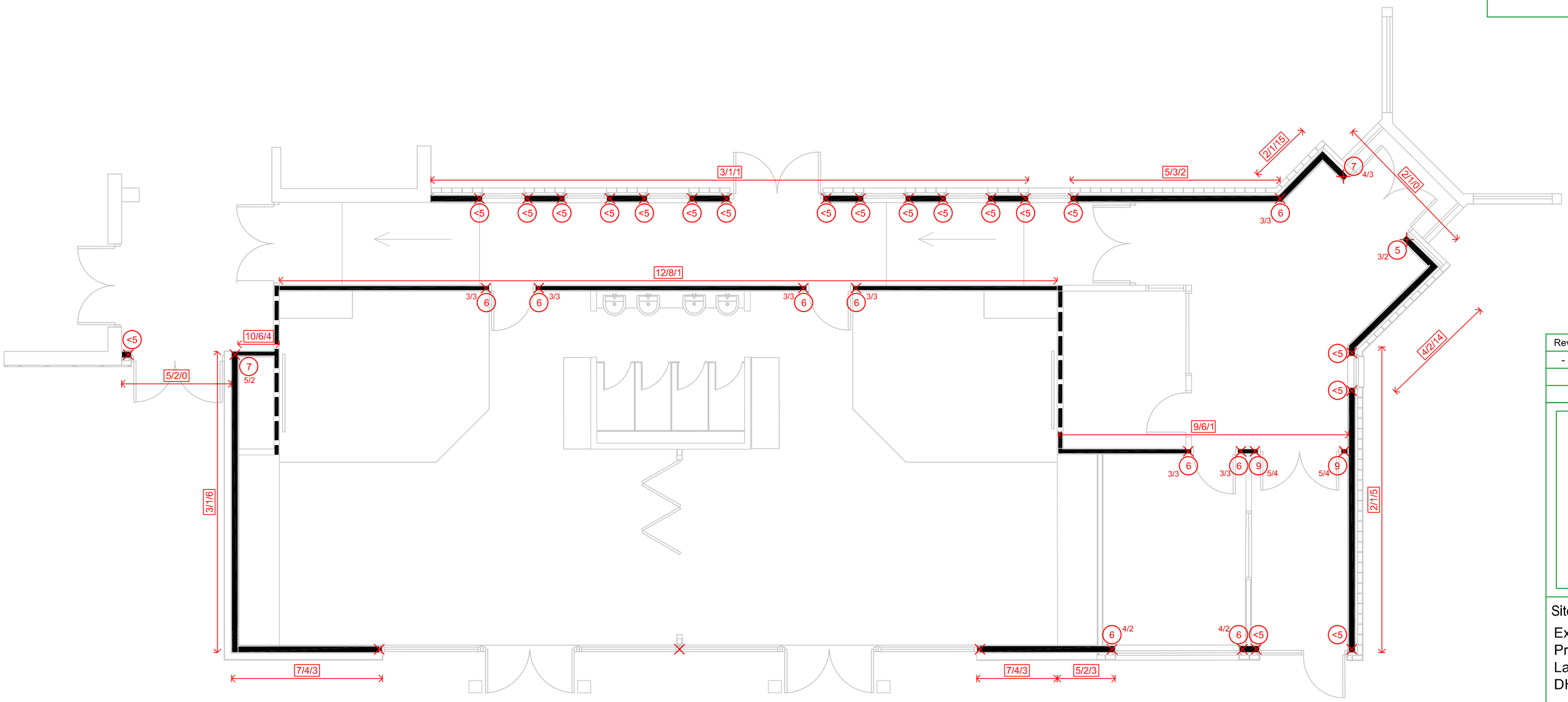
NOTE 1: Loads given above exclude any external masonry leaf unless it is carried by the timber frame.
NOTE 2: Steel transfer grillages should be designed based upon a maximum deflection of L/360 or 14mm, whichever is the lesser, under total loads to prevent undue distress to the timber frame.

NOTES:

5/2/1 — Denotes (UNFACTORED DEAD/IMPOSED/ VERTICAL WIND) Line Loads IN kN/m run.
Minimum loads of 5kN/m Ommited for Clarity.
The wind load gives a reversible triangular load distribution of max.positive to max.negative.

25 9/16 — Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads in kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight cladding, if present is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 'x' kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings in both the internal and external loadbearing wall (refer to architects layouts for extent of all openings). these should be calculated from UDL and allowed for in the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR Inner leafs. if masonry is included it will be denoted : M -
Ground floor loads are excluded. if a timber ground floor is included it will be denoted : GF -



Rev.	Date	Details	Drawn
-	-	-	-

ADEPT
Consulting(UK) Ltd

ADEPT Consulting(UK) Ltd
Riverside Court,
Beufort Park
Chepstow
Monmouthshire
NP16 5UH
t: 01291635522
m: 07515361138
f: 01173 376702
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address:
Extension to Lanchester EP Primary School,
Lanchester, Durham
DH7 0HU

Description:
Line & Point Loads

Drawing Number: 3095 - 001

Date: 27-Feb-2017

Scale: 1:75 @ A2

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G

Checked: M.K.

Client:

Karlin Timber Frame (NE) Ltd.

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @ 600mm c/c
- Party = N/A
- ILB = 38x89mm C16 Studs @ 600mm c/c

Alignment of studs with joists:
- External = N/A
- Party = N/A
- ILB = As noted on drawing

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Ties:
- N/A

Wall Panel Fixings:
- Soleplate (s/p) =
  Tapcon fasteners 6.35Φx95mm @ 350mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0Φx90mm nails @ 150mm c/c
- Panel-Deck where Soleplate omitted (w/p) =
  N/A

Sheathing:
9mm OSB @ 150mm c/c both gable and eaves directions, used throughout on all external walls as standard.

Lintels:
- External Walls = N/A
- Party Walls = N/A
- ILB = N/A

Beams/Trimmers:
- N/A

Cripple/Full height Studs:
- N/A

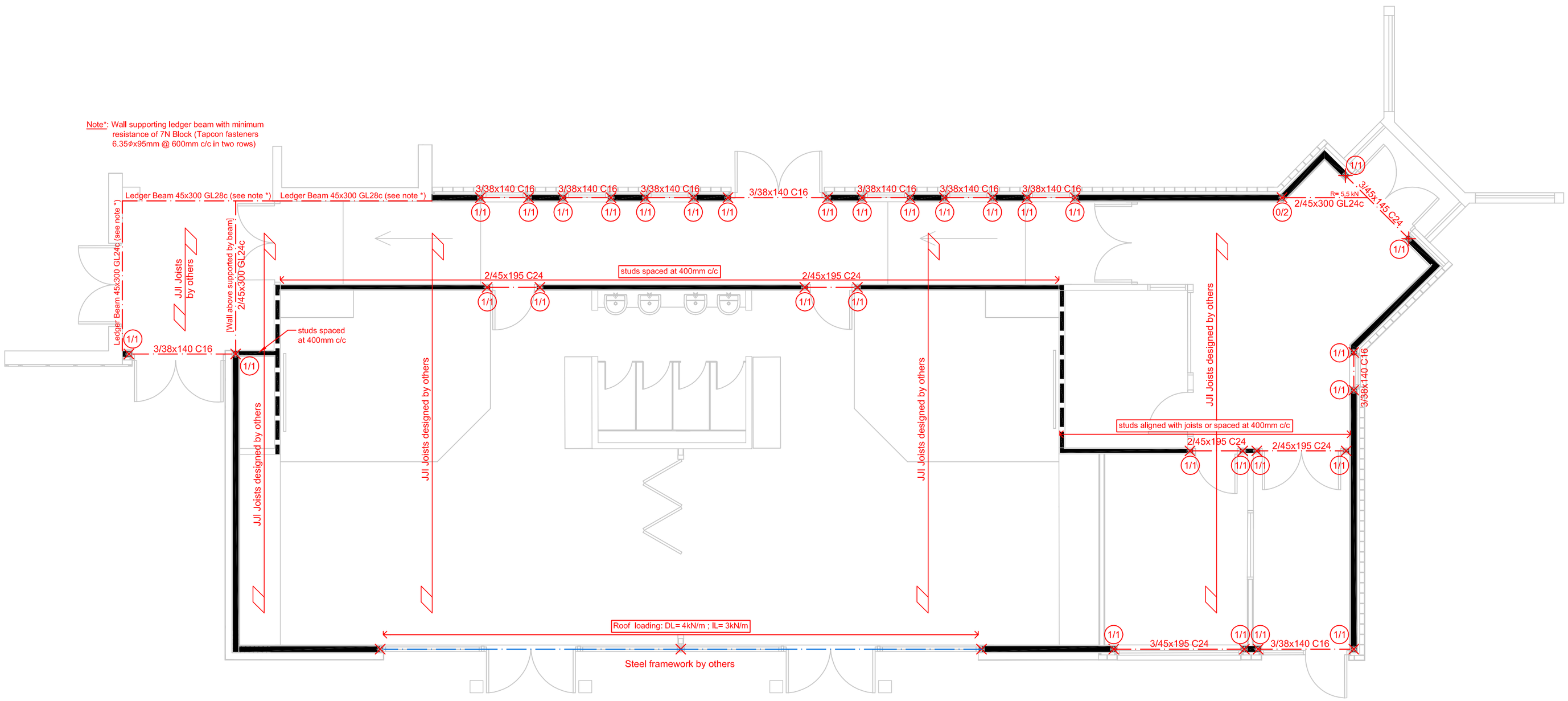
Roof Joists:
- JJI joists designed by others
- Floor Joists to align with wall studs
  - External = N/A
  - Party = N/A
  - ILB = N/A

F.A.O. Truss Designer:
- Plots considered to lie within open country
- Plots considered outside of Long Horn Beetle Area
- Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 0.840 kN/m².
- JJI-joists used throughout at maximum 600mm c/c
- Roof joists to align with wall studs;
  - External = N/A
  - Party = N/A
  - ILB = As noted on drawing
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.000 kN/m²
	Imposed	= 0.750 kN/m²
Floor -	Dead	= N/A
	Imposed	= N/A
Walls -	External	= 0.597 kN/m²
	Party	= N/A
	ILB	= 0.485 kN/m²

THIS DRAWING MUST NOT BE SCALED.
PRIOR TO THE COMMENCEMENT OF ANY WORKS, THE BUILDER IS TO CHECK AND/OR DETERMINE ALL CONSTRUCTION DETAILS, INCLUDING CHECKING EXISTING SITE LEVELS AND DIMENSIONS. THE DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS, CONSTRUCTION NOTES AND/OR PROJECT SPECIFICATION. ALL DISCREPANCIES SHOULD BE REPORTED IMMEDIATELY.



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m: 07515361138
f: 01173 376702
e-mail: info@adeptco.co.uk
www.adeptco.co.uk

STRUCTURAL MARK-UPS LEGEND:
- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. (No. Cripple Studs/No. Full Height Studs) 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
-	-	-	-

Site Address:
Extension to Lanchester EP Primary School,
Lanchester, Durham
DH7 0HU

Description:
Ground Floor
Structural Mark-Ups

Drawing Number: 3095 - 002

Date: 27-Feb-2017 Scale: 1:75 @ A2

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G Checked: M.K.

Client:
Karlin Timber Frame (NE) Ltd.

Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres)

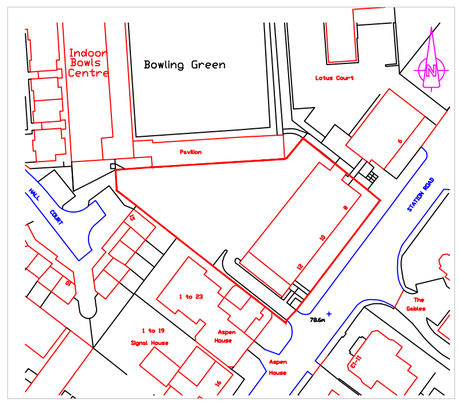
Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre)

DRAWING SIZE A1

NOTES :

ALL DIMENSIONS TO BE CHECKED ON SITE. ONLY FIGURED DIMENSIONS TO BE USED. ANY DISCREPANCIES TO BE RAISED WITH SIDEY DESIGN BEFORE WORK COMMENCES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERS INFORMATION AND CALCULATIONS



Location Plan
Scale 1:1250

Existing Lower Ground Floor/Site Plan (Based on Topographical Survey)
Scale 1:100

Sidey Design ARCHITECTURE ©

10 MARKET SQUARE, HIGHAM FERRERS, NN10 8BT
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EMAIL: enquiries@sideydesign.co.uk
WEBSITE: www.sideydesign.co.uk

Drawing Status

PLANNING

Client

Barton Lodge Developments Ltd

Title

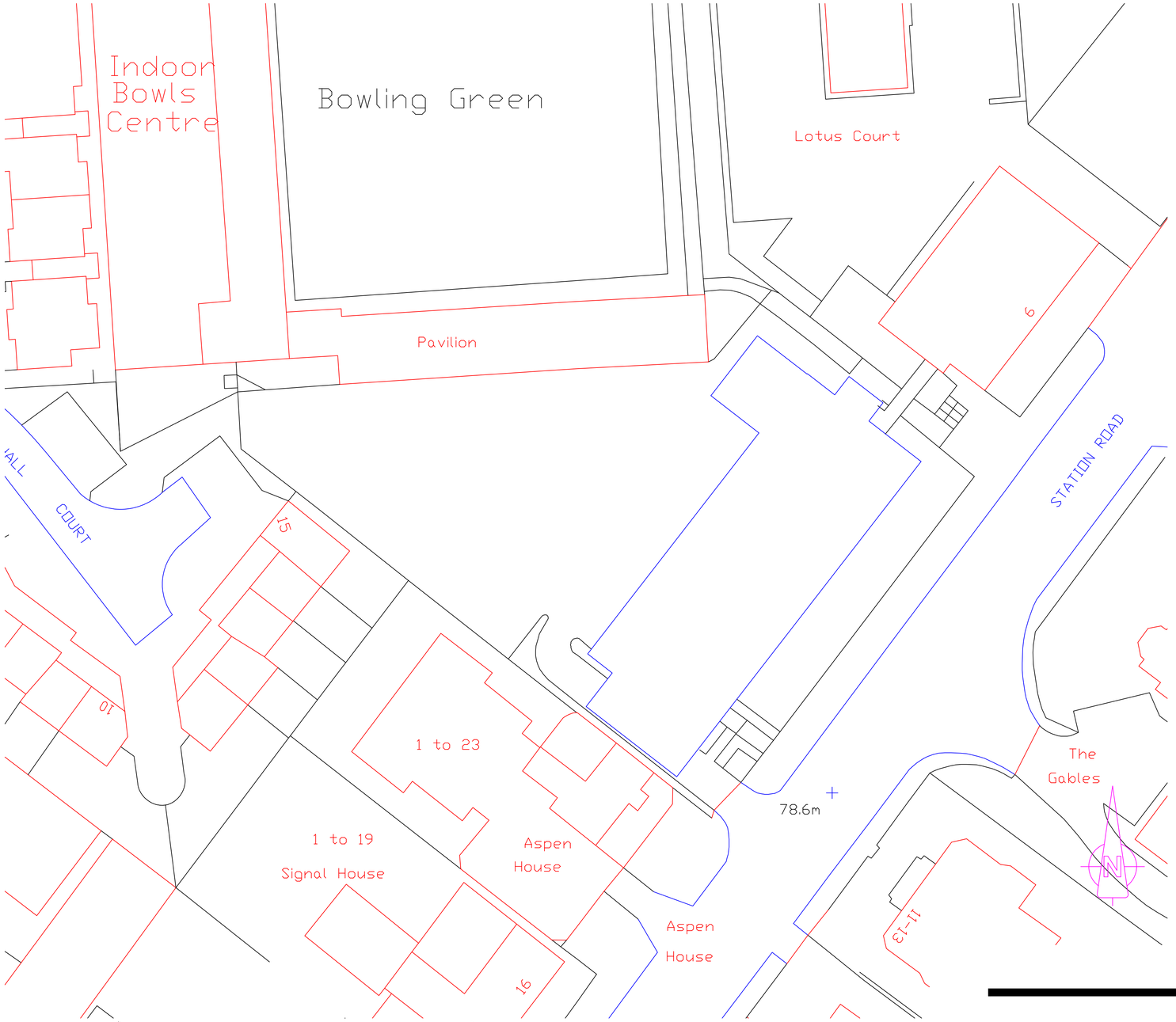
Proposed Extensions At Clarendon House, 12 Station Road, Kettering, Northants, NN15 7HH

Drawing

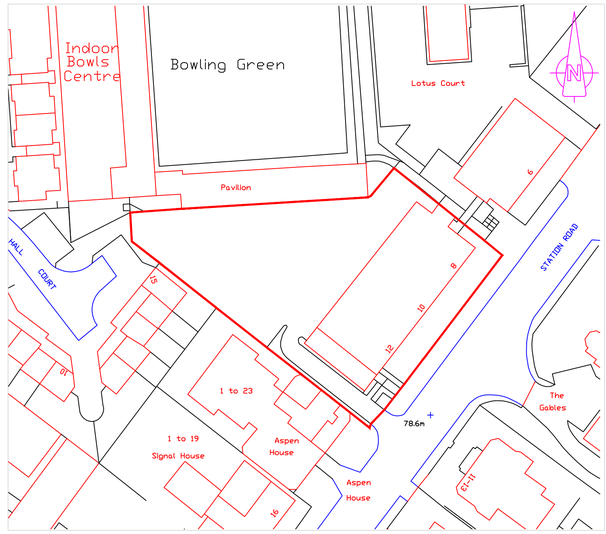
Existing Lower Ground Floor/ Site Pla
Location Plan

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Oct '16	SC		As Noted	16-101-01	

Scale 1:100 (1cm = 1 metre) | Scale 1:200 (1cm = 2 metres) | DRAWING SIZE A3



Site Plan
Scale 1:500



Location Plan
Scale 1:1250

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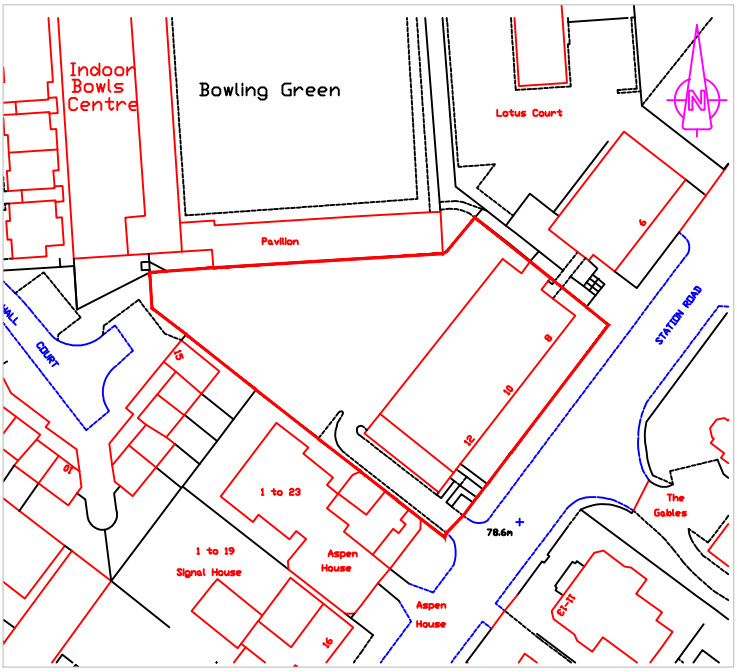
Title
Barton Lodge Developments Ltd
Clarendon House, 12 Station Road,
Kettering, Northants, NN15 7HH

Drawing
Service Plan

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Oct '16	SC		As Noted	16-101-SP1	

Scale 1:100 (1cm = 1 metre) | A4



Location Plan
Scale 1:1250

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ARCHITECTURE
10 MARKET SQUARE, HIGHAM FERRERS, NN10 8BT
TEL: 01933 317967
FAX: 01933 311161
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WEBSITE: www.sideydesign.co.uk

Title
Barton Lodge Developments Ltd
Clarendon House, 12 Station Road,
Kettering, Northants, NN15 7HH

Drawing
Location Plan

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Oct '16	SC		1:1250	16–101–LP	

Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres)

Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre)

DRAWING SIZE A1

NOTES :

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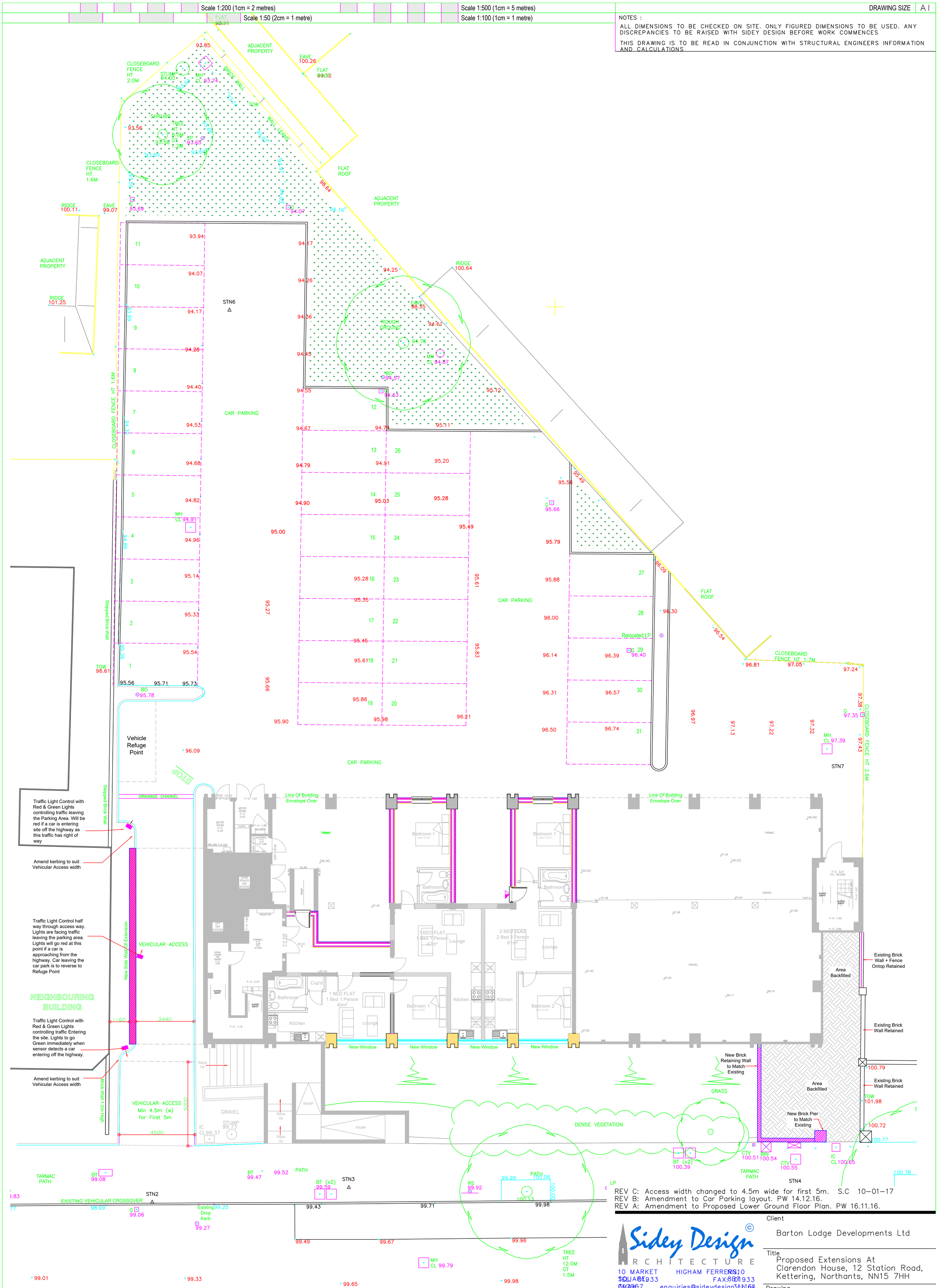

Proposed Lower Ground Floor/Site Plan (Based on Topographical Survey)
Scale 1:100

REV C: Access width changed to 4.5m wide for first 5m. S.C 10–01–17
REV B: Amendment to Car Parking layout. PW 14.12.16.
REV A: Amendment to Proposed Lower Ground Floor Plan. PW 16.11.16.

