

 Harlow Norwich - 01279 430888 - 01603 300360	Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
	Part of Structure Apartment west wing				Sheet no./rev. -	
	Calc. by VM	Date Aug 24	Chck'd by JGW	Date Aug 24	Rev'd by	Date
Ref.	Calculations				Output	

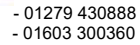


House type calculations

Apartment west wing

 Harlow - 01279 430888 Norwich - 01603 300360		Project				Job Ref.	
		Redevelopment of East Court, East Grinstead, RH19 3LT				10056	
		Part of Structure				Sheet no./rev.	
		Apartment west wing				-	
		Calc. by	Date	Chck'd by	Date	Rev'd by	Date
		VM	Aug 24	JGW	Aug 24		
Ref.	Calculations					Output	

CALCULATION INDEX	
Section	Item Description
1	Introduction and design standards
2	Loading Schedule
3	Layouts and Details
4	Load Run Down
5	Masonry Panel Checks and Block Strengths
6	Steelwork Design
7	Timber Design (Not required)
8	General Stability Check
9	Chimney Check (Not required)
10	Movement Joint Details
11	Ground Beam Check



Date

Output

—

 Harlow - 01279 430888 Norwich - 01603 300360		Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
		Part of Structure Apartment west wing				Sheet no./rev. 1.1	
		Calc. by VM	Date Aug 24	Chck'd by JGW	Date Aug 24	Rev'd by	Date
Ref.	Calculations					Output	
Client:		WAS Chartered Architects & Surveyors					
Information upon Which Design is Based:		Refer to section 3 for mark-up's and relevant information used to prepare these calculations. For 3 rd party details available prior to design refer to section 11					
Function of Construction & Loading:		Domestic					
Description of Design to be carried out, or Elements to be Designed		These are standard house type calculations. They are designed in compliance with Building Regulations Part A. Any design outside of the building regulations, are to be designed in accordance with the relevant Eurocodes.					
Element		Compliance with Building regulations Part A 2004			Comments		
Roof		Restraint straps to be provided in accordance with Part A, conditions 2C32 to 2C37. Refer to diagram 16 and relevant NHBC technical standards.			To specialist design, loose cut roof not considered, to include appropriate bracing, if design layouts available refer to section 11 of calculations.		
Steelwork		Outside of Building Regulations			Designed in accordance with EC3 and British National annex		
Floor joists		Restraint straps to be provided in accordance with Part A, conditions 2C32 to 2C37. Refer to diagram 15 and relevant NHBC technical standards.			To specialist design (Maximum span of 6m) and to include appropriate bracing, if design layouts available refer to section 11 of calculations		
Beam bearing design		Outside of Building Regulations			Designed in accordance with EC6 and British National annex		
Masonry design		Masonry checks on strength and pier sizes to conform with Building regulations 2C17 to 2C27 and construction to be in accordance with NHBC technical standards.			Masonry considered outside of building regulations to be designed in accordance with EC6 and British National annex		
Lintels		Outside of Building Regulations			To specialist design, if included at time of design refer to section 11. Equal bearing each side of opening. Minimum 150mm bearing. Full block to be provided at bearing.		
Ground Floor/ Foundations		Outside of Building Regulations			Ground bearing and precast floor scenarios provided with spread foundations; widths calculated based on a minimum allowable bearing pressure of 100kN/m ² . Depths should be based on site specific conditions.		
Design Outside of Building Regulations Based upon the Following; Standards, Codes of Practice, guidance & other technical information		BS EN 845 BS EN 771 EN 1991 EN 1992			EN 1993 EN 1995 EN 1996 Steelwork Execution Class EX2		
Party Wall Act		Party Wall Act dealt with by others.					
CDM 2015		Barter Hill Partnership is not the Principal Designer . The designer on the project to supply a design risk assessment					

 Harlow - 01279 430888 Norwich - 01603 300360	Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
	Part of Structure Apartment west wing				Sheet no./rev. 1.2	
	Calc. by VM	Date Aug 24	Chck'd by JGW	Date Aug 24	Rev'd by	Date
Ref.	Calculations				Output	

Building Description:		
☐ Bungalow House: ☐ 2 Storey ☐ 2.5 Storey ☒ 3 Storey ☐ 4 Storey	☒ Detached ☐ Semi Detached ☐ Link Detached ☐ Terraced	Part A checks: ☒ Height to ridge less than 15m ☐ 4 Structural walls internal area less than 70m ² (If 3 structural walls area reduced to 36m ²) ☐ Max. Floor to ceiling masonry height 2.7m ☐ Max. Timber floor span 6m ☒ No Opening to exceed 3m Ensure stability checks carried out in accordance with section 8 of calculations

Notes:

- The following calculations only concern the elements of the construction & the client to which they specifically refer. No responsibility or liability is accepted in respect of any other element or part of the construction, or any other party.
- These are standard calculations; site specific conditions should be considered and supersede these calculations if more onerous. Foundations are to be site specific.
- The brief does not include any site inspections unless specifically instructed.
- No construction or fabrication should be carried out until all statutory approvals are obtained.
- All bearing stresses, dimensions and levels should be checked on site.
- Not to be used for setting out
- Wall Ties, Masonry strength, Construction/Workmanship and Mortars as per conditions 2C19 to 2C22 of B.Reg's Part A.
- Maximum span of Timber floors should not exceed 6m and Roof spans not to exceed 12m.
- Chases for services within the masonry leaf are to be in accordance with condition 2C30 of B.Reg's Part A.
- For wind load, these calculations assume no significant topography or wind speed exceeding 23m/s
- Building to be constructed in accordance with Building regulations Part A and latest NHBC technical standards

The Contractor shall ensure the stability of each element and the overall construction until the work is complete.