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TEL: 01933 317967 FAX: 01933 317161
EMAIL: enquiries@sideydesign.co.uk
WEBSITE: www.sideydesign.co.uk

Drawing Status: PLANNING

Client: Barton Lodge Developments Ltd

Title: Proposed Extensions At Clarendon House, 12 Station Road, Kettering, Northants, NN15 7HH

Drawing: Proposed Lower Ground Floor/ Site P

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Dec '16	SC/PW		As Noted	16–101–02	C

Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres)

Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre)

DRAWING SIZE A1

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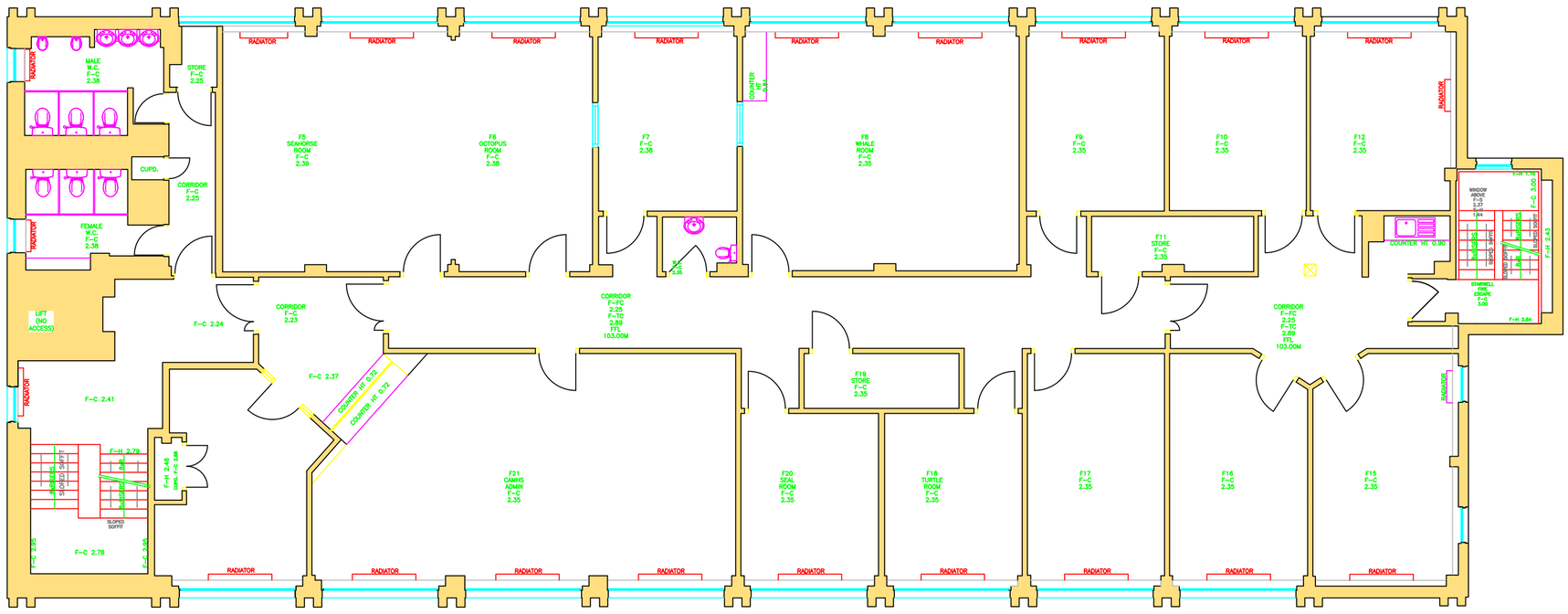
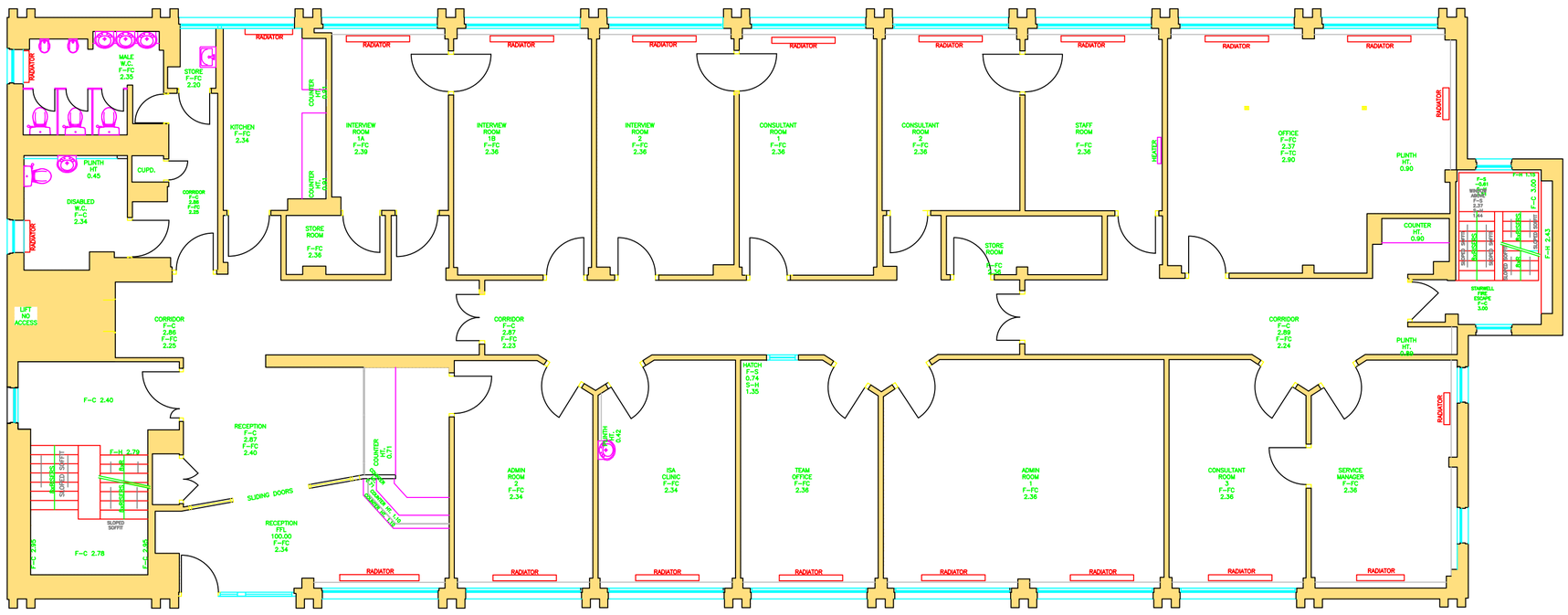
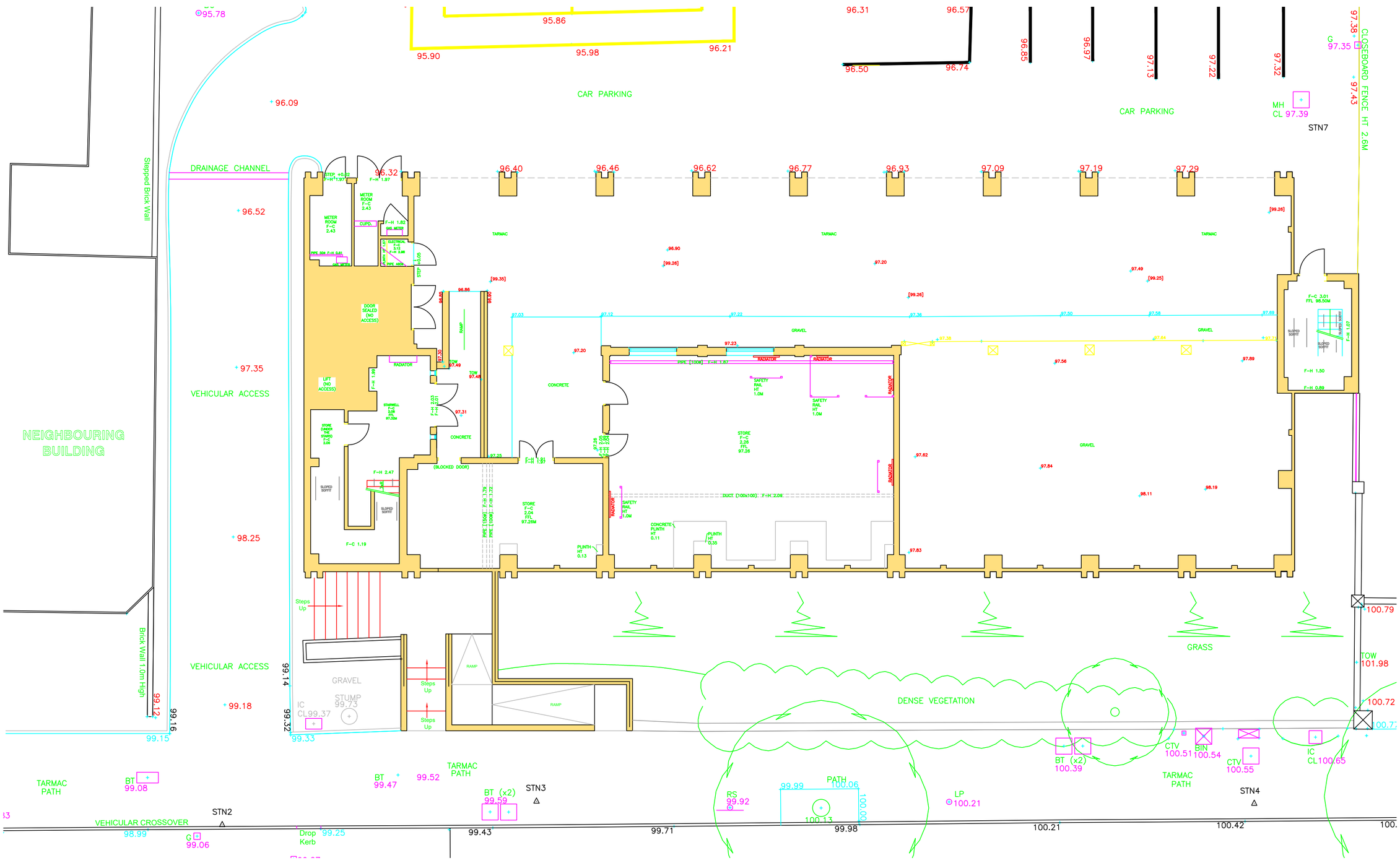


Existing First Floor Plan
Scale 1:100



Existing Ground Floor Plan
Scale 1:100



Existing Lower Ground Floor Plan
Scale 1:100

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Drawing Status

PLANNING

Client

Barton Lodge Developments Ltd

Title

Proposed Extensions At Clarendon House, 12 Station Road, Kettering, Northants, NN15 7HH

Drawing

Existing Floor Plans

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Oct '16	SC		As Noted	16-101-03	

Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres)

Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre)

DRAWING SIZE A1

NOTES :

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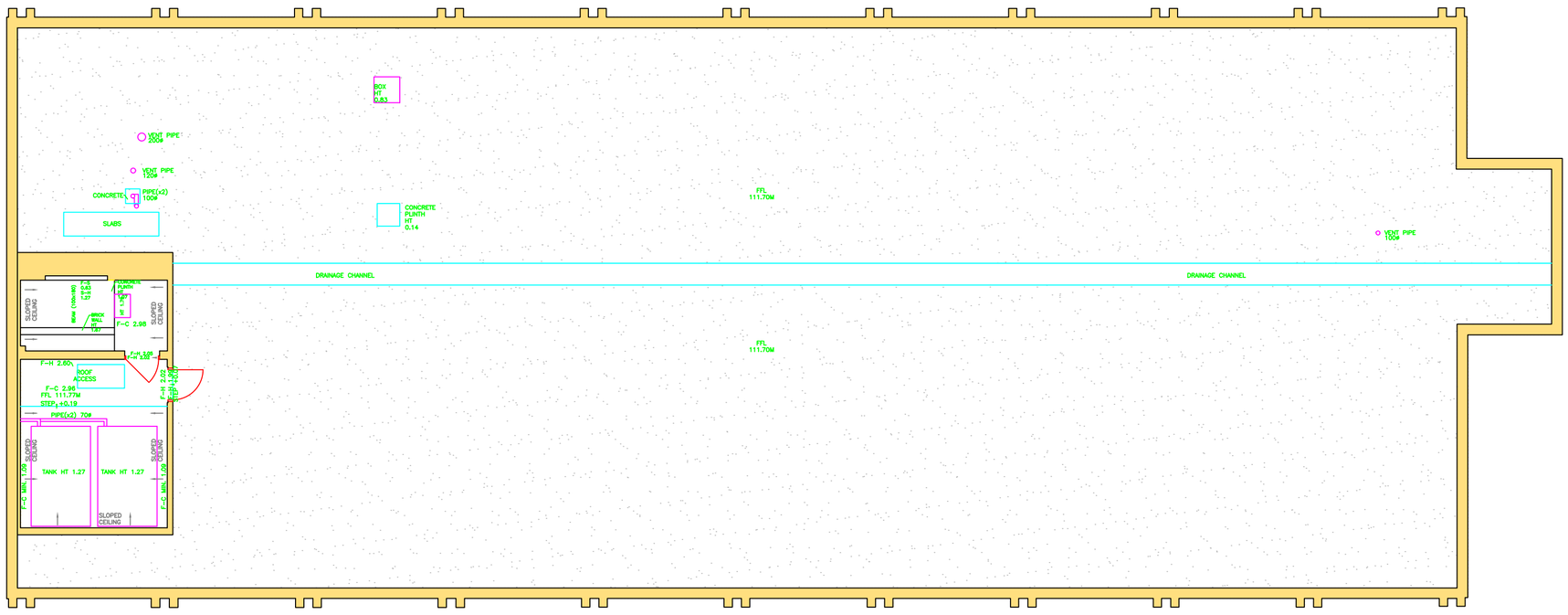
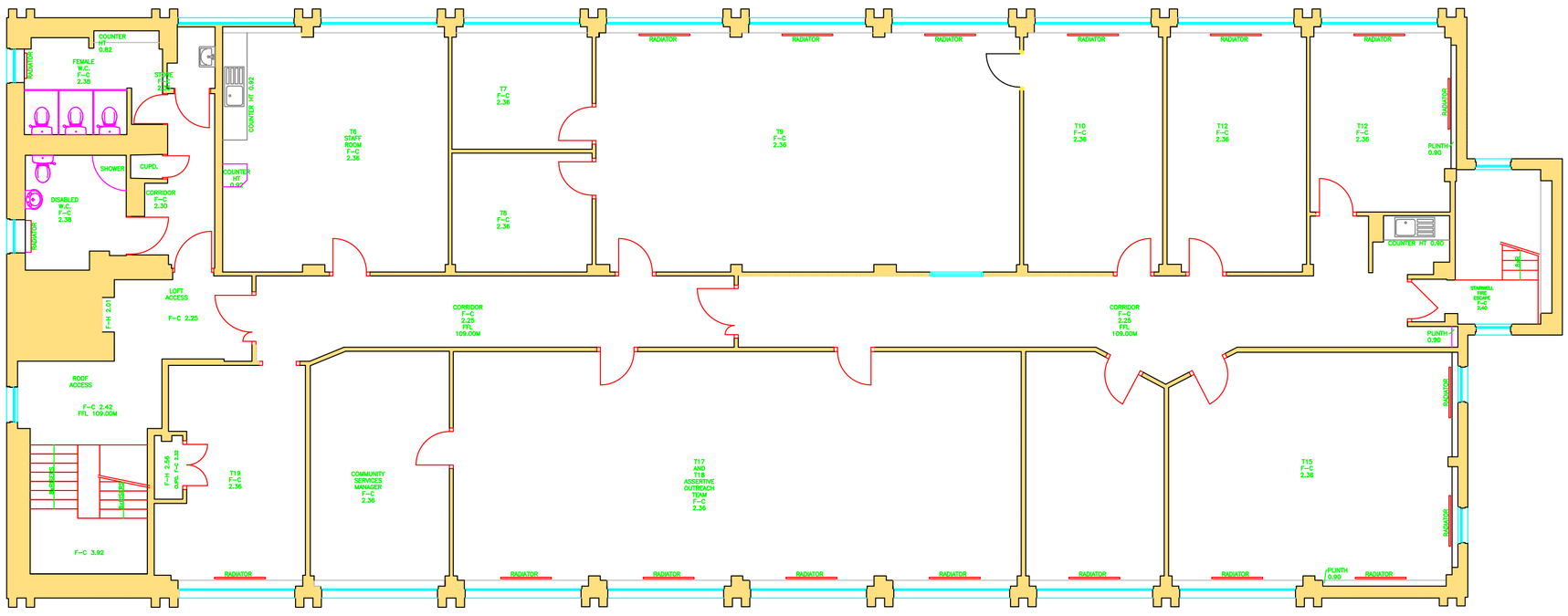
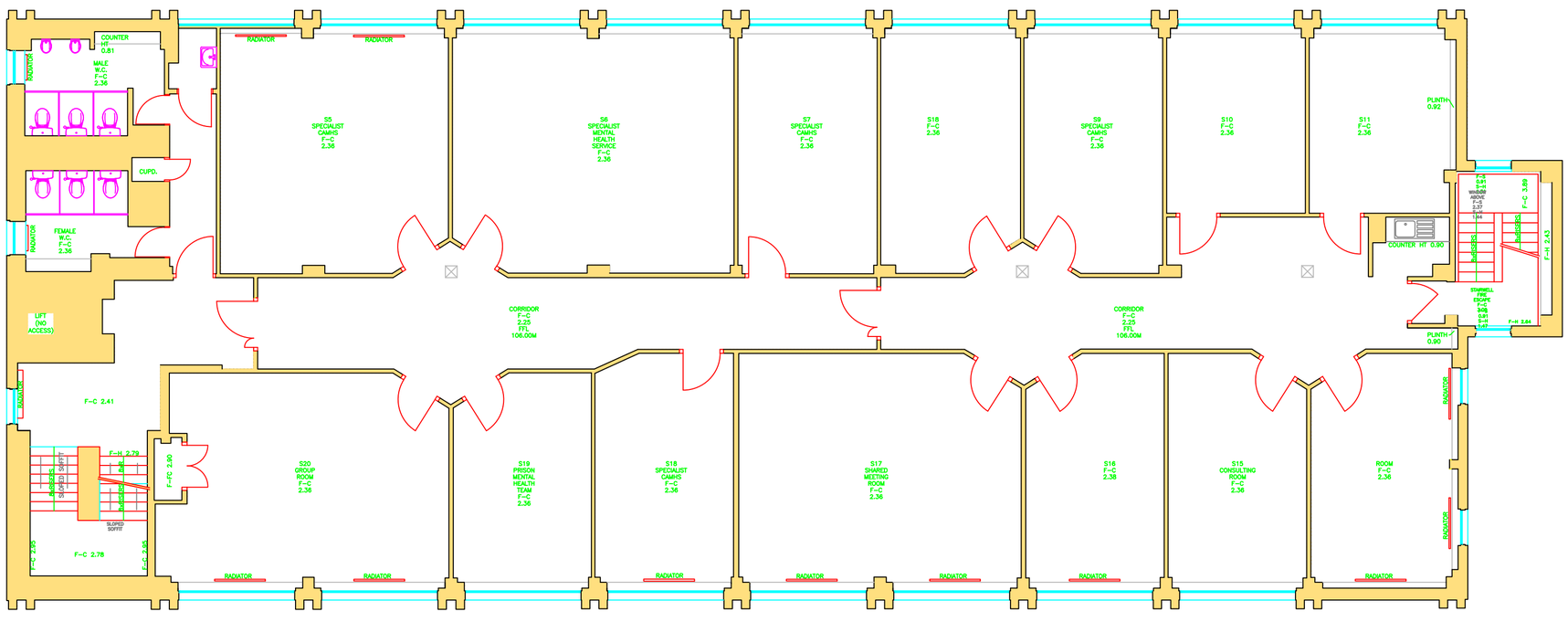


Existing Fourth Floor/ Roof Plan
Scale 1:100



Existing Third Floor Plan
Scale 1:100



Existing Second Floor Plan
Scale 1:100

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WEBSITE: www.sideydesign.co.uk

Drawing Status

PLANNING

Client

Barton Lodge Developments Ltd

Title

Proposed Extensions At Clarendon House, 12 Station Road, Kettering, Northants, NN15 7HH

Drawing

Existing Plans

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Oct '16	SC		As Noted	16-101-04	

Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres)

Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre)

DRAWING SIZE A1

NOTES :

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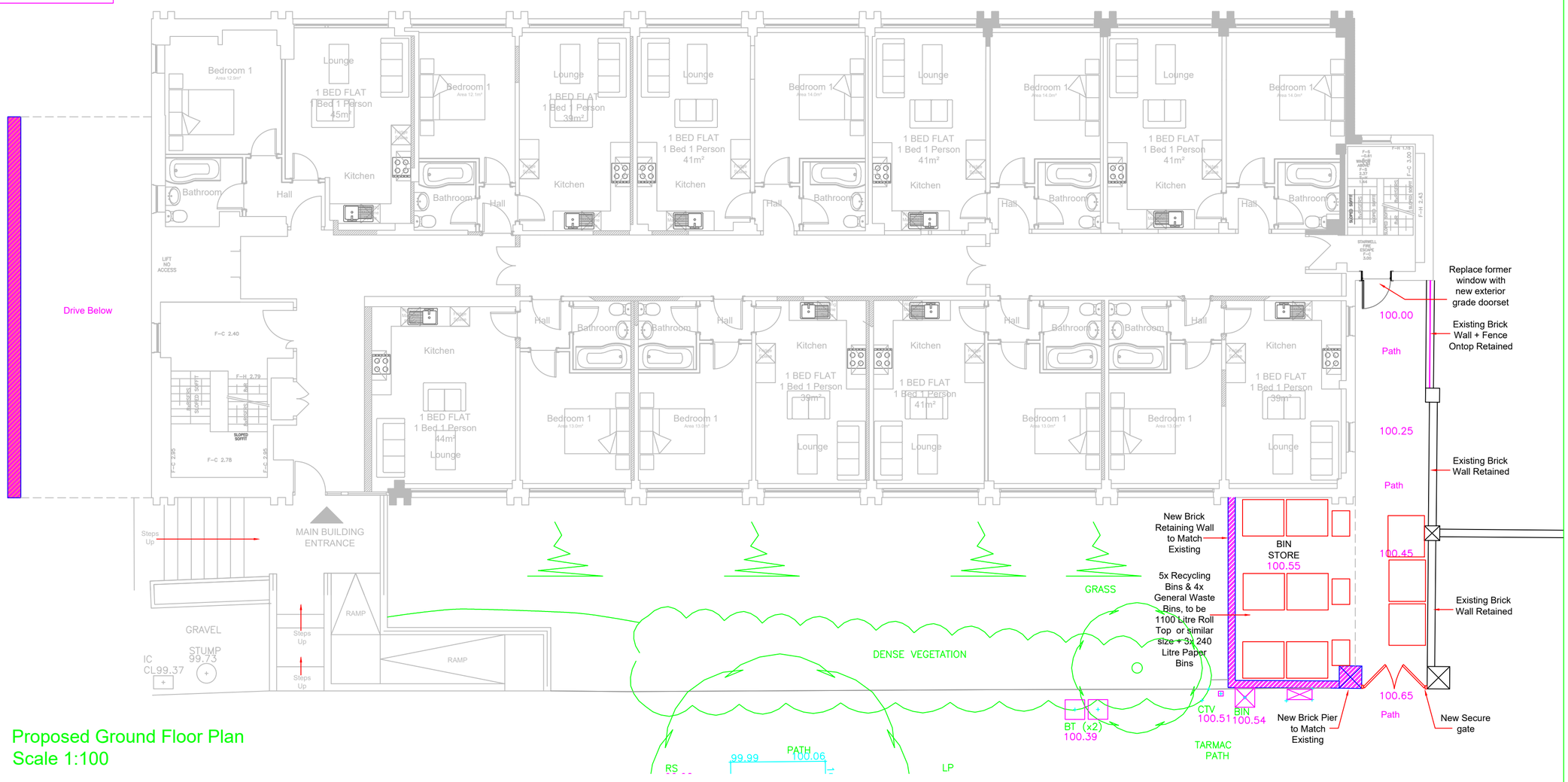
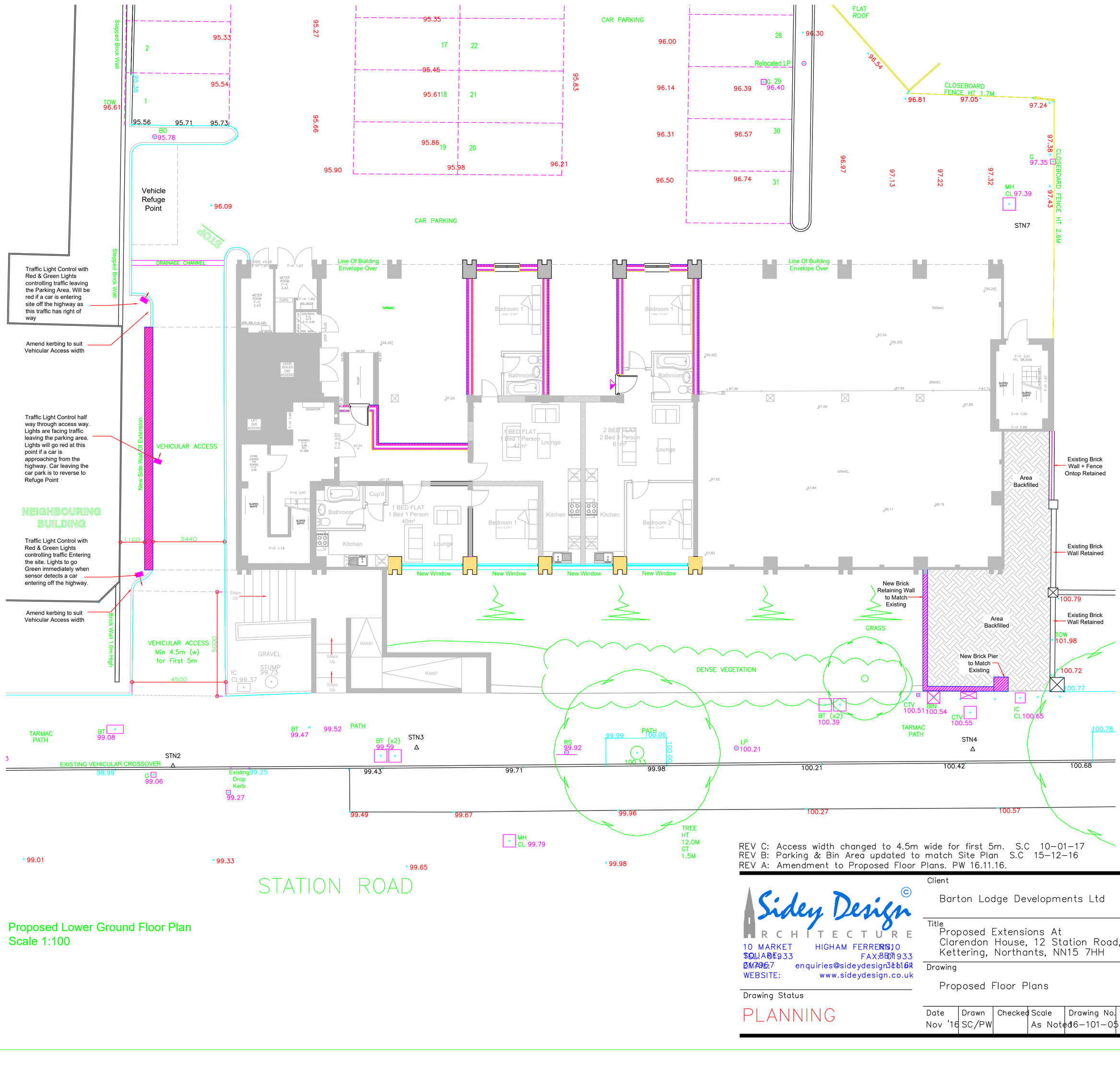
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERS INFORMATION AND CALCULATIONS

NOTE:- AREAS IN GREY ARE NOT SUBJECT TO THIS APPLICATION



Proposed Ground Floor Plan
Scale 1:100



REV C: Access width changed to 4.5m wide for first 5m. S.C 10-01-17
REV B: Parking & Bin Area updated to match Site Plan S.C 15-12-16
REV A: Amendment to Proposed Floor Plans. PW 16.11.16.

STATION ROAD

Proposed Lower Ground Floor Plan
Scale 1:100

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WEBSITE: www.sideydesign.co.uk

Drawing Status: PLANNING

Client: Barton Lodge Developments Ltd

Title: Proposed Extensions At Clarendon House, 12 Station Road, Kettering, Northants, NN15 7HH

Drawing: Proposed Floor Plans

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Nov '16	SC/PW		As Noted	16-101-05	C

Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres)

Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre)

DRAWING SIZE A1

NOTES :

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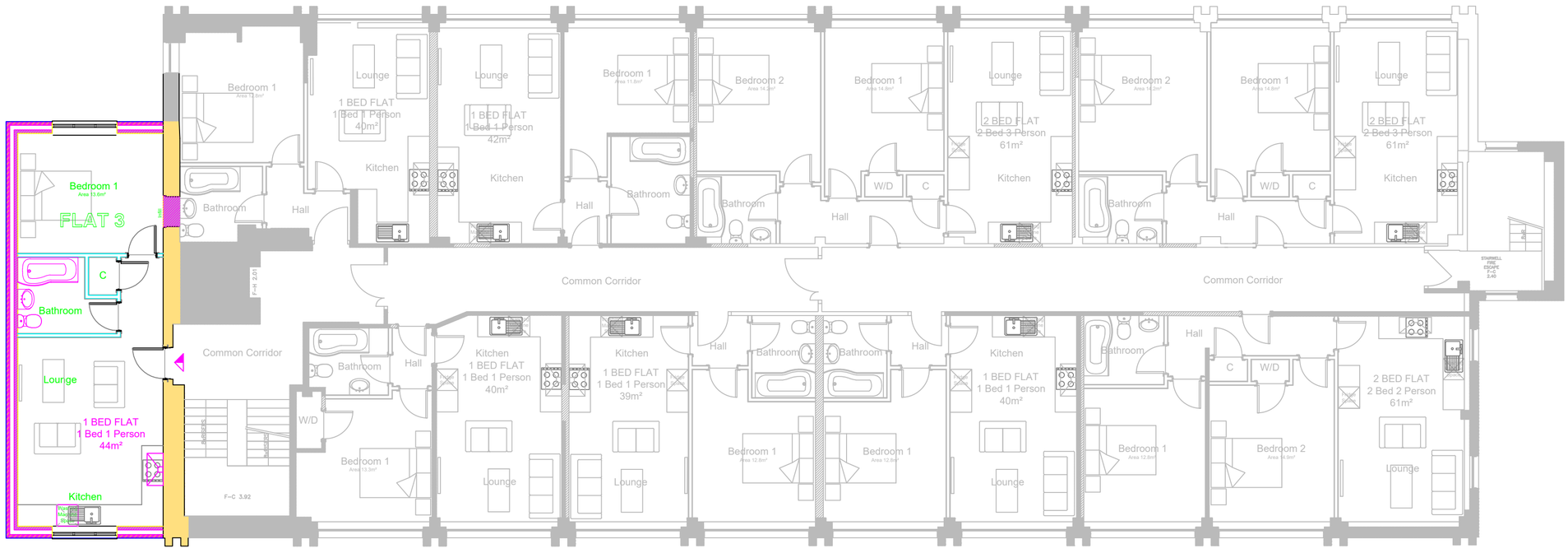
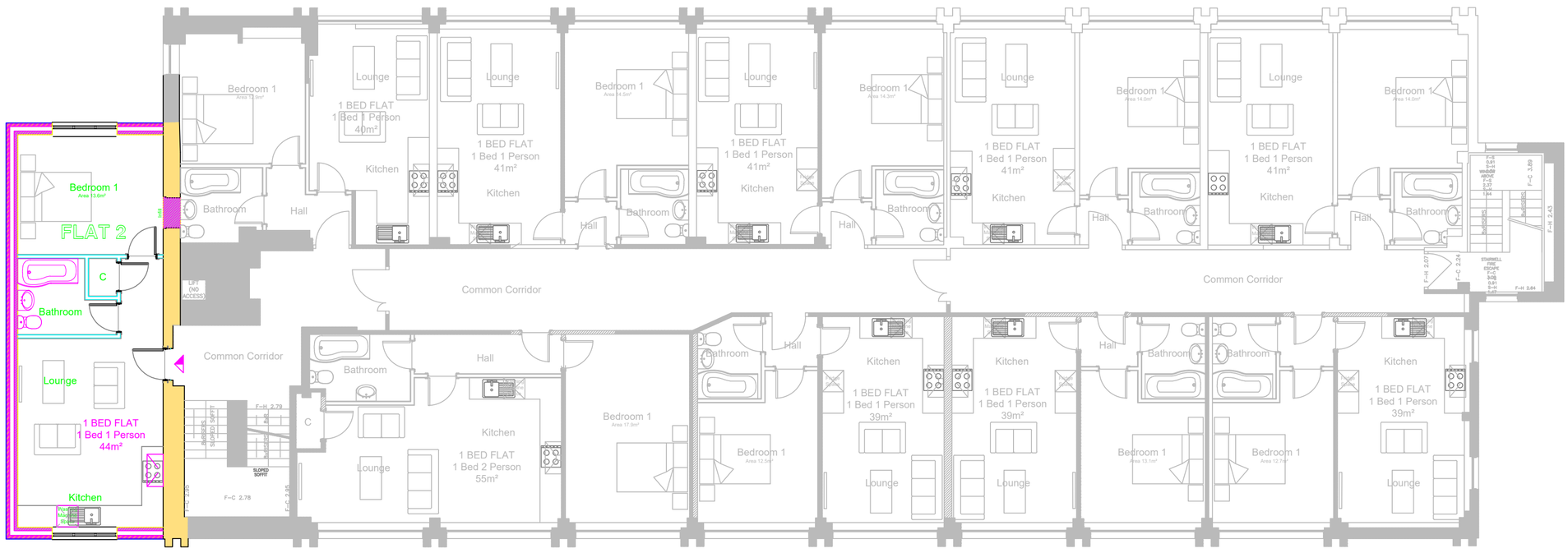
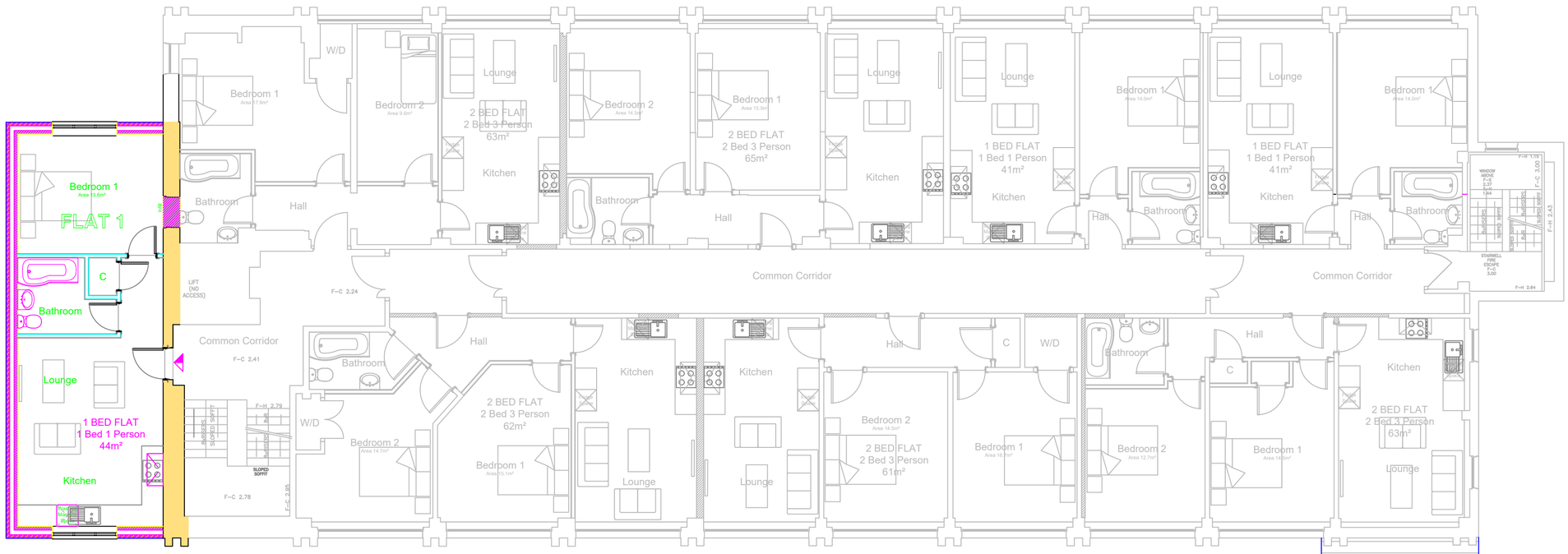
NOTE:- AREAS IN GREY ARE NOT SUBJECT TO THIS APPLICATION



Proposed Third Floor Plan
Scale 1:100



Proposed Second Floor Plan
Scale 1:100



Proposed First Floor Plan
Scale 1:100

REV B: Bin Store size updated. S.C 15–12–16

REV A: Amendments to Proposed Floor Plans. PW 16.11.16.

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EMAIL: enquiries@sideydesign.co.uk

WEBSITE: www.sideydesign.co.uk

Drawing Status

PLANNING

Client

Barton Lodge Developments Ltd

Title

Proposed Extensions At
Clarendon House, 12 Station Road,
Kettering, Northants, NN15 7HH

Drawing

Proposed Floor Plans

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Nov '16	SC/PW		As Noted	16–101–06	B

Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres)

Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre)

DRAWING SIZE A1

NOTES :

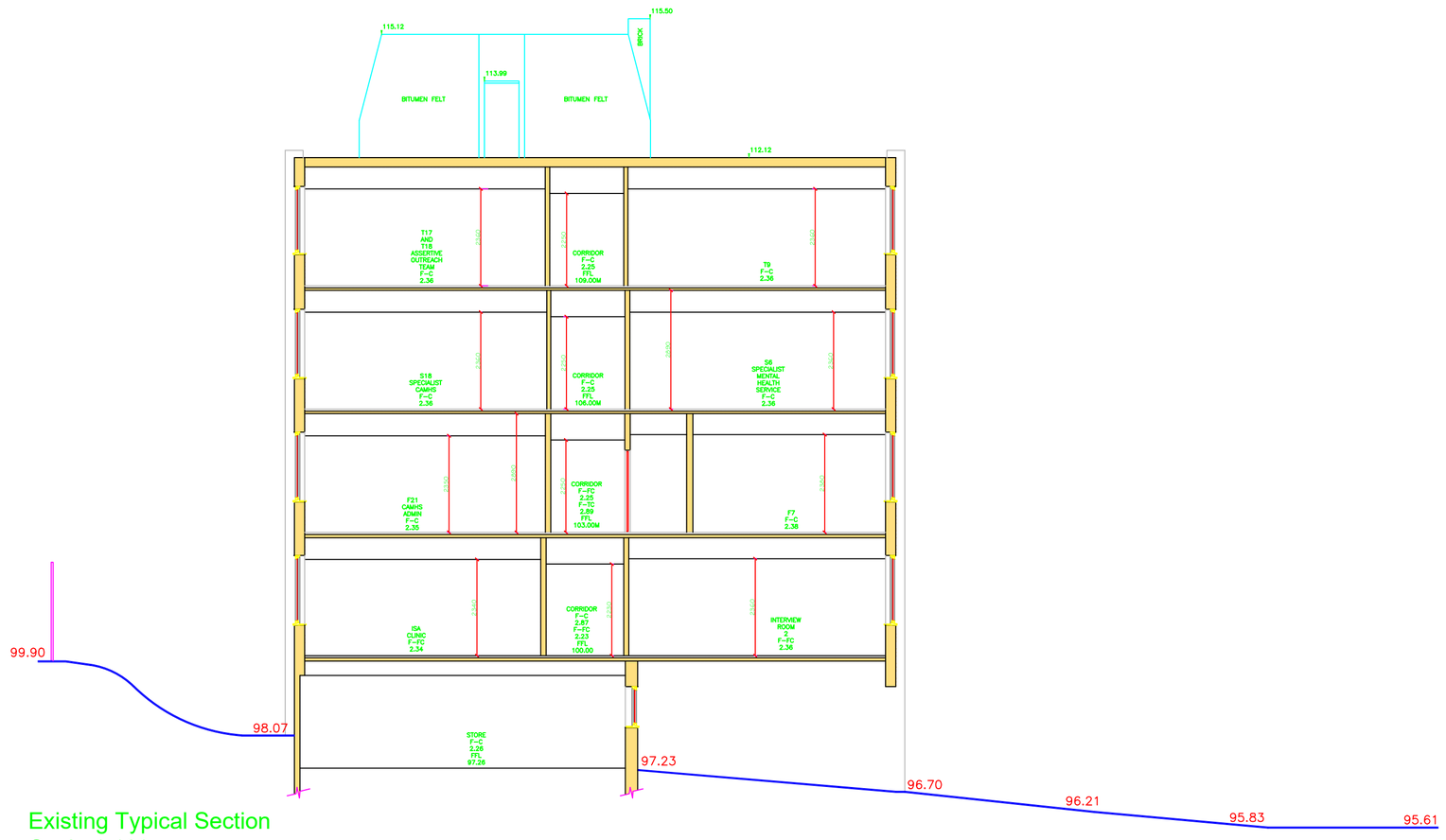
ALL DIMENSIONS TO BE CHECKED ON SITE. ONLY FIGURED DIMENSIONS TO BE USED. ANY DISCREPANCIES TO BE RAISED WITH SIDEY DESIGN BEFORE WORK COMMENCES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERS INFORMATION AND CALCULATIONS

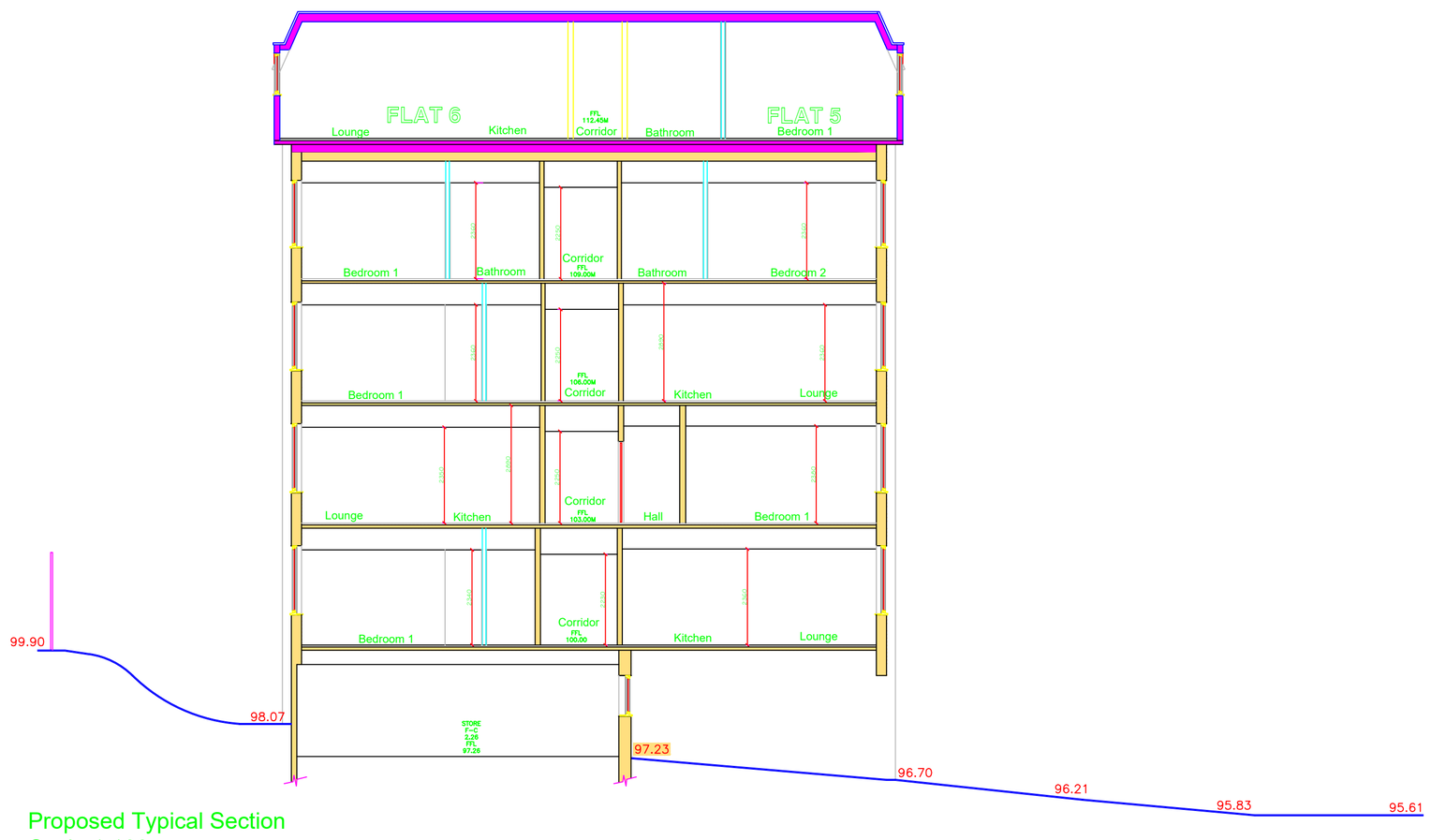
Proposed Fourth Floor Plan
Scale 1:100

DWELLING SCHEDULE

FLAT 1	- 1 Bed 1 Person	44m²
FLAT 2	- 1 Bed 1 Person	44m²
FLAT 3	- 1 Bed 1 Person	44m²
FLAT 4	- 2 Bed 3 Person	62.7m²
FLAT 5	- 1 Bed 2 Person	50m²
FLAT 6	- 2 Bed 4 Person	73.3m²
FLAT 7	- 2 Bed 4 Person	75.4m²
FLAT 8	- 1 Bed 2 Person	50m²
FLAT 9	- 3 Bed 6 Person	166.4m²



Existing Typical Section
Scale 1:100



Proposed Typical Section
Scale 1:100

REV A: Amendments to Proposed Floor Plan & Dwelling Schedule. PW 16.11.16.