Harlow - 01279 430888
Norwich - 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Part of Structure
Apartment west wing

Calc. by
VM

Date
Aug 24

Chck'd by
JGW

Date
Aug 24

Job Ref.
10056

Sheet no./rev.
1.3

Rev'd by
Date

Ref.

Calculations

Output

Diagram 3 Determination of wall thickness

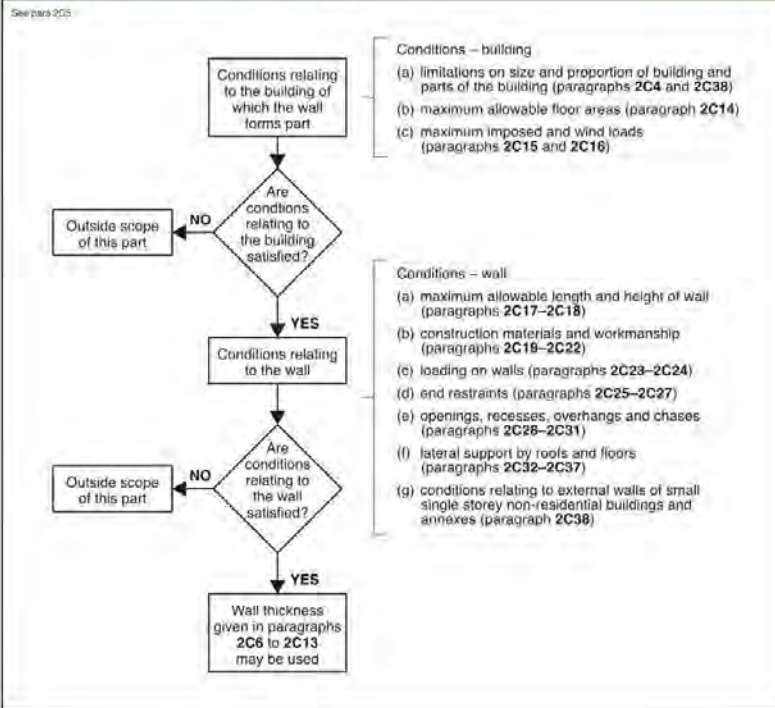
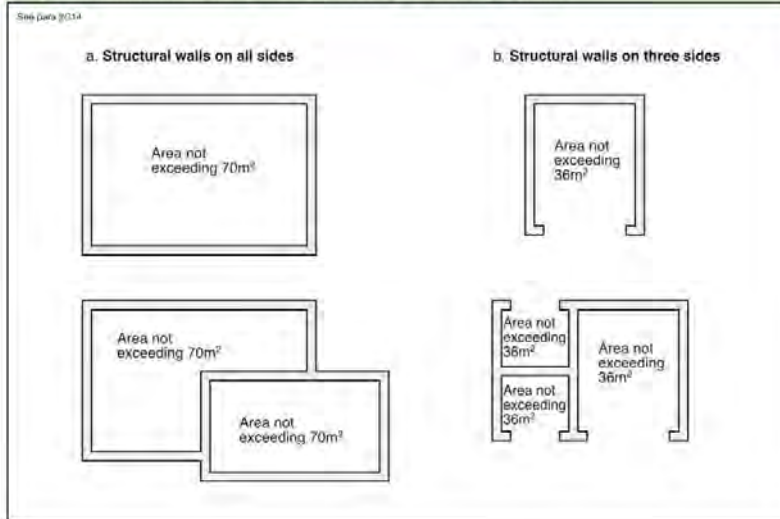


Diagram 5 Maximum floor area enclosed by structural walls





Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

Apartment west wing

Sheet no./rev.

1.4

Calc. by
VM

Date
Aug 24

Chck'd by
JGW

Date
Aug 24

Rev'd
by

Date

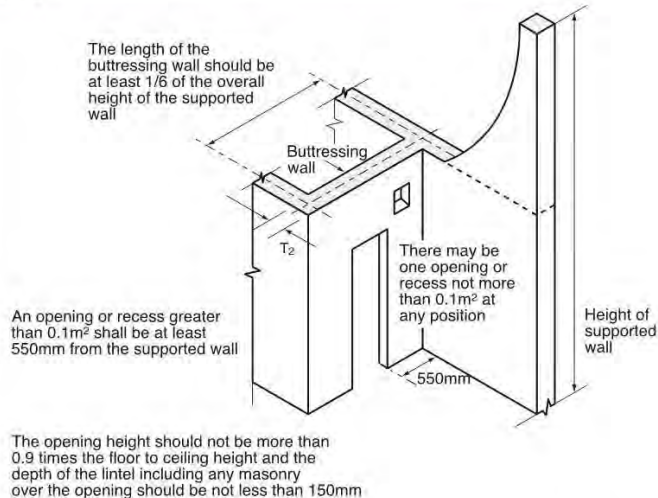
Ref.

Calculations

Output

Diagram 12 Openings in a buttressing wall

See para 2C26



Notes

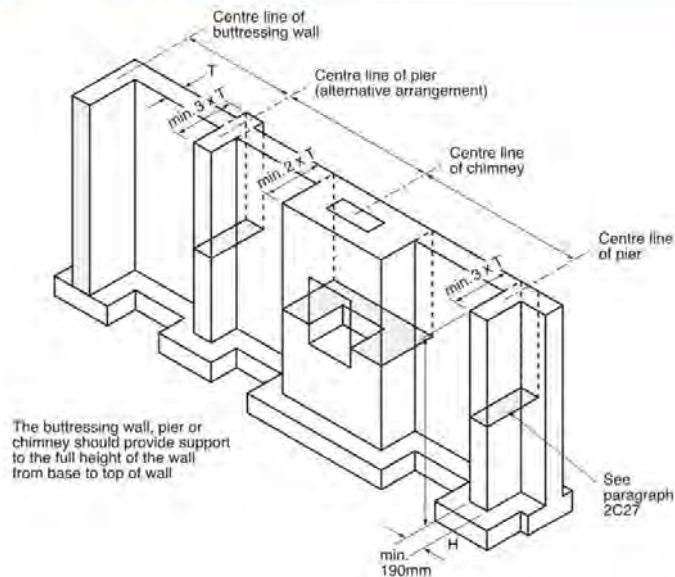
- 1 The buttressing wall should be bonded or securely tied to the supported wall and at the other end to a buttressing wall, pier or chimney.
- 2 Openings or recesses in the buttressing wall should be as shown – the

position and shape of the openings should not impair the lateral support to be given by the buttressing wall.

- 3 Refer to Diagram 8 for the rules for measuring the height of the supported wall.

Diagram 13 Buttrressing

See para 2C27





Harlow
Norwich

- 01279 430888
- 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

Apartment west wing

Sheet no./rev.

1.5

Calc. by
VM

Date
Aug 24

Chck'd by
JGW

Date
Aug 24

Rev'd
by

Date

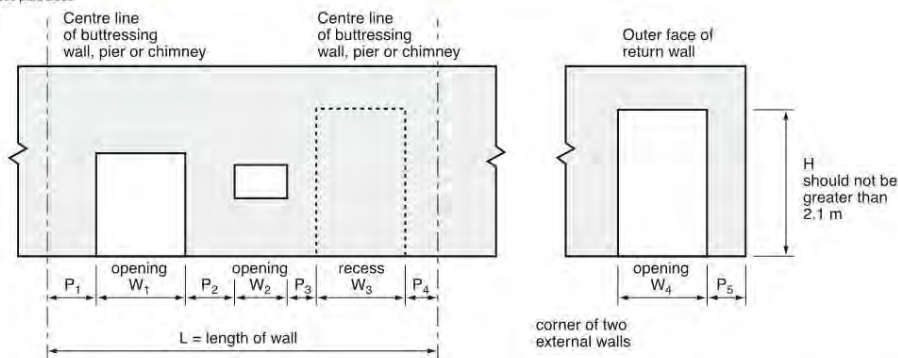
Ref.

Calculations

Output

Diagram 14 Sizes of openings and recesses

See para 2G29



Notes

Requirements (refer to Table 8 for values of Factor X).

- 1 $W_1 + W_2 + W_3$ should not exceed $\frac{2L}{3}$
- 2 W_1, W_2 or W_3 should not exceed 3m
- 3 P_1 should be greater than or equal to $\frac{W_1}{X}$
- 4 P_2 should be greater than or equal to $\frac{W_1 + W_2}{X}$

- 5 P_3 should be greater than or equal to $\frac{W_2 + W_3}{X}$

- 6 P_4 should be greater than or equal to $\frac{W_3}{X}$

- 7 P_5 should be greater than or equal to $\frac{W_4}{X}$ but should not be less than 665mm.

- 8 Take the value of the Factor X from Table 8, or it can be given the value 6, provided the declared compressive strength of the bricks or blocks (in the case of a cavity wall – in the loaded leaf) is not less than 7.3N/mm².

Table 8 Value of Factor 'X' (see Diagram 14)

Nature of roof span	Maximum roof span (m)	Minimum thickness of wall inner (mm)	Span of floor is parallel to wall	Span of timber floor into wall		Span of concrete floor into wall	
				max 4.5m	max 6.0m	max 4.5m	max 6.0m
Value of Factor 'X'							
Roof spans parallel to wall	Not applicable	100	6	6	6	6	6
		90	6	6	6	6	5
Timber roof spans into wall	9	100	6	6	5	4	3
		90	6	4	4	3	3

Note: For pier checks refer to section 5 of calculations



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

Apartment west wing

Sheet no./rev.

1.6

Calc. by
VM

Date
Aug 24

Chck'd by
JGW

Date
Aug 24

Rev'd
by

Date

Ref.