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WEBSITE: www.sideydesign.co.uk

Drawing Status

PLANNING

Client

Barton Lodge Developments Ltd

Title

Proposed Extensions At
Clarendon House, 12 Station Road,
Kettering, Northants, NN15 7HH

Drawing

Proposed Floor Plans
Existing & Proposed Typical Section
Dwelling Schedule

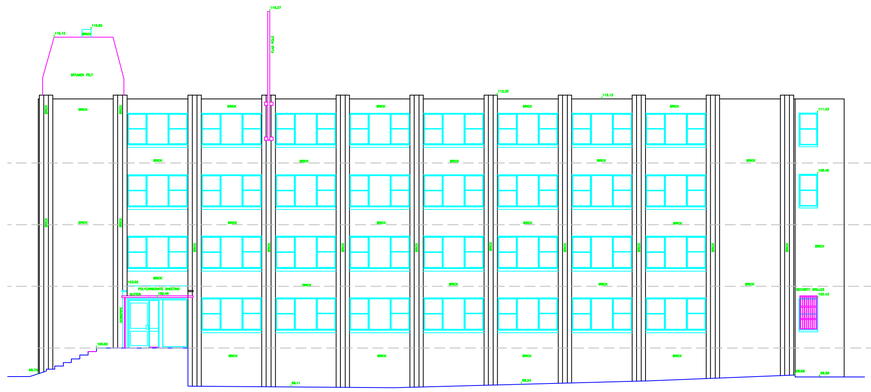
Date	Drawn	Checked	Scale	Drawing No.	Rev.
Nov '16	SC/PW		As Noted	16-101-07	A

Scale 1:50 (2cm = 1 metre) | Scale 1:100 (1cm = 1 metre) | Scale 1:200 (1cm = 2 metres) | Scale 1:500 (1cm = 5 metres) | DRAWING SIZE A1

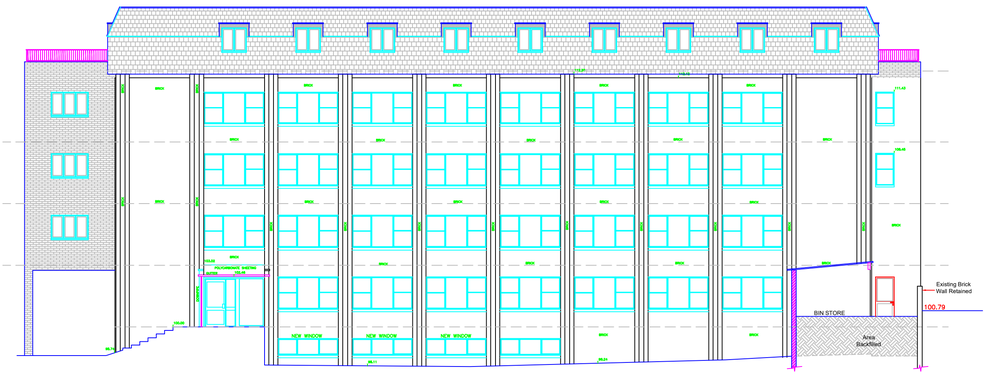
NOTES :

ALL DIMENSIONS TO BE CHECKED ON SITE. ONLY FIGURED DIMENSIONS TO BE USED. ANY DISCREPANCIES TO BE RAISED WITH SIDEY DESIGN BEFORE WORK COMMENCES

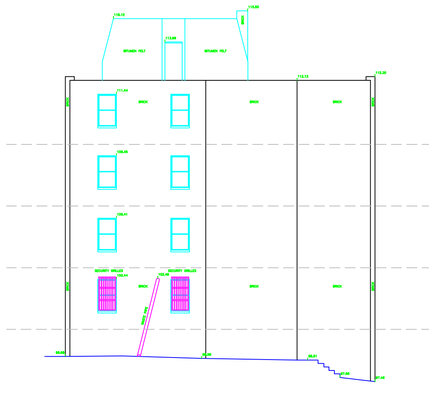
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERS INFORMATION AND CALCULATIONS



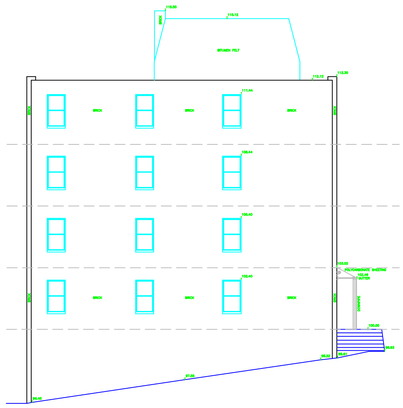
Existing North West Elevation
Scale 1:150



Proposed North West Elevation
Scale 1:150

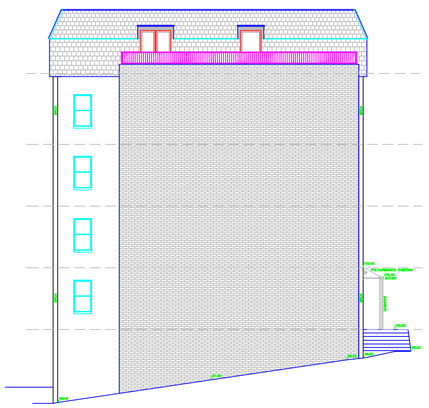


Existing North East Elevation
Scale 1:150

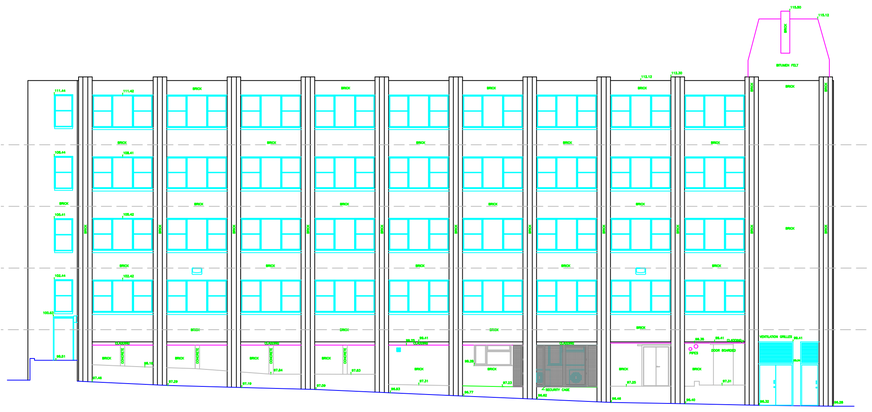


Existing South West Elevation
Scale 1:150

Proposed North East Elevation
Scale 1:150



Proposed South West Elevation
Scale 1:150



Existing South East Elevation
Scale 1:150

Proposed South East Elevation
Scale 1:150

REV B: Bin Store size updated S.C 15–12–16

REV A: Amendments to Proposed Elevations. PW 16.11.16.

Sidey Design © ARCHITECTURE
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TEL: 01933 314796 FAX: 01933 314796
EMAIL: enquiries@sideydesign.co.uk
WEBSITE: www.sideydesign.co.uk

Drawing Status

PLANNING

Client

Barton Lodge Developments Ltd

Title

Proposed Extensions At Clarendon House, 12 Station Road, Kettering, Northants, NN15 7HH

Drawing

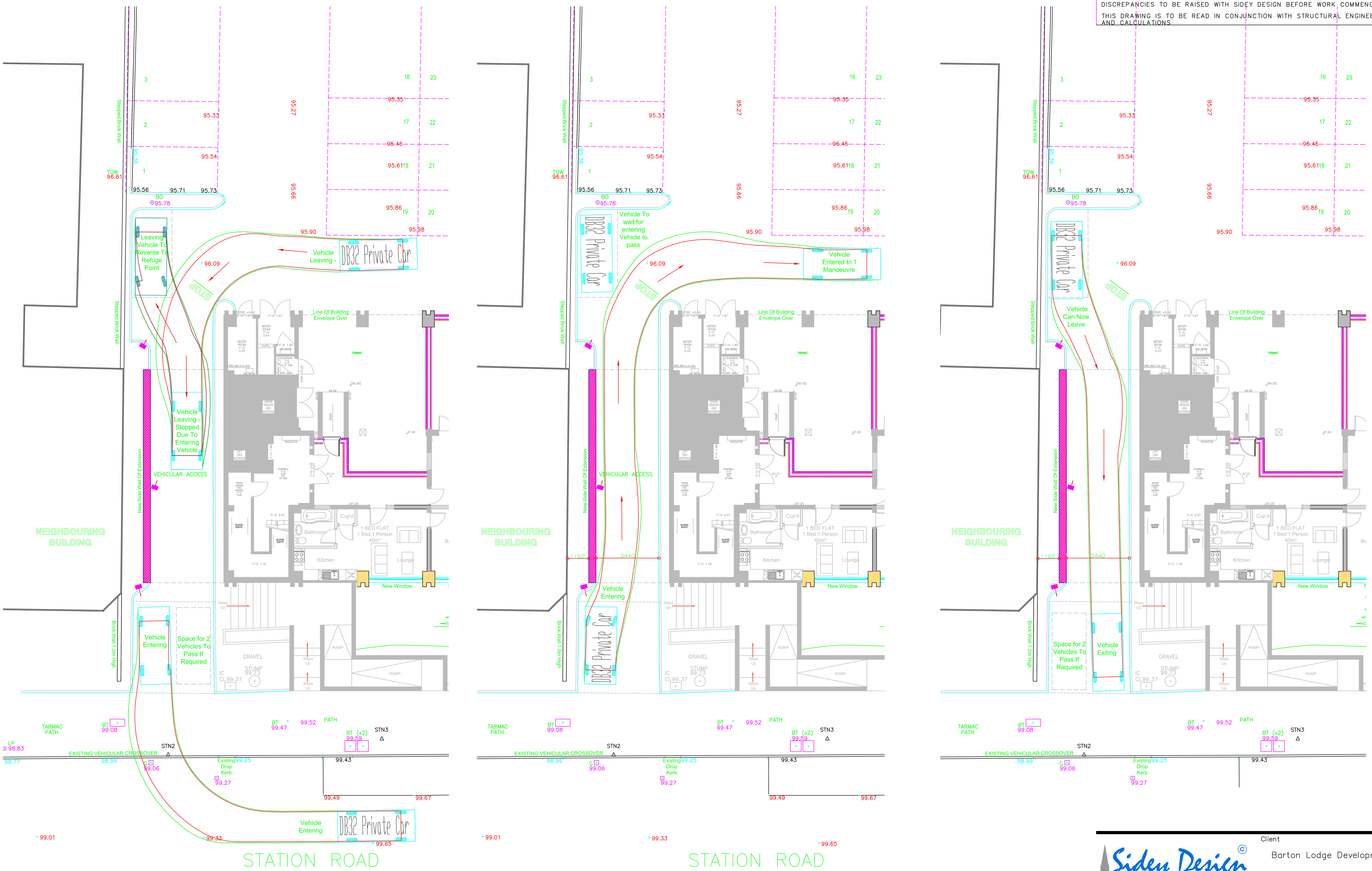
Existing & Proposed Elevations

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Nov '16	SC/PW			16–101–08	B

Scale 1:50 (2cm = 1 metre) Scale 1:100 (1cm = 1 metre) Scale 1:200 (1cm = 2 metres) Scale 1:500 (1cm = 5 metres)

DRAWING SIZE A1

NOTES :
ALL DIMENSIONS TO BE CHECKED ON SITE. ONLY FIGURED DIMENSIONS TO BE USED. ANY DISCREPANCIES TO BE RAISED WITH SIDEY DESIGN BEFORE WORK COMMENCES
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERS INFORMATION AND CALCULATIONS



Sidey Design ©
ARCHITECTURE

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Client
Barton Lodge Developments Ltd

Title
Proposed Extensions At Clarendon House, 12 Station Road, Kettering, Northants, NN15 7HH

Drawing
Proposed Vehicle Tracking

Drawing Status
PLANNING

Date	Drawn	Checked	Scale	Drawing No.	Rev.
Jan '17	SC			16-101-VT	

Bedroom 1
Area 17.9m²

Bedroom 1
Area 13.6m²

FLAT 1

Bathroom

Hall

C

LIFT
(NO
ACCESS)

Bathroom

Common Corridor

F-C 2.41

Lounge

1 BED FLAT
1 Bed 1 Person
44m²

F-H 2.79

RISERS

SLOPED SOFFIT

RISERS

SLOPED
SOFFIT

Kitchen

F-C 2.78

F-C 2.95

Proposed First Floor Plan
Scale 1:100

Scale 1:200 (1cm = 2 metres)

Scale 1:50 (2cm = 1 metre)

Scale 1:500 (1cm = 5 metres)

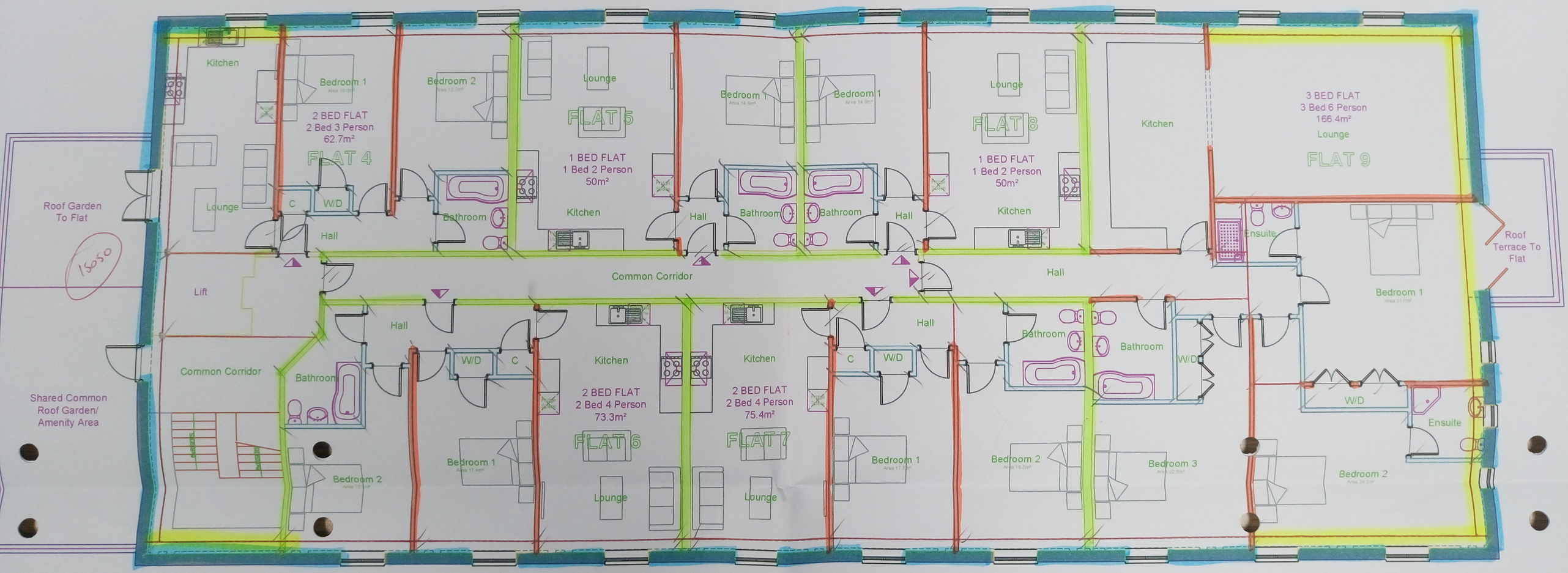
Scale 1:100 (1cm = 1 metre)

NOTES :

ALL DIMENSIONS TO BE CHECKED ON SITE. ONLY FIGURED DIMENSIONS
DISCREPANCIES TO BE RAISED WITH SIDEY DESIGN BEFORE WORK COM

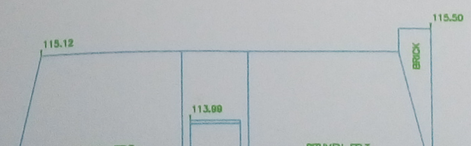
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL EN
AND CALCULATIONS

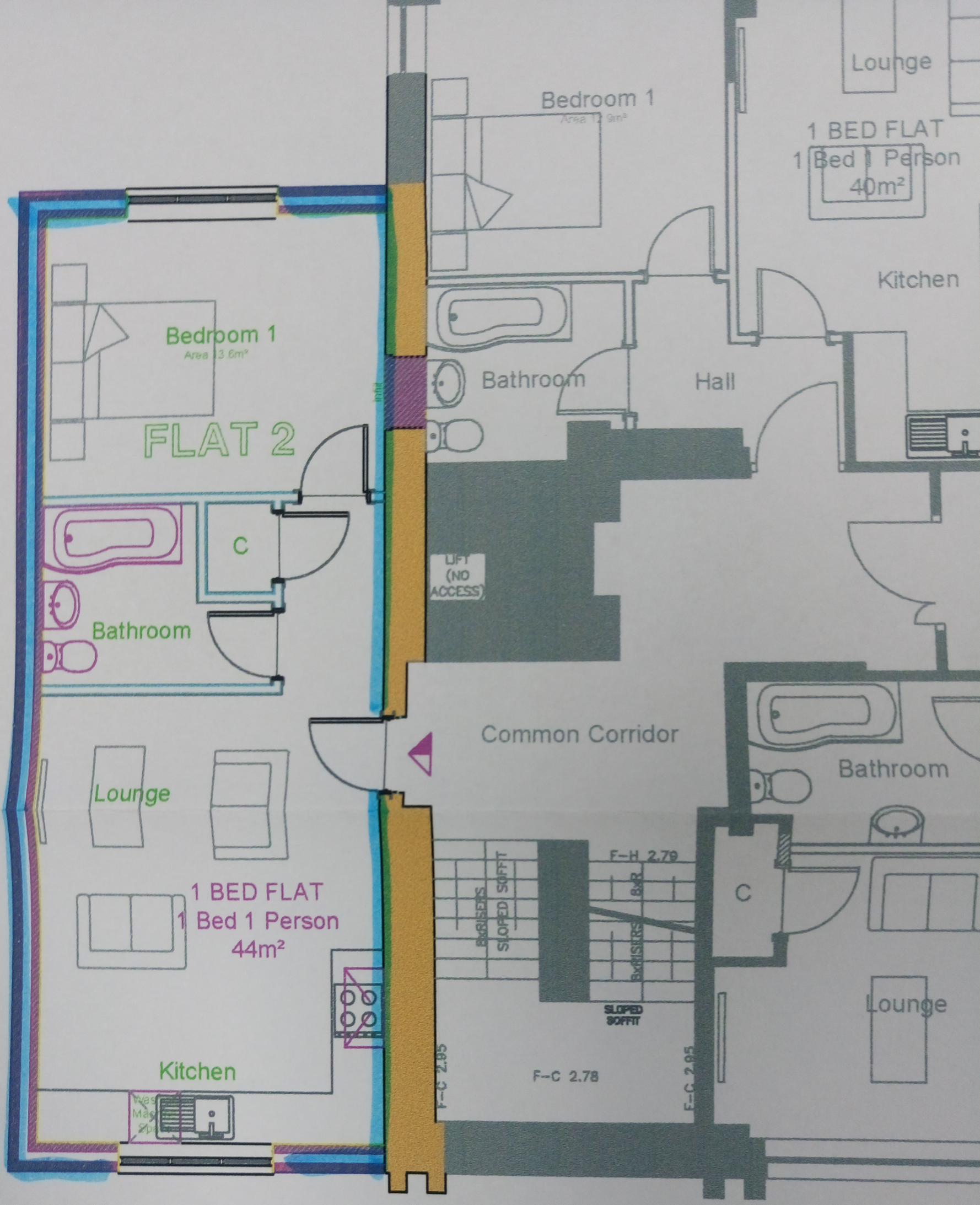
37200



roposed Fourth Floor Plan
cale 1:100

3720





Proposed Second Floor Plan
Scale 1:100

Designers Specification (revision A 21/6/04)
(revision B 21/7/04)
(revision C 6/9/04)
(revision D 15/2/05)
(rev E 4/6/07 Boise & Glulam update)
(rev F 2/4/08 Glulam & general update)
(rev G 9/9/10 Versalam & truss stock added)
(rev H 22/8/16 Ultralams Masonite joists added and general updates)

DRAWINGS REQUIRED

Houses

Preliminary Drawings For Approval

Ground Floor Plan – Include brickwork dimensions, structural opening schedule & stairs etc.
First Floor Plan – Include brickwork dimensions, structural opening schedule & stairs etc.
Second Floor / Attic Plan (where applicable) – Include brickwork dimensions, structural opening schedule & stairs etc.
Typical Section – Include ground floor construction, screed depth, dimensions to window heads and finished floors etc.

Manufacturing / Erection Drawings & Schedules

Soleplate Layout – This should incorporate a sole plate fixing detail / specification and highlight any special fixing requirements. Clearly state the number of soleplate layers required and their size. Add diagonal dimensions to assist checking square
Ground Floor Panel Layout – Note any special nailing requirements or holding down straps if specified
First Floor Panel Layout– Note any special nailing requirements
Second Floor Panel Layout (where applicable) – Note any special nailing requirements
Floor Joist / Cassette Layout – Clearly dimensioned / referenced, detail any connections, trimmers and hangers etc. required
Roof Truss / Spandrel Layout – Show all truss positions, infill timbers and bracing. Include truss profiles indicating spans, height, pitch and critical timber depths. For complicated roofs where necessary, refer to truss designer/fabricator details.
Steelwork Fabrication Drawings – Fully detailed incorporating all engineer's notes, include clear instructions for timber packers etc.
Wall Panel Elevations (On Individual A4 Sheets) – Include cutting for timber (not cladding), section through, and cladding / paper / special nailing info. Maximum panel size 2.8m x 3.6m.
Wall Panel Cutting Lists – Accumulated list for each panel type and building level. E.G. GF Externals, GF Party Walls, GF Internals, FF Externals…and so on (all on separate lists). Do not separate schedules on a panel by panel basis.
Floor Deck/Cassette Drawings (On Individual A3 Sheets**)** – Include schedule for all materials and hangers etc excluding chipboard. Note on drawing flooring requirement. Please clearly identify hangers, including any hangers that can be attached to a cassette adjoining a loose trimmer or steel beam. Maximum floor cassette size 2.4m x 9.5m.
Bay Window & Porch Roofs – Where included in our kit (please check with MTE) need to be fully detailed and scheduled

Loose Schedule – Quantify linear length of sole plate & DPC, and number / type of fixings required. Include quantity of 1200mm loose head binder linking sections for each floor level. Schedule all site fixed joists, hangers, chipboard/flooring, floor edge insulation and waistband. All loose roof timbers/hip corners, hangers etc. Basically all non-prefabricated items required to build the structural frame, floors and roofs need to appear in your schedule.

Flats

As above, repeated for all storeys. Include starter plate layouts, and quantify in schedule. All floating floor materials will be scheduled by others.

SPECIFICATION

Materials

We stock only the following materials. Anything other than listed bellow we will need to be notified of prior to fabrication. Please check with MTE before specifying materials outside our current stock.