Calculations

Output

Diagram 8 Measuring storey and wall heights

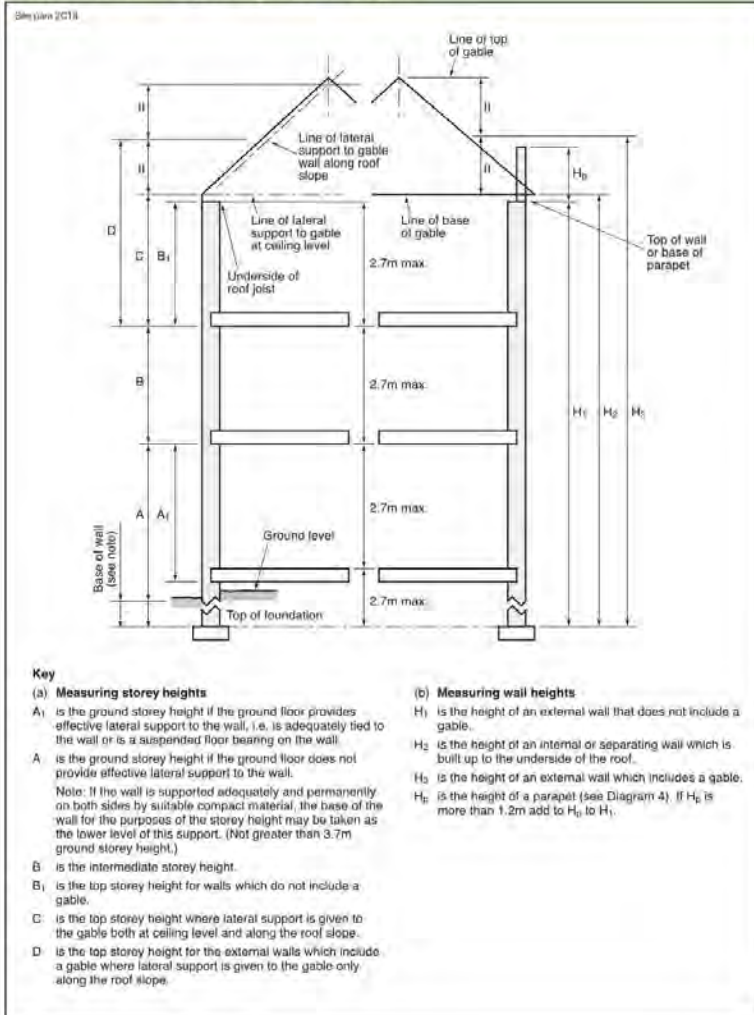
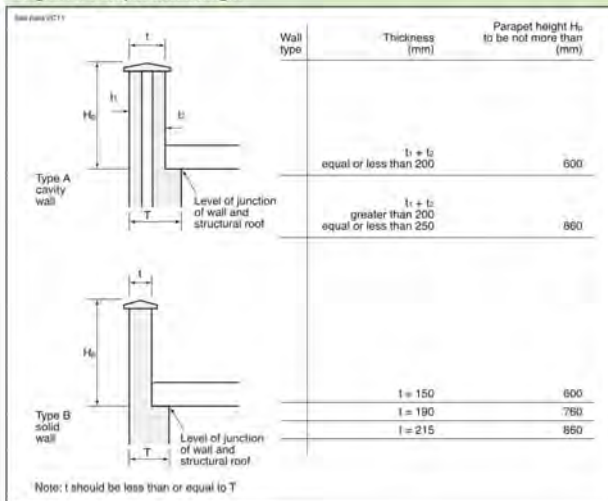


Diagram 4 Parapet walls: height



 Harlow - 01279 430888 Norwich - 01603 300360		Project				Job Ref.	
		Redevelopment of East Court, East Grinstead, RH19 3LT				10056	
		Part of Structure				Sheet no./rev.	
		Apartment west wing				1.7	
		Calc. by	Date	Chck'd by	Date	Rev'd by	Date
		VM	Aug 24	JGW	Aug 24		
Ref.	Calculations					Output	

Table 5 Cavity wall ties		
Nominal cavity width mm (Note 1)	Tie length mm (Note 2)	BS EN 845-1 tie
50 to 75	200	Type 1, 2, 3 or 4 to BSI PD 6697:2010 and selected on the basis of the design loading and design cavity width.
76 to 100	225	
101 to 125	250	
126 to 150	275	
151 to 175	300	
176 to 300	(See Note 3)	

Notes:

- Where face insulated blocks are used the cavity width should be measured from the face of the masonry unit.
- The embedment depth of the tie should not be less than 50mm in both leaves.
- For cavities wider than 175mm calculate the length as the nominal cavity width plus 125mm and select the nearest stock length. For wall ties requiring embedment depths in excess of 50mm, increase the calculated tie length accordingly.

Table 6 Declared compressive strength of masonry units complying with BS EN 771-1 to -5 (N/mm ²)							
Masonry unit	Clay masonry units to BS EN 771-1	Calcium silicate masonry units to BS EN 771-2	Aggregate concrete masonry units to BS EN 771-3	Autoclaved aerated conc. masonry units to BS EN 771-4	Manufactured stone masonry units to BS EN 771-5		
Condition A (See Diagram 9)						Any unit complying with BS EN 771-5 will be acceptable for conditions A, B and C	
Brick	Group 1 6.0	Group 2 9.0	Group 1 6.0	Group 2 9.0	6.0		–
Block	See Table 7	See Table 7	See Table 7	See Table 7	2.9*		2.9
Condition B (See Diagram 9)							
Brick	Group 1 9.0	Group 2 13.0	Group 1 9.0	Group 2 13.0	9.0		–
Block	See Table 7	See Table 7	See Table 7	See Table 7	7.3*		7.3
Condition C (See Diagram 9)							
Brick	Group 1 18.0	Group 2 25.0	Group 1 18.0	Group 2 25.0	18.0		–
Block	See Table 7	See Table 7	See Table 7	See Table 7	7.3*		7.3

* These values are dry strengths to BS EN 772-1

Notes:

- This table applies to Group 1 and Group 2 units.
- For the EN 771 series of standards for masonry units the values of declared compressive strengths (N/mm²) given in Table 6 are mean values.
- Brick: a masonry unit having work sizes not exceeding 337.5mm in length or 112.5mm in height.
- Block: a masonry unit exceeding either of the limiting work sizes of a brick and with a minimum height of 190mm. For blocks with smaller heights, excluding cuts or make up units, the strength requirements are as for brick except for solid external walls where the blocks should have a compressive strength at least equal to that shown for block for an inner leaf of a cavity wall in the same position.
- Group 1 masonry units have not more than 25% formed voids (20% for frogged bricks). Group 2 masonry units have formed voids greater than 25%, but not more than 55%.



Harlow
Norwich

- 01279 430888
- 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

Apartment west wing

Sheet no./rev.

1.8

Calc. by
VM

Date
Aug 24

Chck'd by
JGW

Date
Aug 24

Rev'd
by

Date

Ref.

Calculations

Output

Diagram 15 Lateral support by floors

See para 2C35

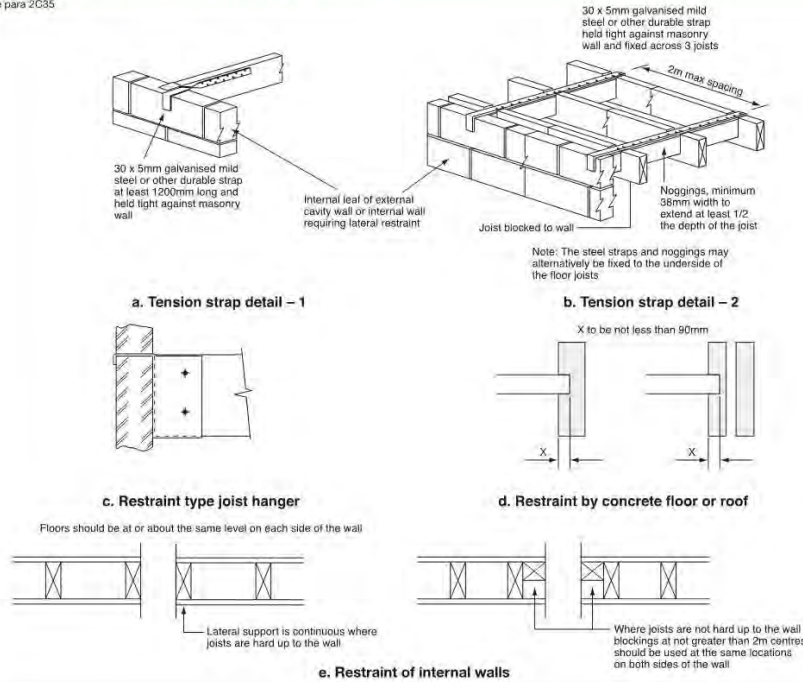
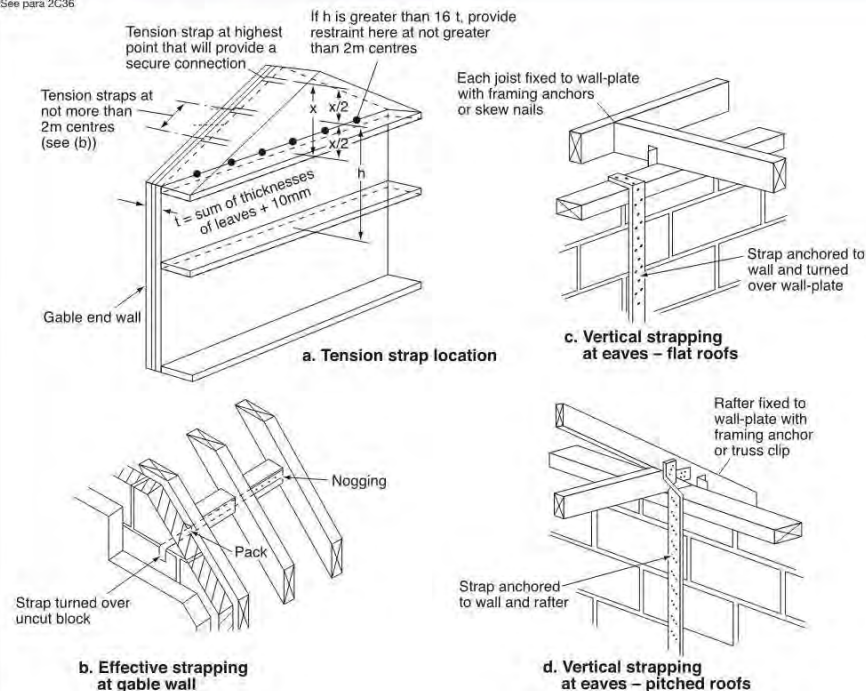