General Timber

38 x 63mm C16
38 x 72mm C16
38 x 75mm C16
38 x 90mm C16 Treated
38 x 90mm C16 Untreated
38 x 140mm C16 Treated
44 x 194mm C24 Treated (generally for lintels)
44 x 219mm C24 Treated (generally for lintels)
38 x 240mm Glulam GL24
45 x 240mm Ultralam
90 x 240mm Ultralam

Truss / Roof / Eco-joist Stock

35 x 72mm TR26
35 x 97mm TR26
35 x 122mm TR26
35 x 147mm TR26
47 x 72mm TR26
47 x 97mm TR26
47 x 122mm TR26
47 x 147mm TR26
47 x 197mm TR26
47 x 220mm TR26

I-Joists

Masonite HL 240 (47x240mm)
Masonite H 240 (47x240mm)
Masonite HM 240 (60x240mm)

Masonite HI 240 (70x240mm)
Masonite HB 240 (97x240mm)

Boards
9mm Conditioned OSB (1200x2400)
15mm Conditioned OSB (1200x2400) (for sub decks)
6mm Ply (1220x2440)
18mm WBP Ply (1220x2440)
22mm Chipboard (600x2400)
22mm Peel Clean Chipboard (600x2400)
12.5mm Plaster Board (1200x2400)

Sole Plates & Starter Plates

Where possible use 1 layer 38x90/140mm C16 on top of 150deep coursing blocks. Our preferred sole plate fixing is using Hilti nails if fixing to 150 deep coursing blocks. Fischer fixings may be used if requested by client and MTE has costed for. Soleplate anchor/holding down straps only used if specified by engineer in extreme circumstances.

Panels

Externals - Generally 38x140mm with 9mm OSB (unless engineer requires otherwise), these panels may have either Tyvek reflex or Proctor Frame-Shield 100 breather membrane, please clarify with MTE for each job. External Panels should be treated and use 38x140mm C16 or 44x194mm C24 lintels, unless required otherwise by engineer. Lintels are to be set flush with the underside of the top rail, cripple studs are to be as specified by engineer. If steel lintels are required these should be fully packed with timber and clearly identified. A factory fixed head binder is required, with 1200mm long loose linking sections between panels. Head binders should be lapped at corners and cut out at perpendicular junctions with internal load bearing panels.

Party Wall Panels - OSB only where specified by engineer. They should also have factory fitted head binders as above.

Internal Load Bearing Panels - OSB only where required for racking purposes. They should also have factory fitted head binders as above.

Internal Non Load Bearing Panels - To be set down min 5mm for deflection of joists / roof trusses, and do not require cripple studs or lintels. It may be necessary to allow increased deflection gap when under attic or large span trusses.

External Spandrel Panels - To be set down for 38x90mm gable ladders unless verge detail requires otherwise. Use single top rails for all spandrels.

Party Wall Spandrels - Generally set down 35mm from the top of the rafter at the apex.

General – Studs at 600mm centres unless required otherwise by engineer. OSB will be nailed at 150mm centres unless your drawings instruct otherwise.

Joists

Please check with MTE if I-Joists, solid or Eco joists are required for individual projects. Joists can be spaced at 400mm or 600mm centres as required by calculation. Please refer to MTE or engineers to check spans of joists or to calculate trimmers when necessary.

See MTE standard details for edge details.

Joists cont.

When using floor cassettes or decks for solid joists, I-joists & eco joists should have gap of 100mm wide for a site fixed infill strip of floor decking **(check with MTE before design, as this can vary between jobs)**. Please remember to include this material in your schedule, and to indicate on manufacturing drawings where floor decking is to extend only half way across the joist.

Non load bearing partitions parallel to the joist should have a joist directly below, providing the partition is at least 2/3rds the length of the joist. Otherwise provide a full depth noggin or a 38x90mm noggin on 'z' clips at your discretion. Solid joists require stiffening noggins if over 2.4m span. I-Joists generally do not require stiffening noggins. All joists require full depth noggins above / below a load bearing partition.

Houses are to have 22mm T&G chipboard decking. Flats are to have compartment floor construction as follows; 112mm deep floating floor on top of 241/302 I-Joists and 15mm OSB sub-deck (see MTE detail 30.1). This comprises of 18mm chip board, 19mm plank and 75mm acoustic batten (400mm centres with insulation between) or a 28mm acoustic Screed-board system. The main contractor will need to provide a resilient bar (depth to their specification) and 19+12.5mm plaster board underneath. Please assume this compartment floor construction unless requested otherwise by architect / client, please also check floating floor requirements on landing / communal areas.

Ground floor decks require 200mm insulation on draped netlon (see MTE detail 10.10).

Please note I-Joists floors will require squash blocks under all multiple stud clusters. It is imperative that you clearly identify these in you drawings.

Always watch out for SVPs and avoid clashing with joists.

Roofs

For simple roofs we would expect a layout, bracing details and indicative truss profiles detailing span, pitch and anticipated rafter depth etc. We also require a schedule for all infill timbers and associated ironmongery.
For more complicated roofs please liase with MTE to establish layouts, truss profiles and bracing requirements.
Where gable ladder are required, set down spandrel by 90mm (ladders will be manufactured by MTE where possible).

Steelwork

Please provide steel fabrication drawings incorporating all engineers' specifications. Note on drawing that all steel is coated in a primer to BS Specification unless the project spec requires something different. For steel connections please use only G8.8 bolts and quantify these in schedule.

Generally all steel work supporting brickwork is excluded. However where brickwork requires a 'goal post' please check with MTE if we require a fabrication detail for these. Please provide all column fixing details etc. where applicable.

Where possible please consider using 45x240 or 90x240 Ultralam beams in lieu of steels as stair trimmers or lintels. 2/3ply Versalams should also be considered (include fixing details).

Administration

Please ensure that you keep our project co-ordinator furnished with all copies of correspondence (letters, faxes and emails) you have engaged with our client or their architect, as we may later need to refer to them. Likewise please confirm to us in writing any verbal instructions you receive from the client or architect directly.

Requests For Information (RFI)- If you are prevented from working on the project whilst waiting for information make sure this is recorded in writing with a copy to MTE.

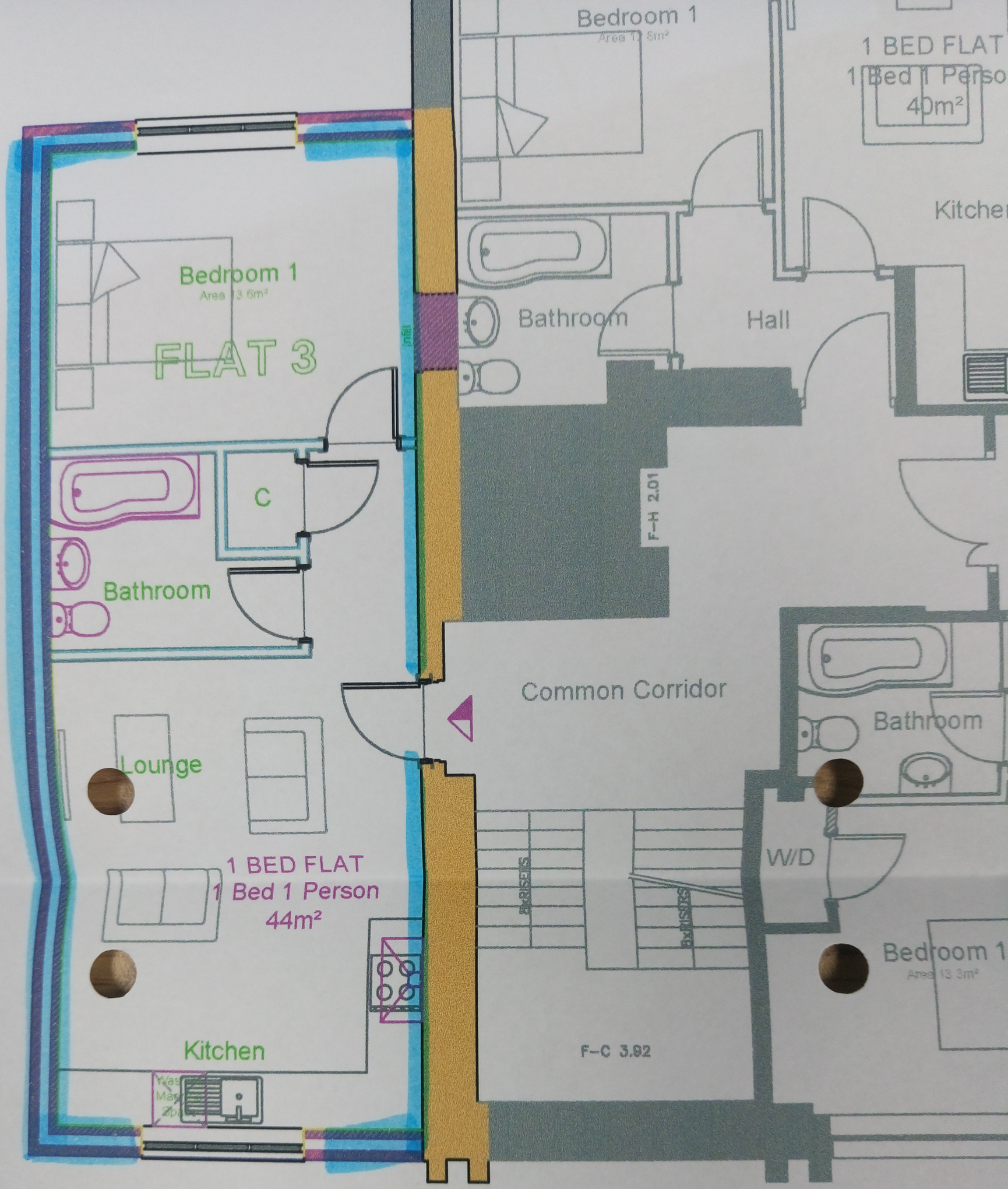
On completion of preliminary drawings for approval please forward 1 set to MTE with a drawing issue register so we can distribute them accordingly. Upon their return please amend your drawing to incorporate all comments and instructions and re-issue.

Once approval has been obtained please proceed with all fabrication details, erection drawings and schedules. When completed please send 1 copy of all including structural calculations to MTE. You are also expected to familiarise yourself with the programme and report any variations / envisaged variations

Due to our design office been consistently at full capacity, we are unable to accept fabrication drawings via email, only in emergencies will this be possible. Where possible please send panel drawings etc. as a single pdf file for ease and speed of printing.

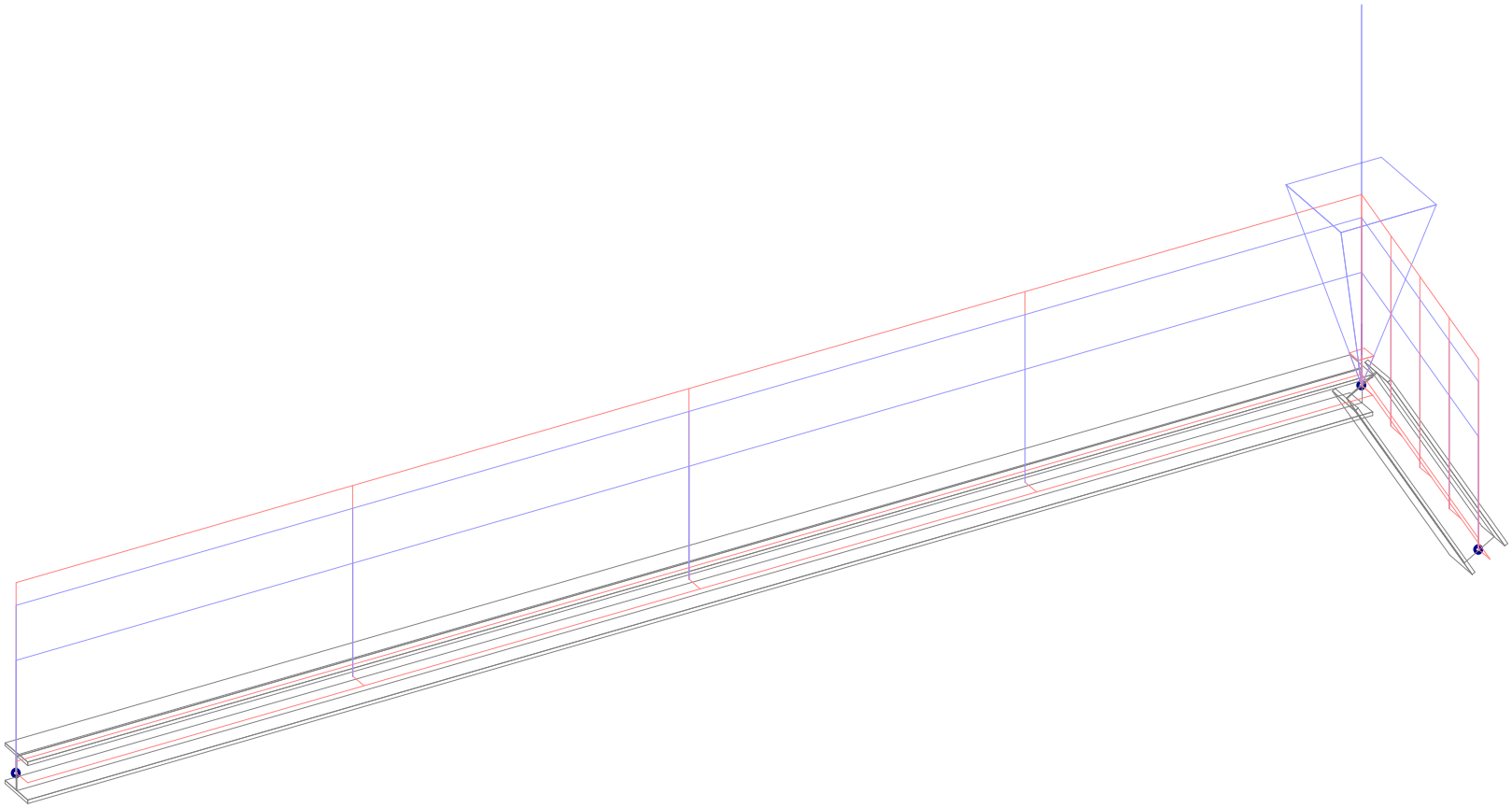
Should you have any problems or queries complying with the above please do not hesitate to contact any of the following members of staff:

Kirk Eversfield	(Managing Director)	kirk@mte-leicester.co.uk
Tim Cooling	(Design Manager)	tim@mte-leicester.co.uk
Dave Bamford	(Technical Sales Director)	dave@mte-leicester.co.uk
Emma Barker	(Business Director)	emma@mte-leicester.co.uk



Proposed Third Floor Plan
Scale 1:100

Current View



	Cranked Steel Beam 1.29	Job No 3101 Job Ref Loft Floor Designed By R.G. Checked By M.K. Date 28/03/17 Revision No Calc No 1.0 Page No 1

Joint Displacements for Combination Comb1

Analysis Type : Linear elastic

Joint reference	Displacements (mm)			Rotations (°)		
	Dx	Dy	Dz	Rx	Ry	Rz
1	0.00	0.00	0.00	-0.009	0.000	-0.367
2	0.00	-4.08	0.00	-0.009	0.014	0.359
3	6.87	0.00	0.00	-0.008	0.014	0.389

Joint Displacements for Combination Comb2

Analysis Type : Linear elastic

Joint reference	Displacements (mm)			Rotations (°)		
	Dx	Dy	Dz	Rx	Ry	Rz
1	0.00	0.00	0.00	-0.007	0.000	-0.306
2	0.00	-3.40	0.00	-0.007	0.012	0.299
3	5.73	0.00	0.00	-0.007	0.012	0.324

Joint Displacements for Combination Comb3

Analysis Type : Linear elastic

Joint reference	Displacements (mm)			Rotations (°)		
	Dx	Dy	Dz	Rx	Ry	Rz
1	0.00	0.00	0.00	0.000	0.000	-0.440
2	0.00	-4.89	0.00	0.000	0.000	0.430
3	8.23	0.00	0.00	0.000	0.000	0.466

Support Reactions for Combination Comb1

Analysis Type : Linear elastic

Joint reference	Support reactions (kN)			Support moments (kNm)		
	Px	Py	Pz	Mx	My	Mz
1	0.000	20.051	-0.773	0.000	1.090	0.000
2	0.000	0.000	-0.569	0.000	0.000	0.000
3	0.000	23.629	-0.106	0.000	0.000	0.000

Support Reactions for Combination Comb2

Analysis Type : Linear elastic

Joint reference	Support reactions (kN)			Support moments (kNm)		
	Px	Py	Pz	Mx	My	Mz
1	0.000	16.710	-0.644	0.000	0.908	0.000
2	0.000	0.000	-0.474	0.000	0.000	0.000
3	0.000	19.691	-0.088	0.000	0.000	0.000

Support Reactions for Combination Comb3

Analysis Type : Linear elastic

Joint reference	Support reactions (kN)			Support moments (kNm)		
	Px	Py	Pz	Mx	My	Mz
1	0.000	24.033	0.000	0.000	0.000	0.000

Support Reactions for Combination Comb3 (continued)

Analysis Type : Linear elastic

Joint reference	Support reactions (kN)			Support moments (kNm)		
	Px	Py	Pz	Mx	My	Mz
2	0.000	0.000	0.000	0.000	0.000	0.000
3	0.000	28.279	0.000	0.000	0.000	0.000

Member Effects for Combination Comb1

Analysis Type : Linear elastic

Interval no	Interval pos. (m)	Axial force (kN)	Shear force (kN)		Moment effects (kNm)		
			Normal	Lateral	Torsion	Normal	Lateral
Member 1							
0	0.000	0.000	20.051	-0.773	0.000	0.000	1.090
1	1.764	0.000	10.976	-0.464	0.000	27.362	0.000
2	3.527	0.000	1.900	-0.155	0.000	38.717	-0.545
3	5.291	0.000	-7.175	0.155	0.000	34.066	-0.545
4	7.055	0.000	-16.251	0.464	0.000	13.407	0.000
Member 2							
0	0.000	17.190	-10.165	-0.106	0.000	13.407	0.000
1	0.302	17.977	-10.631	-0.053	0.000	10.266	-0.024
2	0.604	18.764	-11.096	0.000	0.000	6.985	-0.032
3	0.906	19.551	-11.562	0.053	0.000	3.563	-0.024
4	1.208	20.339	-12.027	0.106	0.000	0.000	0.000

Member Effects for Combination Comb2

Analysis Type : Linear elastic

Interval no	Interval pos. (m)	Axial force (kN)	Shear force (kN)		Moment effects (kNm)		
			Normal	Lateral	Torsion	Normal	Lateral
Member 1							
0	0.000	0.000	16.710	-0.644	0.000	0.000	0.908
1	1.764	0.000	9.147	-0.386	0.000	22.802	0.000
2	3.527	0.000	1.584	-0.129	0.000	32.265	-0.454
3	5.291	0.000	-5.979	0.129	0.000	28.388	-0.454
4	7.055	0.000	-13.542	0.386	0.000	11.172	0.000
Member 2							
0	0.000	14.325	-8.471	-0.088	0.000	11.172	0.000
1	0.302	14.981	-8.859	-0.044	0.000	8.555	-0.020
2	0.604	15.637	-9.247	0.000	0.000	5.821	-0.027
3	0.906	16.293	-9.635	0.044	0.000	2.969	-0.020
4	1.208	16.949	-10.023	0.088	0.000	0.000	0.000

Member Effects for Combination Comb3

Analysis Type : Linear elastic

Interval no	Interval pos. (m)	Axial force (kN)	Shear force (kN)		Moment effects (kNm)		
			Normal	Lateral	Torsion	Normal	Lateral
Member 1							
0	0.000	0.000	24.033	0.000	0.000	0.000	0.000
1	1.764	0.000	13.154	0.000	0.000	32.794	0.000
2	3.527	0.000	2.275	0.000	0.000	46.400	0.000
3	5.291	0.000	-8.604	0.000	0.000	40.818	0.000
4	7.055	0.000	-19.484	0.000	0.000	16.048	0.000
Member 2							
0	0.000	20.581	-12.170	0.000	0.000	16.048	0.000
1	0.302	21.521	-12.726	0.000	0.000	12.288	0.000
2	0.604	22.461	-13.282	0.000	0.000	8.360	0.000
3	0.906	23.401	-13.838	0.000	0.000	4.264	0.000
4	1.208	24.341	-14.394	0.000	0.000	0.000	0.000

Member Deflections (Global) for combination Comb1

Analysis Type : Linear elastic

Interval no	Interval pos. (m)	Displacements (mm)			Slopes (°)		
		Axial	Normal	Lateral	Torsion	Normal	Lateral
Member 1							
0	0.000	0.00	0.00	0.00	-0.009	-0.367	0.000
1	1.764	0.00	-10.26	0.20	-0.009	-0.270	-0.010
2	3.527	0.00	-15.34	0.43	-0.009	-0.048	-0.004
3	5.291	0.00	-12.97	0.37	-0.009	0.197	0.008
4	7.055	0.00	-4.08	0.00	-0.009	0.359	0.014
Member 2							
0	0.000	3.51	-2.08	0.00	-0.016	0.359	0.000
1	0.302	3.51	-0.15	0.00	-0.016	0.372	0.000
2	0.604	3.50	1.84	0.00	-0.016	0.381	0.000
3	0.906	3.50	3.87	0.00	-0.016	0.387	0.000
4	1.208	3.50	5.92	0.00	-0.016	0.389	0.000

Member Deflections (Global) for combination Comb2

Analysis Type : Linear elastic

Interval no	Interval pos. (m)	Displacements (mm)			Slopes (°)		
		Axial	Normal	Lateral	Torsion	Normal	Lateral
Member 1							
0	0.000	0.00	0.00	0.00	-0.007	-0.306	0.000
1	1.764	0.00	-8.55	0.17	-0.007	-0.225	-0.008
2	3.527	0.00	-12.78	0.36	-0.007	-0.040	-0.003
3	5.291	0.00	-10.81	0.31	-0.007	0.164	0.007
4	7.055	0.00	-3.40	0.00	-0.007	0.299	0.012
Member 2							

Member Deflections (Global) for combination Comb2 (continued)

Analysis Type : Linear elastic

Interval no	Interval pos. (m)	Displacements (mm)			Slopes (°)		
		Axial	Normal	Lateral	Torsion	Normal	Lateral
0	0.000	2.93	-1.73	0.00	-0.014	0.299	0.000
1	0.302	2.92	-0.12	0.00	-0.014	0.310	0.000
2	0.604	2.92	1.53	0.00	-0.014	0.318	0.000
3	0.906	2.92	3.22	0.00	-0.014	0.323	0.000
4	1.208	2.92	4.93	0.00	-0.014	0.324	0.000

Member Deflections (Global) for combination Comb3

Analysis Type : Linear elastic

Interval no	Interval pos. (m)	Displacements (mm)			Slopes (°)		
		Axial	Normal	Lateral	Torsion	Normal	Lateral
Member 1							
0	0.000	0.00	0.00	0.00	0.000	-0.440	0.000
1	1.764	0.00	-12.30	0.00	0.000	-0.324	0.000
2	3.527	0.00	-18.38	0.00	0.000	-0.057	0.000
3	5.291	0.00	-15.54	0.00	0.000	0.236	0.000
4	7.055	0.00	-4.89	0.00	0.000	0.430	0.000
Member 2							
0	0.000	4.21	-2.49	0.00	0.000	0.430	0.000
1	0.302	4.20	-0.18	0.00	0.000	0.446	0.000
2	0.604	4.20	2.20	0.00	0.000	0.457	0.000
3	0.906	4.20	4.63	0.00	0.000	0.464	0.000
4	1.208	4.19	7.09	0.00	0.000	0.466	0.000

Member Axial and Shear Effect Envelopes

Interval no	Interval pos. (m)	Maximum Axial (kN)	Maximum Shear (kN)		Minimum Axial (kN)	Minimum Shear (kN)	
			Normal	Lateral		Normal	Lateral
Member 1							
0	0.000	0.000	24.033	0.000	0.000	0.000	-0.773
1	1.764	0.000	13.154	0.000	0.000	0.000	-0.464
2	3.527	0.000	2.275	0.000	0.000	0.000	-0.155
3	5.291	0.000	0.000	0.155	0.000	-8.604	0.000
4	7.055	0.000	0.000	0.464	0.000	-19.484	0.000
Member 2							
0	0.000	20.581	0.000	0.000	0.000	-12.170	-0.106
1	0.302	21.521	0.000	0.000	0.000	-12.726	-0.053
2	0.604	22.461	0.000	0.000	0.000	-13.282	0.000
3	0.906	23.401	0.000	0.053	0.000	-13.838	0.000
4	1.208	24.341	0.000	0.106	0.000	-14.394	0.000