Diagram 16 Lateral support at roof level

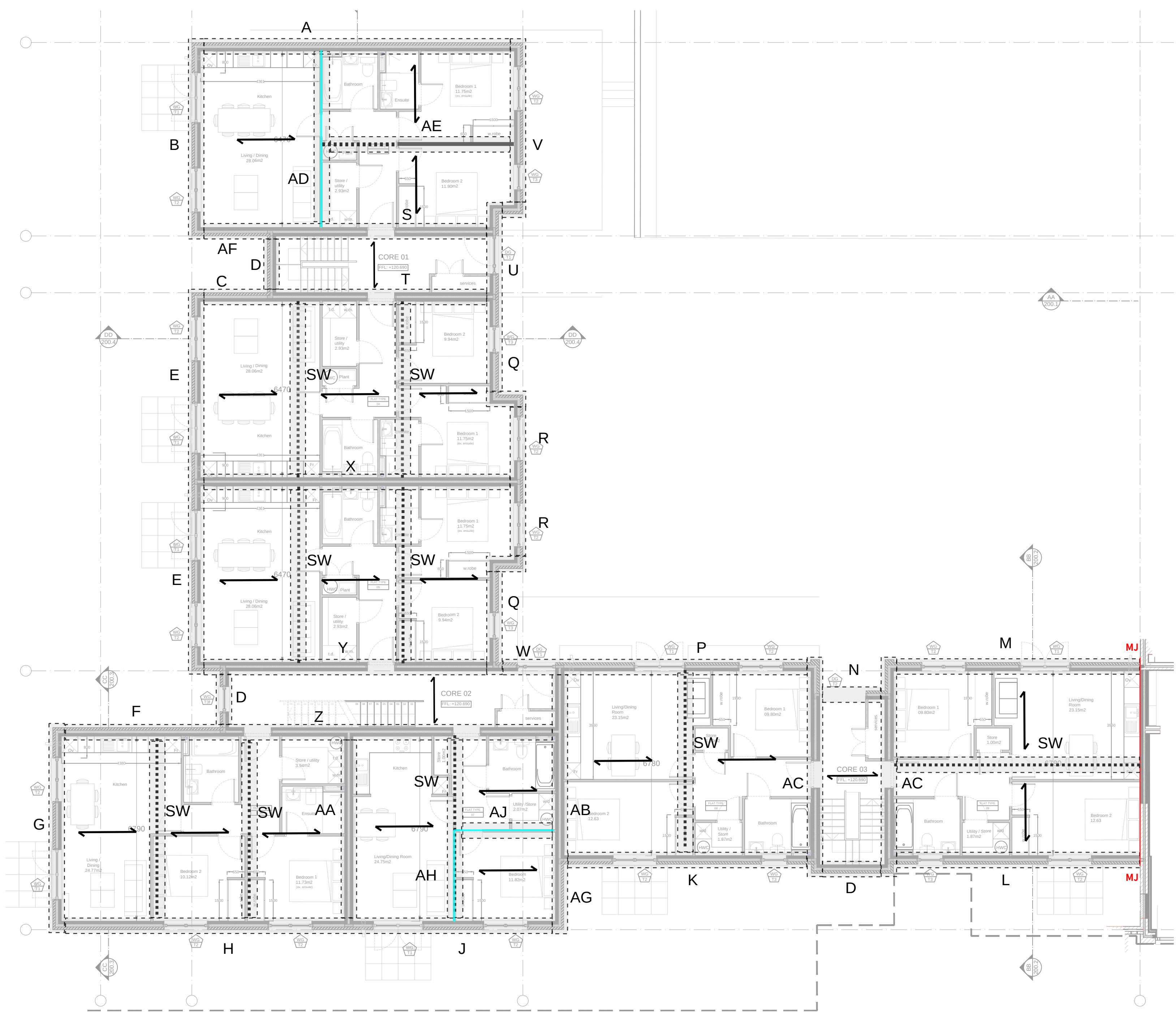
See para 2C36



 Harlow - 01279 430888 Norwich - 01603 300360	Project Redevelopment of East Court, East Grinstead, RH19				Job Ref. 10056	
	Part of Structure Apartment west wing				Sheet no./rev. 2.1	
	Calc. by VM	Date Aug 24	Chck'd by JGW	Date Aug '24	Rev'd by	Date
Ref.	Calculations				Output	

Loading		
Item:	Dead Load Kn/m ²	Live Load Kn/m ²
Roof		
Tiles	0.65	
Battens and Felt	0.06	
Rafters	0.10	
Insulation felt	0.04	
Plasterboard and Skim	0.15	
Roof/ Ceiling super		1.00
TOTAL	1.00	1.00
Attic Roof		
Tiles	0.65	
Battens and Felt	0.06	
Rafters	0.10	
Insulation felt	0.04	
Plasterboard and Skim (Attic)	0.15	
Plasterboard and Skim (Floor)	0.15	
Boards	0.12	
Floor Joists	0.18	
Ceiling imposed		0.25
Roof Imposed		0.75
Imposed Load (Floor)		1.50
TOTAL	1.45	2.50
External Walls: Light Density 3.5-7.3 N (100mm Inner Leaf)		
Brickwork	2.25	
Blockwork	0.86	
Plaster	0.22	
TOTAL	3.33	0.00
External Walls: Light Density 3.5-7.3 N (140mm Inner Leaf)		
Brickwork	2.25	
Blockwork	1.26	
Plaster	0.22	
TOTAL	3.73	0.00
External Rendered/ Boarded Walls: Light Density 3.5-7.3 N (100mm Inner Leaf)		
Blockwork Rendered	1.50	
Blockwork	0.86	
Plaster	0.22	
TOTAL	2.58	0.00

 Harlow - 01279 430888 Norwich - 01603 300360		Project Redevelopment of East Court, East Grinstead, RH19				Job Ref. 10056	
		Part of Structure Apartment west wing				Sheet no./rev. 2.2	
		Calc. by VM	Date Aug 24	Chck'd by JGW	Date Aug '24	Rev'd by	Date
Ref.	Calculations					Output	
Party Wall (Medium Dense Blockwork)			1 Leaf	2 Leaf's			
Blockwork			1.62	3.24			
Plaster			0.22	0.44			
TOTAL			1.84	3.68			
Internal Partition, Blockwork, 100mm wide, Light weight							
Blockwork 100			0.86				
Plaster x2			0.44				
TOTAL			1.30	0.00			
Internal Partition, Timber Studwork							
Studs			0.24				
Plaster and Insulation			0.52				
Sound Quilt			0.05				
TOTAL			0.81	0.00			
First Floor, Timber							
Timber Joists			0.18				
Chipboard			0.12				
Plasterboard			0.15				
Sound Quilt			0.05				
Partitions			0.50				
Imposed				1.50			
TOTAL			1.00	1.50			
Ground Floor - Beam and Block							
150 PC Concrete			3.60				
Screed			1.80				
Partitions			0.50				
Imposed				1.50			
TOTAL			5.90	1.50			
Ground Floor - Jetfloor							
150 PC Concrete and EPS Infill			1.35				
Structural Topping			1.80				
Partitions			0.50				
Imposed				1.50			
TOTAL			3.65	1.50			
Ground Floor - Beam and Block							
150 PC Concrete			3.60				
Screed			1.80				
Imposed				1.50			
TOTAL			5.40	1.50			



Ground Floor Plan

Wall	DL	LL	SLS
	(kN/m)	(kN/m)	(kN/m)
A	65	11	76
B	80	18	98
C	85	25	110
D	45	6	51
E	51	6	57
F	76	15	91
G	65	15	80
H	74	13	87
J	83	19	102
K	76	15	91
L	84	17	101
M	84	17	101
N	46	6	52
P	76	15	91
Q	50	6	56
R	53	7	60
S	90	16	106
T	113	34	147
U	43	4	47
V	55	8	63
W	57	9	66
X	127	37	164
Y	110	29	139
Z	103	22	125
AA	80	19	99
AB	76	12	88
AC	74	11	85
AD	68	19	87
AE	88	22	110
AF	47	7	54
AG	63	11	74
AH	60	12	72
AJ	51	12	63
SW	31	7	38

LEGEND

FOUNDATION 600mm WIDE UNO

SPAN OF BEAM AND BLOCK FLOOR 150DP

SPAN OF PRECAST CONCRETE FLOOR 200DP

SPAN OF ROOF TRUSSES/TIMBERS

LOAD BEARING WALL BELOW

BUTTRESS PARTITION

WP1 L WINDPOST IG LP1

STEEL BEAM

10.4N Blockwork

17.5N Blockwork

140mm Blockwork

100mm Blockwork

NOTES

All BLOCKWORK 7.3 N/mm2 100mm WIDE IN MORTAR CLASS M4 UNO.

SUBSTRUCTURE BLOCKWORK TO BE MIN 7.3N/mm² 100mm WIDE N MORTAR CLASS M6 UNO.

CONSTRUCTION TO BE IN ACCORDANCE WITH NHBC TECHNICAL STANDARDS

Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA

Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE

Phone: 01279 430 888

Project Name: Redevelopment of East Court			Project Number: 10056
Drawing Title: Apartment West Wing Structural Markup			
Designed By: VM	Checked By: JGW	Date: Aug 2024	Revision: 01



**Ground Floor Showing
Structure Over**

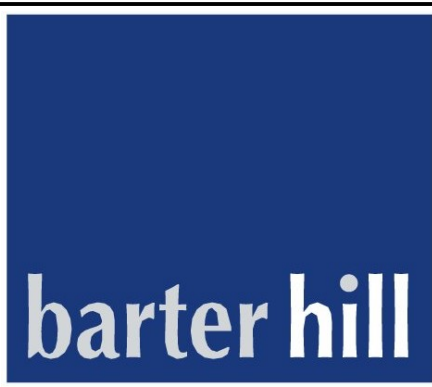
LEGEND

- FOUNDATION 600mm WIDE UNO
- SPAN OF BEAM AND BLOCK FLOOR 150DP
- SPAN OF PRECAST CONCRETE FLOOR 200DP
- SPAN OF ROOF TRUSSES/TIMBERS
- LOAD BEARING WALL BELOW
- BUTTRESS PARTITION
- WP1 C WINDPOST IG U1
- 10.4N Blockwork
- 17.5N Blockwork
- 140mm Blockwork
- 100mm Blockwork
- STEEL BEAM
- B1: 152x152x23 UC
- PADSTONE
P1: 440x100x215 DP
P2: 440x140x215 DP

NOTES

All BLOCKWORK 7.3 N/mm² 100mm WIDE IN MORTAR CLASS M4 UNO.