Member Moment Effect Envelopes

Interval no	Interval pos. (m)	Maximum (kNm)			Minimum (kNm)		
		Torsion	Normal	Lateral	Torsion	Normal	Lateral
Member 1							
0	0.000	0.000	0.000	1.090	0.000	0.000	0.000
1	1.764	0.000	32.794	0.000	0.000	0.000	0.000
2	3.527	0.000	46.400	0.000	0.000	0.000	-0.545
3	5.291	0.000	40.818	0.000	0.000	0.000	-0.545
4	7.055	0.000	16.048	0.000	0.000	0.000	0.000
Member 2							
0	0.000	0.000	16.048	0.000	0.000	0.000	0.000
1	0.302	0.000	12.288	0.000	0.000	0.000	-0.024
2	0.604	0.000	8.360	0.000	0.000	0.000	-0.032
3	0.906	0.000	4.264	0.000	0.000	0.000	-0.024
4	1.208	0.000	0.000	0.000	0.000	0.000	0.000

Maximum Axial, Shear and Deflection effects for Combination Comb1

Member ref	Axial effects		Shear effects		Deflection effects					
	Compr'n (kN)	Tension (kN)	Normal (kN)	Lateral (kN)	Axial (mm)	Pos (m)	Normal (mm)	Pos (m)	Lateral (mm)	Pos (m)
1	0.000	0.000	20.051	-0.773	0.00	7.055	-15.48	3.861	0.45	4.081
2	20.339	0.000	-12.027	-0.106	3.51	0.000	5.92	1.208	0.00	0.604

Maximum Axial, Shear and Deflection effects for Combination Comb2

Member ref	Axial effects		Shear effects		Deflection effects					
	Compr'n (kN)	Tension (kN)	Normal (kN)	Lateral (kN)	Axial (mm)	Pos (m)	Normal (mm)	Pos (m)	Lateral (mm)	Pos (m)
1	0.000	0.000	16.710	-0.644	0.00	7.055	-12.90	3.861	0.38	4.081
2	16.949	0.000	-10.023	0.088	2.93	0.000	4.93	1.208	0.00	0.604

Maximum Axial, Shear and Deflection effects for Combination Comb3

Member ref	Axial effects		Shear effects		Deflection effects					
	Compr'n (kN)	Tension (kN)	Normal (kN)	Lateral (kN)	Axial (mm)	Pos (m)	Normal (mm)	Pos (m)	Lateral (mm)	Pos (m)
1	0.000	0.000	24.033	0.000	0.00	0.000	-18.55	3.861	0.00	4.703
2	24.341	0.000	-14.394	0.000	4.21	0.000	7.09	1.208	0.00	1.208

Max Moment Effects for Combination Comb1

Mbr ref	Torsion				Normal				Lateral			
	Anticlk (kNm)	Pos (m)	Clkwise (kNm)	Pos (m)	Max+ve (kNm)	Pos (m)	Max-ve (kNm)	Pos (m)	Max+ve (kNm)	Positio (m)	Max-ve (kNm)	Pos (m)
1	0.00	0.00	0.00	0.00	39.07	3.90	0.00	0.00	1.09	0.00	-0.61	4.41
2	0.00	0.00	0.00	0.00	13.41	0.00	0.00	1.21	0.00	0.00	-0.03	0.60

Max Moment Effects for Combination Comb2

Mbr ref	Torsion				Normal				Lateral			
	Anticlk	Pos	Clkwise	Pos	Max+ve	Pos	Max-ve	Pos	Max+ve	Positio	Max-ve	Pos
	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)
1	0.00	0.00	0.00	0.00	32.56	3.90	0.00	0.00	0.91	0.00	-0.51	4.41
2	0.00	0.00	0.00	0.00	11.17	0.00	0.00	1.21	0.00	0.00	-0.03	0.60

Max Moment Effects for Combination Comb3

Mbr ref	Torsion				Normal				Lateral			
	Anticlk	Pos	Clkwise	Pos	Max+ve	Pos	Max-ve	Pos	Max+ve	Positio	Max-ve	Pos
	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)	(kNm)	(m)
1	0.00	0.00	0.00	0.00	46.82	3.90	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	16.05	0.00	0.00	1.21	0.00	0.00	0.00	0.00

Max Member Stresses for Combination Comb1

Member reference	Axial stresses (N/mm²)		Bending stresses (N/mm²)			
			Normal		Lateral	
	Compression	Tension	Positive	Negative	Positive	Negative
1	0.0	-0.0	55.3	0.0	4.4	2.5
2	2.3	-0.0	19.0	0.0	0.0	0.1

Note : Members without calculated stress values are not displayed

Max Member Stresses for Combination Comb2

Member reference	Axial stresses (N/mm²)		Bending stresses (N/mm²)			
			Normal		Lateral	
	Compression	Tension	Positive	Negative	Positive	Negative
1	0.0	-0.0	46.1	0.0	3.7	2.1
2	1.9	-0.0	15.8	0.0	0.0	0.1

Note : Members without calculated stress values are not displayed

Max Member Stresses for Combination Comb3

Member reference	Axial stresses (N/mm²)		Bending stresses (N/mm²)			
			Normal		Lateral	
	Compression	Tension	Positive	Negative	Positive	Negative
1	0.0	-0.0	66.3	0.0	-0.0	0.0
2	2.7	-0.0	22.7	-0.0	0.0	-0.0

Note : Members without calculated stress values are not displayed

Summation Check for Combination Comb1

Analysis Type : Linear elastic

Loads	Load summation (kN)			Moment summation (kNm)		
	Px	Py	Pz	Mx	My	Mz
Member loads	0.00	-43.68	1.45	4.04	-5.92	-181.23
Joint loads	0.00	0.00	0.00	0.00	0.00	0.00

Summation Check for Combination Comb1 (continued)

Analysis Type : Linear elastic

Loads	Load summation (kN)			Moment summation (kNm)		
	Px	Py	Pz	Mx	My	Mz
Total loads	0.00	-43.68	1.45	4.04	-5.92	-181.23
Reactions	0.00	43.68	-1.45	-4.04	5.92	181.23
Summations	0.00	0.00	0.00	0.00	0.00	0.00

Summation Check for Combination Comb2

Analysis Type : Linear elastic

Loads	Load summation (kN)			Moment summation (kNm)		
	Px	Py	Pz	Mx	My	Mz
Member loads	0.00	-36.40	1.21	3.37	-4.93	-151.03
Joint loads	0.00	0.00	0.00	0.00	0.00	0.00
Total loads	0.00	-36.40	1.21	3.37	-4.93	-151.03
Reactions	0.00	36.40	-1.21	-3.37	4.93	151.03
Summations	0.00	0.00	0.00	0.00	0.00	0.00

Summation Check for Combination Comb3

Analysis Type : Linear elastic

Loads	Load summation (kN)			Moment summation (kNm)		
	Px	Py	Pz	Mx	My	Mz
Member loads	0.00	-52.31	0.00	0.00	0.00	-216.90
Joint loads	0.00	0.00	0.00	0.00	0.00	0.00
Total loads	0.00	-52.31	0.00	0.00	0.00	-216.90
Reactions	0.00	52.31	0.00	0.00	0.00	216.90
Summations	0.00	0.00	0.00	0.00	0.00	0.00

Member Deflections (Relative) for combination Comb1

Analysis Type : Linear elastic

Interval	Interval	Relative Deflections (mm)					
		Local bow		Local sway relative to end1		Local sway relative to end2	
No	pos. (m)	Normal	Lateral	Normal	Lateral	Normal	Lateral
Member 1							
0	0.000	0.00	0.00	0.00	0.00	4.08	0.00
1	1.764	-9.24	0.20	-10.26	0.20	-6.18	0.20
2	3.527	-13.30	0.43	-15.34	0.43	-11.26	0.43
3	5.291	-9.91	0.37	-12.97	0.37	-8.89	0.37
4	7.055	0.00	0.00	-4.08	0.00	0.00	0.00
Member 2							
0	0.000	0.00	0.00	0.00	0.00	-7.99	0.00
1	0.302	-0.07	0.00	1.93	0.00	-6.06	0.00
2	0.604	-0.08	0.00	3.91	0.00	-4.08	0.00
3	0.906	-0.05	0.00	5.94	0.00	-2.05	0.00
4	1.208	0.00	0.00	7.99	0.00	0.00	0.00

Member Deflections (Relative) for combination Comb2

Analysis Type : Linear elastic

Interval	Interval	Relative Deflections (mm)					
		Local bow		Local sway relative to end1		Local sway relative to end2	
No	pos. (m)	Normal	Lateral	Normal	Lateral	Normal	Lateral
Member 1							
0	0.000	0.00	0.00	0.00	0.00	3.40	0.00
1	1.764	-7.70	0.17	-8.55	0.17	-5.15	0.17
2	3.527	-11.08	0.36	-12.78	0.36	-9.38	0.36
3	5.291	-8.26	0.31	-10.81	0.31	-7.41	0.31
4	7.055	0.00	0.00	-3.40	0.00	0.00	0.00
Member 2							
0	0.000	0.00	0.00	0.00	0.00	-6.66	0.00
1	0.302	-0.06	0.00	1.61	0.00	-5.05	0.00
2	0.604	-0.07	0.00	3.26	0.00	-3.40	0.00
3	0.906	-0.04	0.00	4.95	0.00	-1.71	0.00
4	1.208	0.00	0.00	6.66	0.00	0.00	0.00

Member Deflections (Relative) for combination Comb3

Analysis Type : Linear elastic

Interval	Interval	Relative Deflections (mm)					
		Local bow		Local sway relative to end1		Local sway relative to end2	
No	pos. (m)	Normal	Lateral	Normal	Lateral	Normal	Lateral
Member 1							
0	0.000	0.00	0.00	0.00	0.00	4.89	0.00
1	1.764	-11.08	0.00	-12.30	0.00	-7.41	0.00
2	3.527	-15.94	0.00	-18.38	0.00	-13.49	0.00
3	5.291	-11.87	0.00	-15.54	0.00	-10.65	0.00
4	7.055	0.00	0.00	-4.89	0.00	0.00	0.00
Member 2							
0	0.000	0.00	0.00	0.00	0.00	-9.58	0.00
1	0.302	-0.08	0.00	2.31	0.00	-7.27	0.00
2	0.604	-0.10	0.00	4.69	0.00	-4.88	0.00
3	0.906	-0.06	0.00	7.12	0.00	-2.45	0.00
4	1.208	0.00	0.00	9.58	0.00	0.00	0.00

Excess Member Deflection (All)

Member ref	Deflection limit	Criteria	Limit	Actual	U ratio	Combination
2	Normal	L/d ratio	300.00	181.42	1.654	2 - Comb2

Excess Member Deflection (Max)

Member ref	Deflection limit	Criteria	Limit	Actual	U ratio	Combination
2	Normal	L/d ratio	300.00	181.42	1.654	2 - Comb2

Member deflection above specified URatio (1.0)

Member ref	Deflection limit	Criteria	Limit	Actual	U ratio	Combination
2	Normal	L/d ratio	300.00	181.42	1.654	2 - Comb2

Elastic Critical Load Analysis

No.	Combination Reference	Elastic Critical Load Factor	Critical joint	Critical degree of freedom	No.	Combination Reference	Elastic Critical Load Factor	Critical joint	Critical degree of freedom
1	Comb1	N/A	N/A		2	Comb2	N/A	N/A	
3	Comb3	N/A	N/A						

Error Log

***** No errors or warnings detected

Self Weights

Mem ref	Self weight (kN)	Mem ref	Self weight (kN)	Mem ref	Self weight (kN)	Mem ref	Self weight (kN)
1	4.889	2	0.837				
Total self weight for selected members : 5.726 kN							

Member Loads

Load reference	Load type	Start pos'n (m)	Start intensity (kN) & (m)	End pos'n (m)	End intensity (kN) & (m)	Direction	Category
Loads on member 1 (Length 7.055m)							
Flat Roof	UL		1.250			Vertical	Dead
Flat Roof	UL		1.420			Vertical	Imposed
Point Load	PL	7.055	2.670			Vertical	Dead
Point Load	PL	7.055	0.430			Vertical	Imposed
Pitched Roof	UL		0.840			Vertical	Dead
Wind Y	UL		0.085			Vertical	Wind
Wind Z	UL		0.146			Lateral	Wind
Loads on member 2 (Length 1.208m)							
Flat Roof	UL		1.250			Vertical	Dead
Flat Roof	UL		1.420			Vertical	Imposed
Pitched Roof	UL		0.840			Vertical	Dead
Wind Y	UL		0.085			Vertical	Wind
Wind Z	UL		0.146			Lateral	Wind

Load Combinations

Load Category			Partial Safety Factors			
No	**Name**	**Type**	**Sub type**	**1**	**2**	**3**
	Combination reference			Comb1	Comb2	Comb3
	Limit state			ULS	SLS	ULS
	Elastic analysis			Linear	Linear	Linear
	Plastic analysis			No	No	No
1	Self Weight	Permanent	Self weight	1.20	1.00	1.40
2	Dead	Permanent	Permanent	1.20	1.00	1.40
3	Imposed	Variable	Cat A: domestic	1.20	1.00	1.60
4	Wind	Variable	Wind	1.20	1.00	0.00

Members

Mbr ref	Member type	Start joint	Start fixity	End joint	End fixity	Orient (°)	Directional behaviour	Length (m)	P-Delta behavio ur	Slope (°)
1	203x203 UKC71	1	Fixed	2	Fixed	0.0	Normal	7.055	Normal	0.0
2	203x203 UKC71	2	Fixed	3	Fixed	0.0	Normal	1.208	Normal	-59.4

Joints

Joint ref	X pos (m)	Y pos (m)	Z pos (m)	Joint ref	X pos (m)	Y pos (m)	Z pos (m)	Joint ref	X pos (m)	Y pos (m)	Z pos (m)
1	0.000	2.870	0.000	2	7.055	2.870	0.000	3	7.670	1.830	0.000

Supports

Joint ref	Support type	X Trans. (kN/mm)	Y Trans. (kN/mm)	Z Trans. (kN/mm)	X Rot. (kNm/Rad)	Y Rot. (kNm/Rad)	Z Rot. (kNm/Rad)	Direction control
1	Pinned Base	Fixed	Fixed	Fixed	Free	Fixed	Free	Normal
2	Translation	Free	Free	Fixed	Free	Free	Free	Normal
3	Pinned	Free	Fixed	Fixed	Free	Free	Free	Normal

Sections

Reference	Area (cm^2)	Ixx (cm4)	Iyy (cm4)	J (cm4)	Elements (mm)				
					No	Width	Height	Vert. off	Lat. off
203x203 UKC71	90	7618	2537	80.2					
203x203 UKC86	110	9449	3127	137					

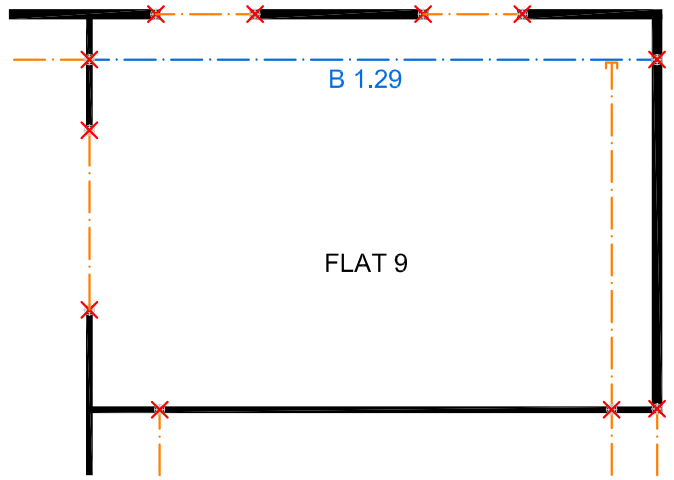
Materials

Material reference	Elastic modulus (kN/mm^2)	Poisson ratio	Density (kN/m3)	Thermal expansion (/°Cx10-6)
UK-S275	205.00	0.30	77.00	12.00

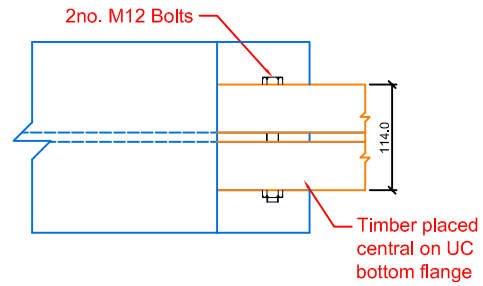
Member Types

Reference	*Shape*	*Material*	*Seg no*	*Start section*	*End section*	*Length (m)*	*Depth (mm)*	*Placing rule*
203x203 UKC71	SW Library	UK-S275	1	203x203 UKC71				

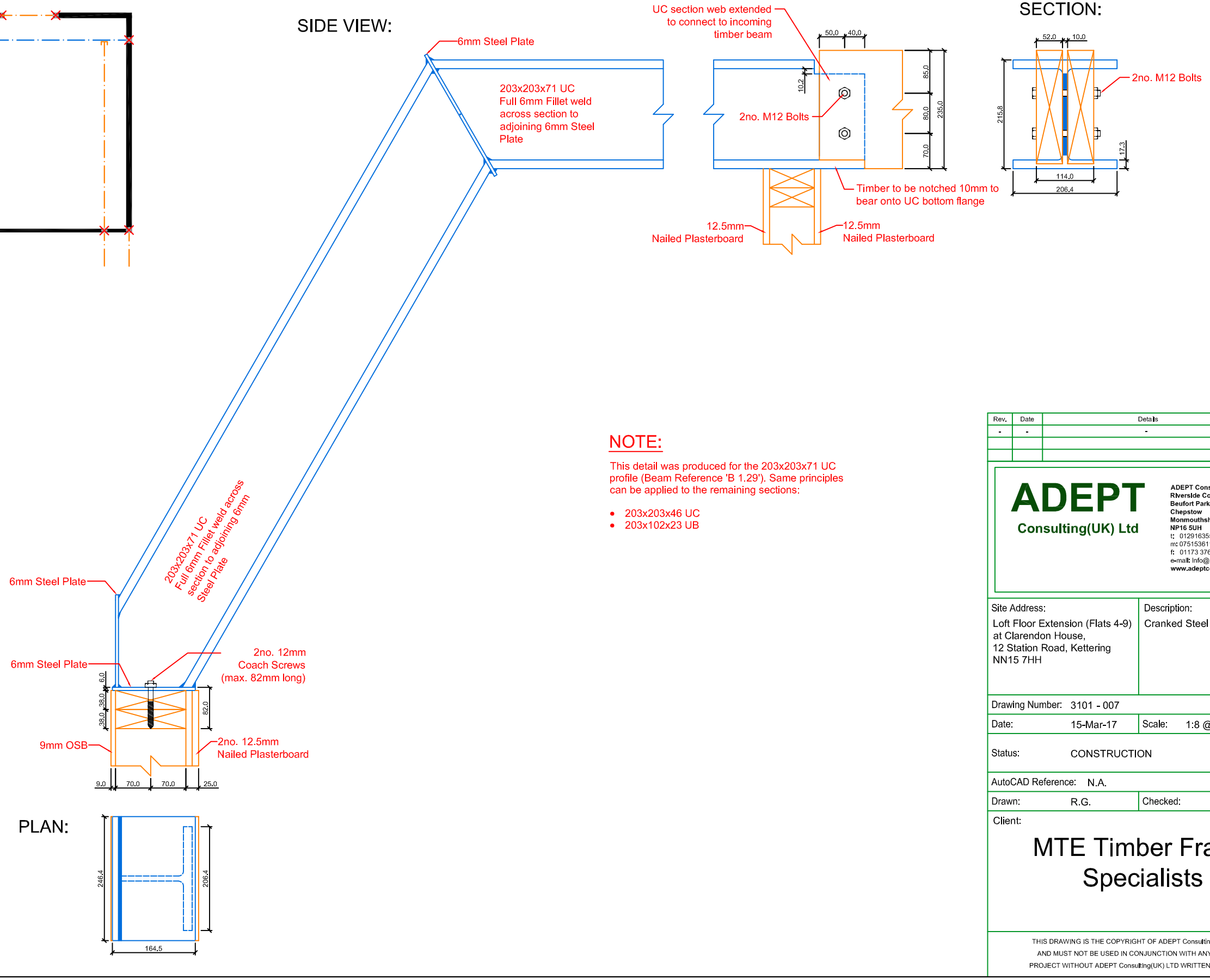
Cranked Steel member (B 1.29) position



PLAN:



SIDE VIEW:



SECTION:

PLAN:

NOTE:

This detail was produced for the 203x203x71 UC profile (Beam Reference 'B 1.29'). Same principles can be applied to the remaining sections:

- 203x203x46 UC
- 203x102x23 UB

Rev.	Date	Details	Drawn
-	-	-	-

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Site Address:
Loft Floor Extension (Flats 4-9)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
Cranked Steel Detail

Drawing Number: 3101 - 007

Date: 15-Mar-17

Scale: 1:8 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists

DRAWING REGISTER & ISSUE SHEET

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Job No.	3101	Sheet No.	1

Project Title:	**Proposed extension at Clarendon House, 12 Station Road, Kettering NN15 7HH**

Drawing Description	Number	Size	Date of Issue	
			D	7
			M	3
			Y	17
Side Extension (Flats 1-3)				
FF Line & Point Loads	001	A3		X
FF Structural Mark-Ups	002	A3		
SF Structural Mark-Ups	003	A3		
TF Structural Mark-Ups	004	A3		
Structural Calculations	1x	A4		
Loft Extension (Flats 4-9)				
LF Line & Point Loads	005	A3		X
LF Structural Mark-Ups	006	A3		
Structural Calculations	1x	A4		

Distribution	Number of copies	
Ryan Bowler - MTE Timber Frame Specialists		X

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P - Paper N - Negative CD - CD disk E - E-mail	Media		E
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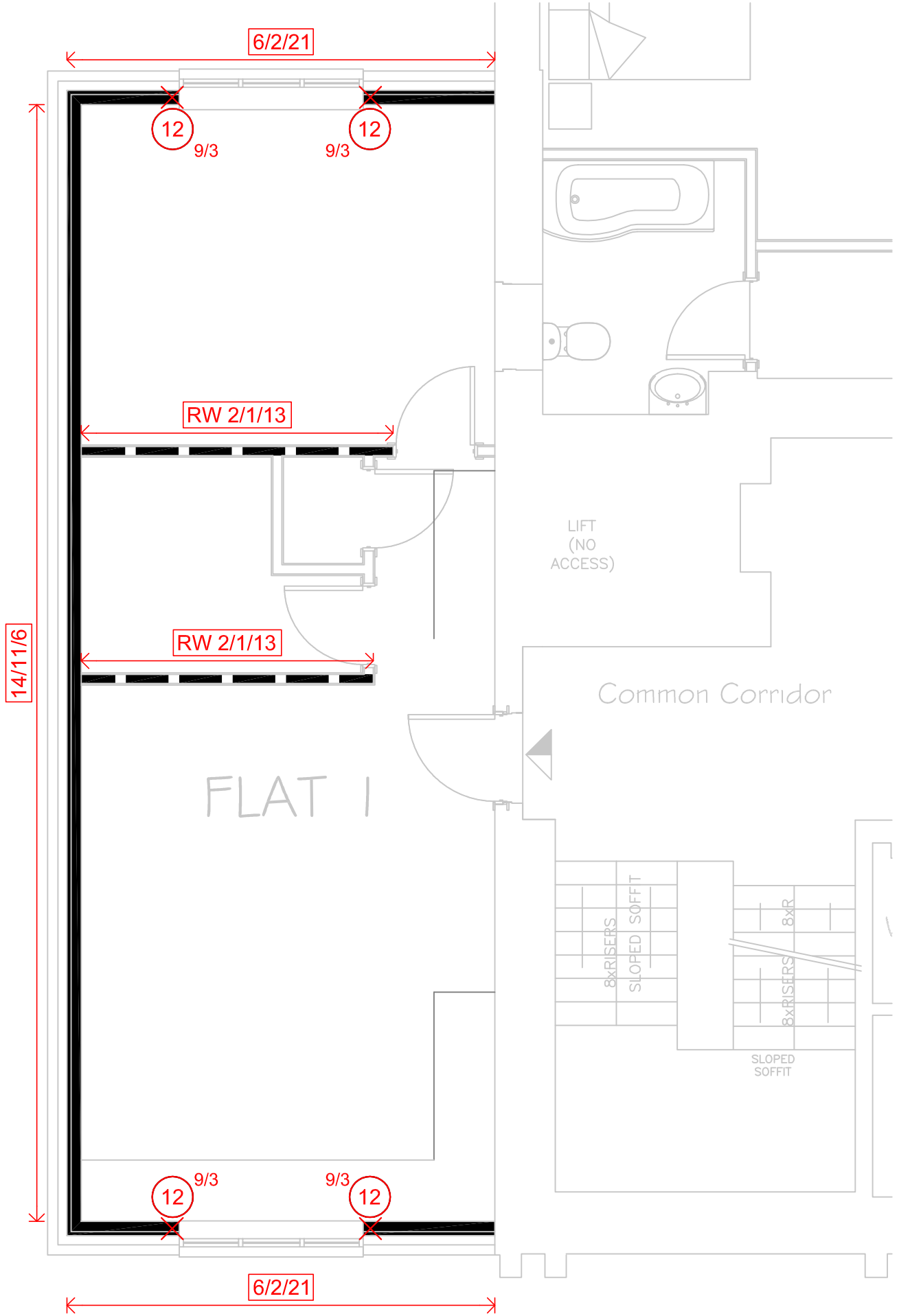
	Issued By		RG

This sheet indicates the latest issue of registered drawings&calculations. Previous issues should be removed from circulation.



NOTES:

5/2/1 Denotes (UNFACTORED DEAD/IMPOSED/ VERTICAL WIND) LIne Loads IN kN/m run. Minimum loads of 5kN/m Ommited for Clarity. The wind load gives a reversible triangular load distribution of max.positive to max.negative.

25 9/16 Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads In kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight cladding, if present Is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 5 kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings In both the Internal and external loadbearing wall (refer to architects layouts for extent of all openings). these should be calculated from UDL and allowed for In the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR Inner leafs. If masonry Is Included It will be denoted : M -
First floor loads are excluded. If a timber first floor Is Included It will be denoted : FF -

Rev.	Date	Details	Drawn
-	-	-	-

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Site Address:
Side Extension (Flats 1-3)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
First Floor
Line & Point Loads

Drawing Number: 3101 - 001

Date: 07-Mar-17 Scale: 1:50 @ A3

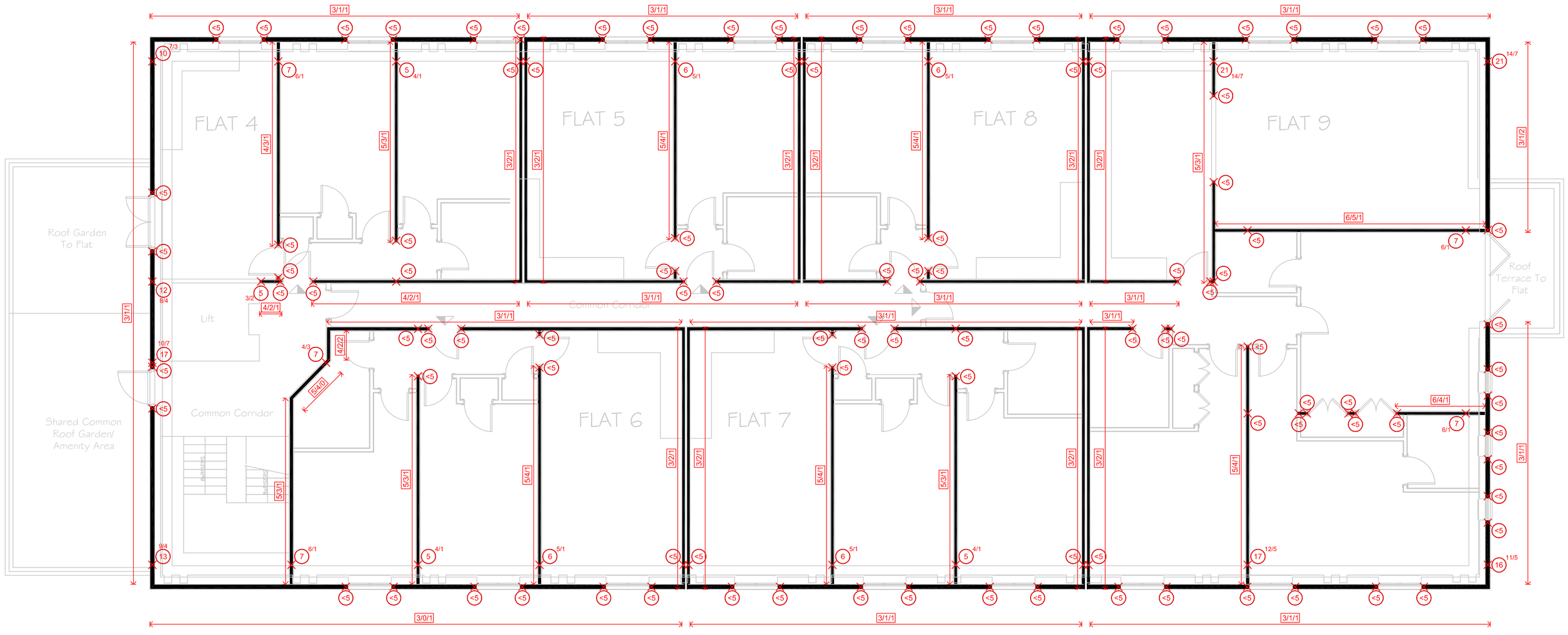
Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G. Checked: M.K.

Client:

MTE Timber Frame Specialists



NOTES:

5/2/1 Denotes (UNFACTORED DEAD/IMPOSED/ VERTICAL WIND) Line Loads IN kN/m run.
Minimum loads of 5kN/m Ommited for Clarity.
The wind load gives a reversible triangular load distribution of max.positive to max.negative.

9/1/6 (25) Denotes Total (UNFACTORED DEAD/IMPOSED) Point Loads in kN. Minimum loads of 5kN Ommited for Clarity.

COMMENTS
Lightweight claddding, if present is included within the value given.
Podium structures are to be have deflection limits l/360 or 14mm whichever is lesser value.
RW - Indicates racking wall only, with a dead load of 1kN/m vertical and a wind load of 'x' kN/m vertical & horizontal.
In addition to the loads noted, concentrations will occur either side of openings in both the internal and external loadbearing wall (refer to architects layouts for extent of all openings), these should be calculated from UDL and allowed for in the design of the building's structure.
EXCLUSIONS:
These values exclude any masonry outer OR Inner leafs. if masonry is included it will be denoted : M -
Floor loads are excluded. If a timber ground floor is included it will be denoted : GF -

TYPICAL LOADINGS:

Flat Roof -	Dead	= 0.527 kN/m²
	Imposed	= 0.600 kN/m²
Pitched Roof -	Dead	= 2.719 kN/m²
	Imposed	= 0.000 kN/m²
Floor -	Dead	= N/A
	Imposed	= N/A
Walls -	External	= 0.351 kN/m²
	Party	= 0.370 kN/m² (1 leaf)
	ILB	= 0.473 kN/m²

STRUCTURAL MARK-UPS LEGEND:

- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- 2/1 Structural Studs, (No. Cripple Studs/No. Full Height Studs)

Rev.	Date	Details	Drawn
-	-	-	-

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e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address:
Loft Floor Extension (Flats 4-9)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
Fourth/Loft Floor
Line & Point Loads

Drawing Number: 3101-005

Date: 07-Mar-17

Scale: 1:75 @ A1

Status: CONSTRUCTION

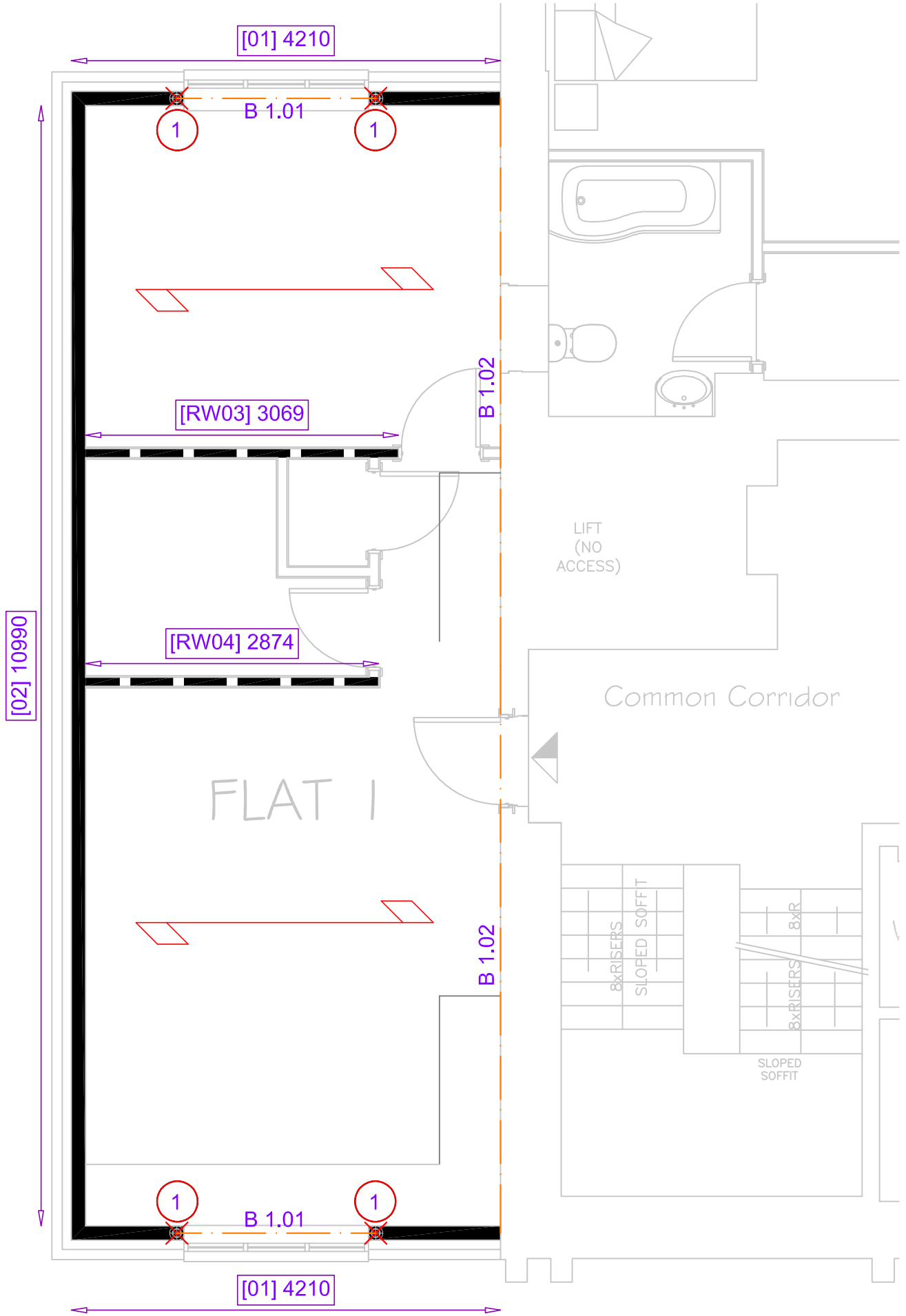
AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists



Rev.	Date	Details	Drawn
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Site Address:
Side Extension (Flats 1-3)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
First Floor
References

Drawing Number: 3101 - SK1

Date: 15-Mar-17

Scale: 1:50 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

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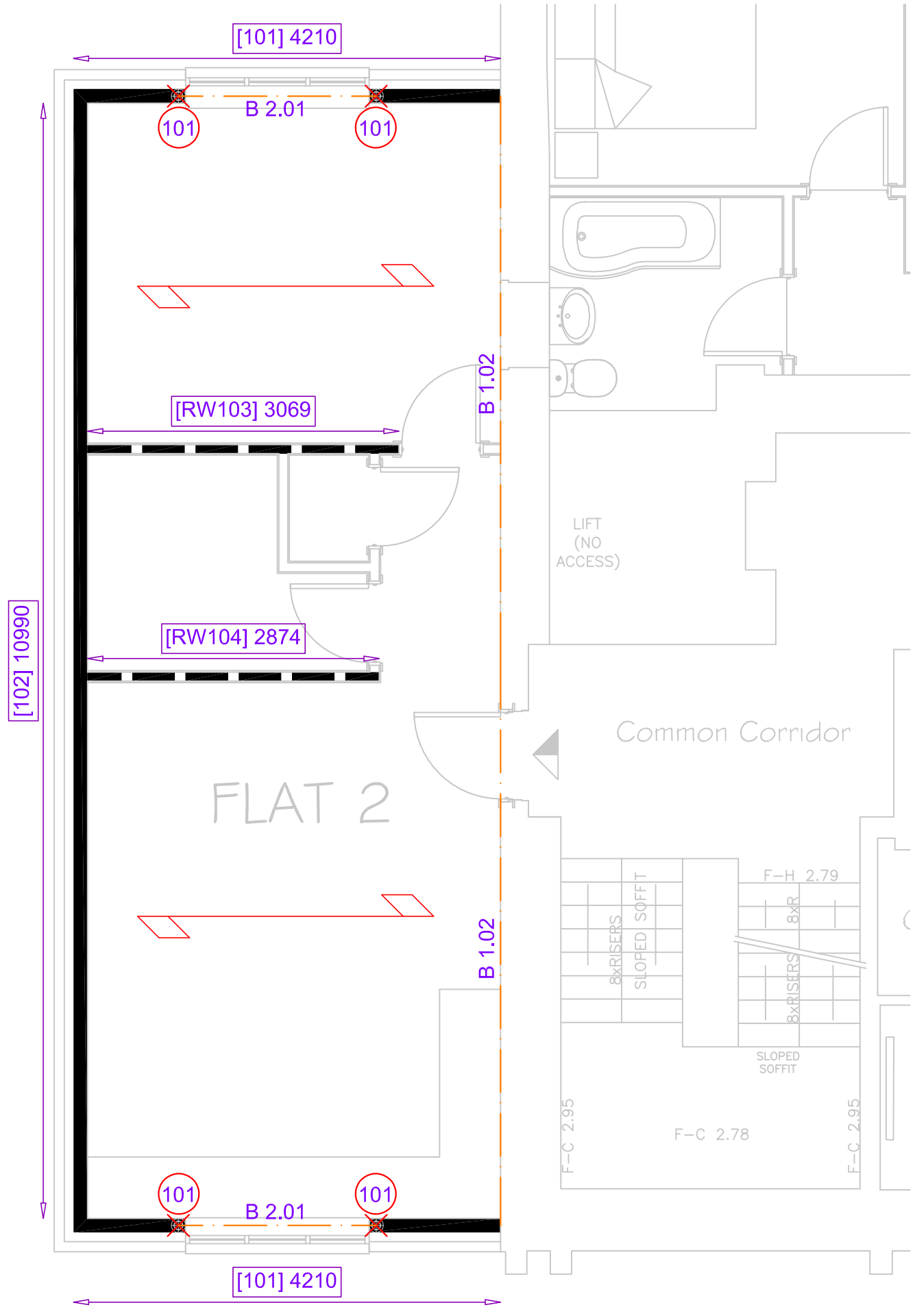

Rev.	Date	Details	Drawn
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Site Address:
Side Extension (Flats 1-3)
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12 Station Road, Kettering
NN15 7HH

Description:
Second Floor
References

Drawing Number: 3101 - SK2

Date: 15-Mar-17

Scale: 1:50 @ A3

Status: CONSTRUCTION

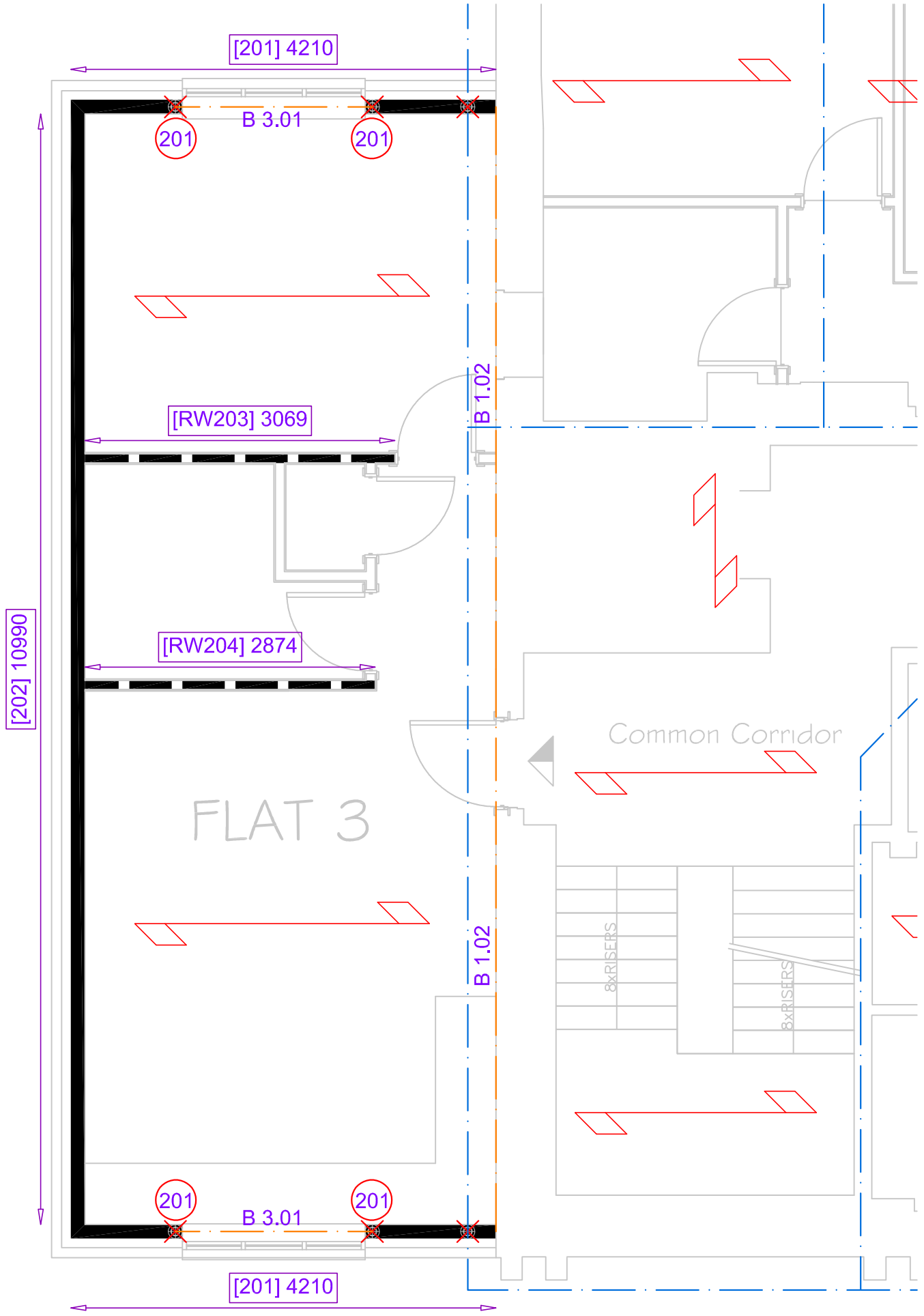
AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists



Rev.	Date	Details	Drawn
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Site Address:
Side Extension (Flats 1-3)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
Third Floor
References

Drawing Number: 3101 - SK3

Date: 15-Mar-17

Scale: 1:50 @ A3

Status: CONSTRUCTION

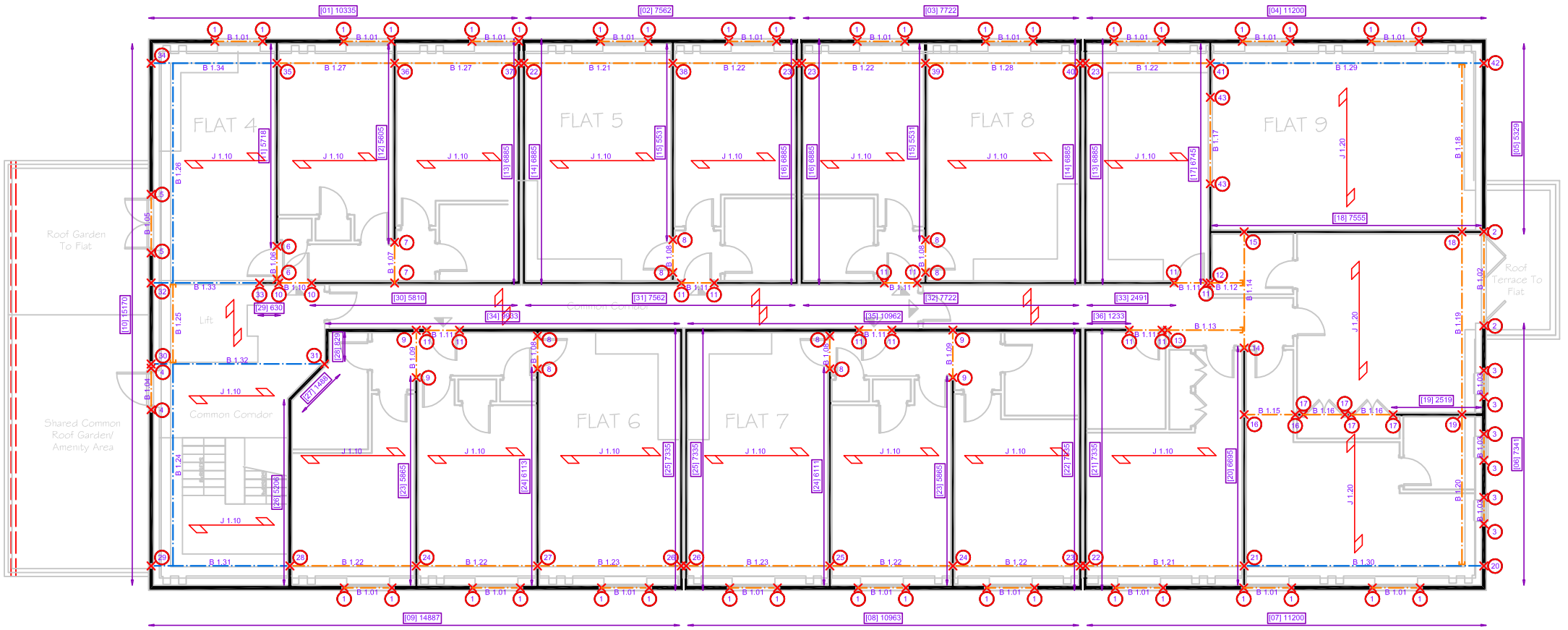
AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists



STRUCTURAL MARK-UPS LEGEND:

- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. (No. Cripple Studs/No. Full Height Studs)

Rev.	Date	Details	Drawn
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Site Address:
Loft Floor Extension (Flats 4-9) at Clarendon House, 12 Station Road, Kettering NN15 7HH

Description:
Fourth/Loft Floor References

Drawing Number: 3101-SK4

Date: 07-Mar-17

Scale: 1:75 @ A1

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @ 600mm c/c
- Party = N/A
- ILB = N/A

Allgnment of studs with joists/trusses:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Tles:
- N/A

Wall Panel Fixings:
- Soleplate (s/p) =
  Hilti HPS-1 8/40 impact anchor @ 600mm c/c assumed fixing to concrete substrate
- Top&Bottom Panel fixings (w/p) =
  Single row of 3,0ø x90mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 75mm c/c on the Eaves direction, used throughout on all external walls as standard.
9mm OSB @ 150mm c/c on Gable direction, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:
- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = N/A

Beams/Trimmers:
- As noted on drawing

Cripple/Full height Studs:
- As noted on drawing

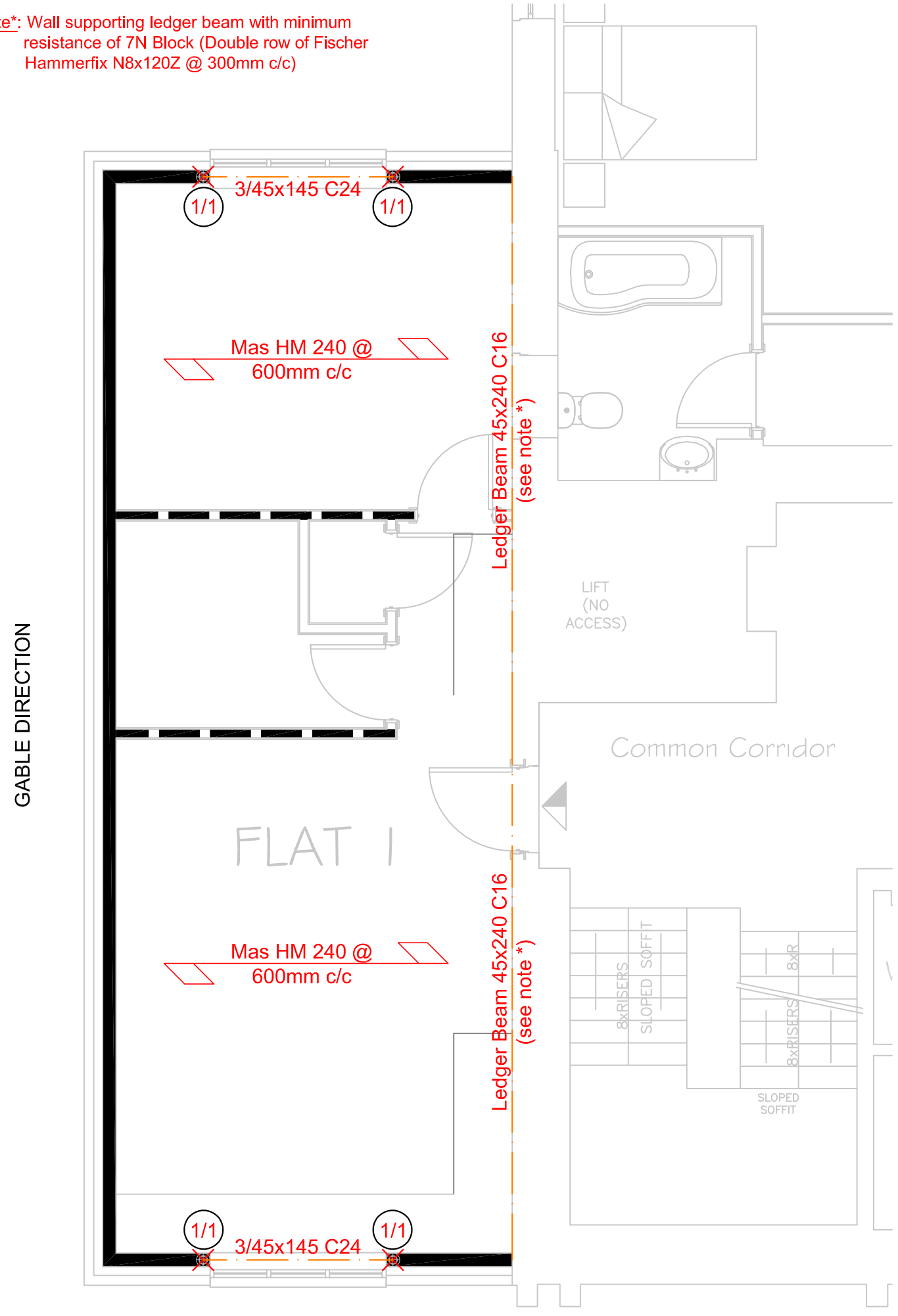
Floor Joists:
- Masonite HM 240mm deep joists @ 600mm c/c

Roof:
- Plots considered to lie within Town
- Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 0.849 kN/m².
- Masonite HM 240mm deep joists @ 600mm c/c used to form the flat roof
- Joists to align with wall studs;
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.283 kN/m²
	Imposed	= 1.500 kN/m²
Floor -	Dead	= 1.283 kN/m²
	Imposed	= 1.500 kN/m²
Walls -	External	= 0.351 kN/m²
	Internal	= 0.473 kN/m²

Note*: Wall supporting ledger beam with minimum resistance of 7N Block (Double row of Fischer Hammerfix N8x120Z @ 300mm c/c)



STRUCTURAL MARK-UPS LEGEND:
- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.

Rev.	Date	Details	Drawn
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Site Address:
Side Extension (Flats 1-3)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
First Floor
Structural Mark-Ups

Drawing Number: 3101 - 002

Date: 15-Mar-17 | Scale: 1:50 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G. | Checked: M.K.

Client:

MTE Timber Frame Specialists

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @ 600mm c/c
- Party = N/A
- ILB = N/A

Allgnment of studs with joists/trusses:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Tles:
- N/A

Wall Panel Fixings:
- Wallplate (s/p) =
  Single row of 3.0ϕx90mm nails @ 300mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0ϕx75mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 75mm c/c on the Eaves, used throughout on all external walls as standard.
9mm OSB @ 150mm c/c on Gables, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:
- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = N/A

Beams/Trimmers:
- As noted on drawing

Cripple/Full height Studs:
- As noted on drawing

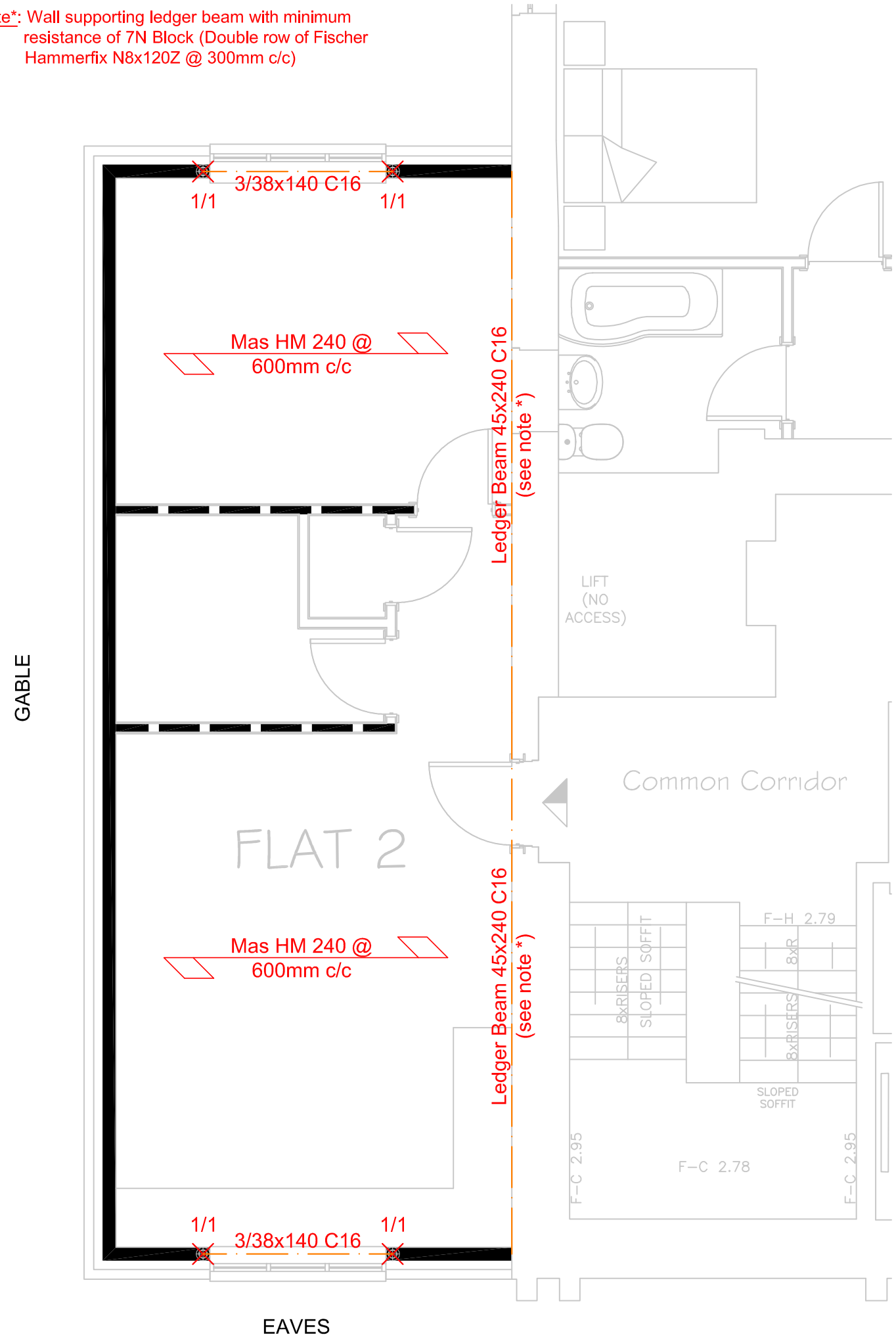
Floor Joists:
- Masonite HM 240mm deep joists @ 600mm c/c

Roof:
- Plots considered to lie within Town
- Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 0.849 kN/m².
- Masonite HM 240mm deep joists @ 600mm c/c used to form the flat roof
- Joists to align with wall studs;
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.283 kN/m²
	Imposed	= 1.500 kN/m²
Floor -	Dead	= 1.283 kN/m²
	Imposed	= 1.500 kN/m²
Walls -	External	= 0.351 kN/m²
	Internal	= 0.473 kN/m²

THIS DRAWING MUST NOT BE SCALED.
PRIOR TO THE COMMENCEMENT OF ANY WORKS, THE BUILDER IS TO CHECK AND/OR DETERMINE ALL CONSTRUCTION DETAILS, INCLUDING CHECKING EXISTING SITE LEVELS AND DIMENSIONS. THE DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS, CONSTRUCTION NOTES AND/OR PROJECT SPECIFICATION. ALL DISCREPANCIES SHOULD BE REPORTED IMMEDIATELY.



STRUCTURAL MARK-UPS LEGEND:
- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. No. Cripple Studs/No. Full Height Studs 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
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Site Address:
Side Extension (Flats 1-3)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
Second Floor
Structural Mark-Ups

Drawing Number: 3101 - 003

Date: 15-Mar-17

Scale: 1:50 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @ 600mm c/c
- Party = N/A
- ILB = N/A

Allgnment of studs with joists/trusses:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Tles:
- N/A

Wall Panel Fixings:
- Wallplate (s/p) =
  Single row of 3.0Φx90mm nails @ 300mm c/c
- Top&Bottom Panel fixings (w/p) =
  Single row of 3.0Φx75mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 75mm c/c on the Eaves direction, used throughout on all external walls as standard.
9mm OSB @ 150mm c/c on Gable direction, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:
- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = N/A

Beams/Trimmers:
- As noted on drawing

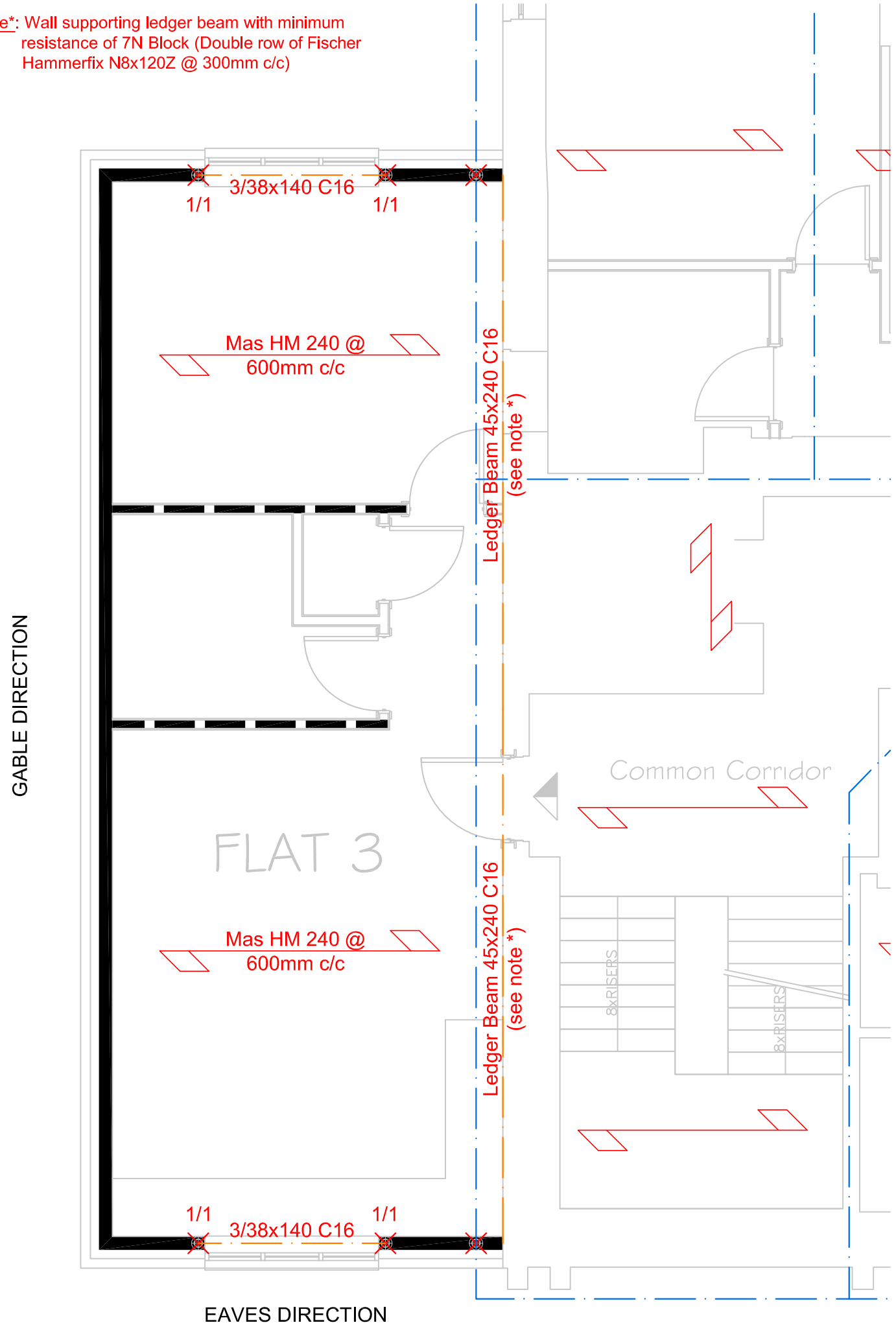
Cripple/Full height Studs:
- As noted on drawing

Floor Joists:
- Masonite HM 240mm deep joists @ 600mm c/c

Roof:
- Plots considered to lie within Town
- Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 0.849 kN/m².
- Masonite HM 240mm deep joists @ 600mm c/c used to form the flat roof
- Joists to align with wall studs;
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Roof -	Dead	= 1.283 kN/m²
	Imposed	= 1.500 kN/m²
Floor -	Dead	= 1.283 kN/m²
	Imposed	= 1.500 kN/m²
Walls -	External	= 0.351 kN/m²
	Internal	= 0.473 kN/m²



STRUCTURAL MARK-UPS LEGEND:
- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. No. Cripple Studs/No. Full Height Studs 1/1 in positions denoted with 'X' for lintels 0/2 for beams and trimmers

Rev.	Date	Details	Drawn
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e-mail: Info@adeptco.co.uk
www.adeptco.co.uk

Site Address:
Side Extension (Flats 1-3)
at Clarendon House,
12 Station Road, Kettering
NN15 7HH

Description:
Third Floor
Structural Mark-Ups

Drawing Number: 3101 - 004

Date: 15-Mar-17

Scale: 1:50 @ A3

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists

STRUCTURAL NOTES
All standard notes Unless Noted Otherwise (u.n.o.) on drawing.
*** Internal Load Bearing (ILB)**

Wall Studs:
- External = 38x140mm C16 Studs @ 600mm c/c
- Party = 38x89mm C16 Studs @ 600mm c/c
- ILB = 38x89mm C16 Studs @ 600mm c/c

Alignment of studs with joists/rafters:
- External = N/A
- Party = N/A
- ILB = N/A

Noggins:
- External = N/A
- Party = N/A
- ILB = N/A

Party Wall Ties:
- Single Cullen's PWS @ 1200mm c/c

Wall Panel Fixings:
- Soleplate (s/p) =
  Fischer Hammerfix N8x120Z @ 600mm c/c
- Top&Bottom Panel fixings (w/p) =
  SIngle row of 3.04x90mm nails @ 300mm c/c

Sheathing:
9mm OSB @ 150mm c/c both gable and eaves directions, used throughout on all external walls as standard.

Lintels:
If not noted otherwise, use the following minimum sections:
- External Walls = 3/38x140 C16
- Party Walls = N/A
- ILB = 2/38x140 C16

Beams/Trimmers:
- As noted on drawing

Cripple/Full height Studs:
- As noted on drawing

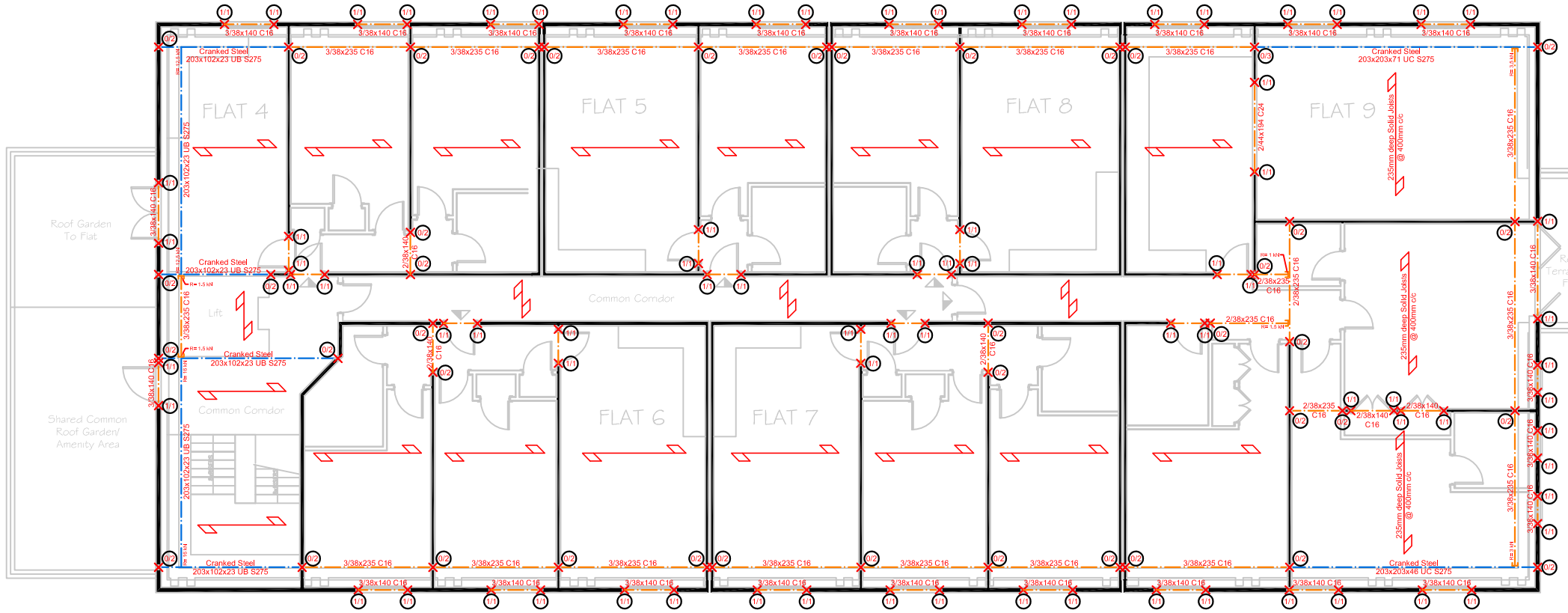
Floor Joists:
- Solid joists designed at later stage.
- Floor Joists to align with wall studs:
  - External = N/A
  - Party = N/A
  - ILB = N/A

Roof:
- Plots considered to lie within Town
- Bracing to be determined from Annex A, BS 5268-3. Maximum dynamic pressure of: 0.509 kN/m²
- 235mm deep C16 Solid Joists @ 600mm c/c used to form the flat roof (use 400mm c/c where noted on the drawing)
- 97x47 TR26 Rafters @ 600mm c/c used throughout all the perimeter as pitched roof
- Rafters to align with wall studs:
  - External = N/A
  - Party = N/A
  - ILB = N/A
- Nominal Cullen's Truss clips used throughout to restrain against uplift

TYPICAL LOADINGS:

Flat Roof -	Dead	= 0.527 kN/m²
	Imposed	= 0.600 kN/m²
Pitched Roof -	Dead	= 2.719 kN/m²
	Imposed	= 0.000 kN/m²
Floor -	Dead	= N/A
	Imposed	= N/A
Walls -	External	= 0.351 kN/m²
	Party	= 0.370 kN/m² (1 leaf)
	ILB	= 0.473 kN/m²

THIS DRAWING MUST NOT BE SCALED.
PRIOR TO THE COMMENCEMENT OF ANY WORKS, THE BUILDER IS TO CHECK AND/OR DETERMINE ALL CONSTRUCTION DETAILS, INCLUDING CHECKING EXISTING SITE LEVELS AND DIMENSIONS. THE DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS, CONSTRUCTION NOTES AND/OR PROJECT SPECIFICATION. ALL DISCREPANCIES SHOULD BE REPORTED IMMEDIATELY.



STRUCTURAL MARK-UPS LEGEND:

- Structure by others
- Non - Loadbearing Wall
- Loadbearing Wall
- Floor Joist/Roof Truss Span.
- Structural Studs. (No. Cripple Studs/No. Full Height Studs)

Rev.	Date	Details	Drawn
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e-mail: info@adeptco.co.uk
www.adeptco.co.uk

Site Address:
Loft Floor Extension (Flats 4-9) at Clarendon House, 12 Station Road, Kettering NN15 7HH

Description:
Fourth/Loft Floor Structural Mark-Ups

Drawing Number: 3101-006

Date: 07-Mar-17

Scale: 1:75 @ A1

Status: CONSTRUCTION

AutoCAD Reference: N.A.

Drawn: R.G.

Checked: M.K.

Client:

MTE Timber Frame Specialists