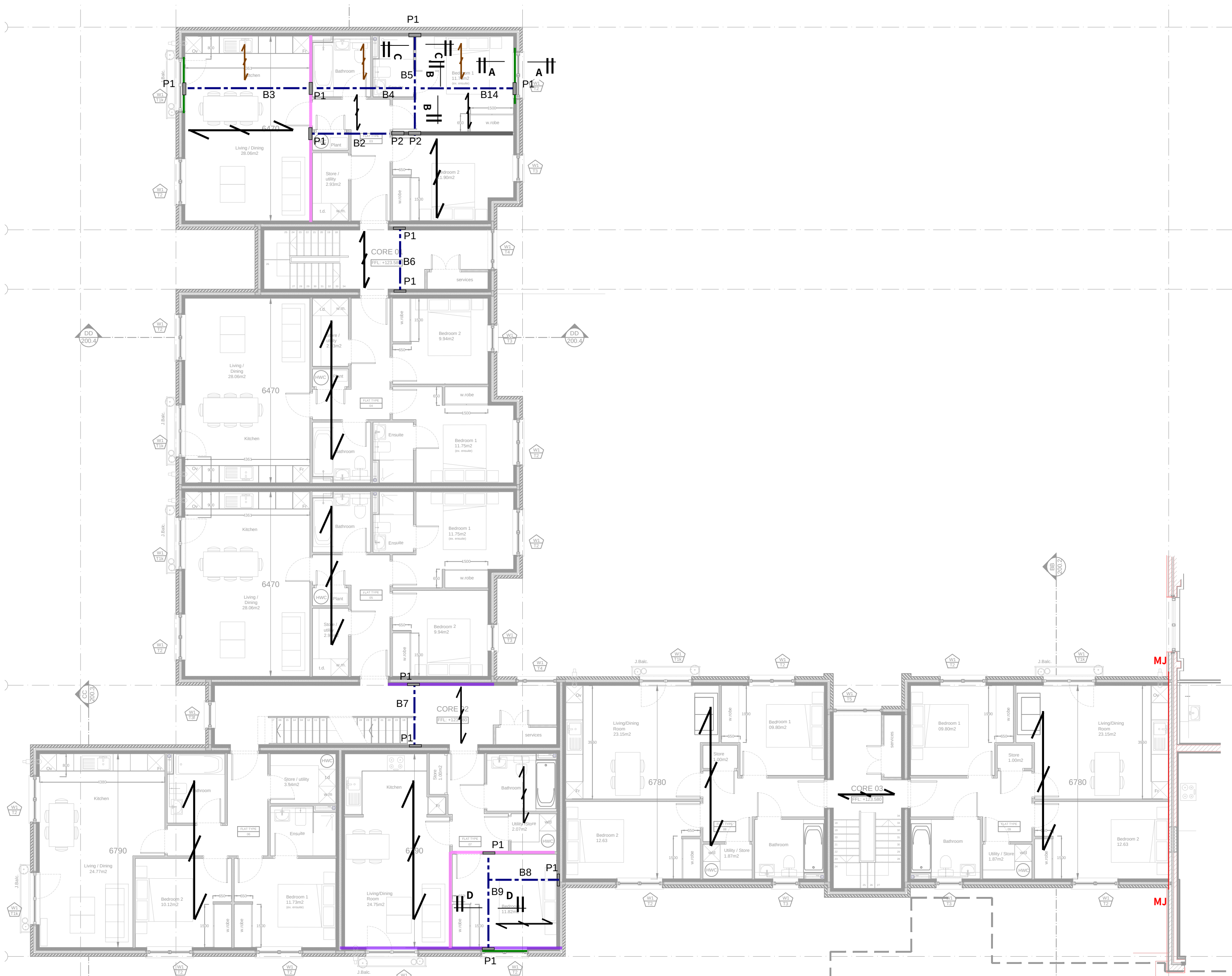
CONSTRUCTION TO BE IN ACCORDANCE WITH NHBC TECHNICAL STANDARDS



Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA
Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE
Phone: 01279 430 888

Project Name: Redevelopment of East Court		Project Number: 10056	
Drawing Title: Apartment West Wing Structural Markup			
Designed By: VM	Checked By: JGW	Date: Aug 2024	Revision: 01



**First Floor Showing
Structure Over**

LEGEND

FOUNDATION 600mm WIDE UNO

SPAN OF BEAM AND BLOCK FLOOR 150DP

SPAN OF PRECAST CONCRETE FLOOR 200DP

SPAN OF ROOF TRUSSES/TIMBERS

LOAD BEARING WALL BELOW

BUTTRESS PARTITION

WP1 WINDPOST IG U1

10.4N Blockwork

140mm Blockwork

100mm Blockwork

IG L5/XHD 100 LINTEL

SPAN OF CUT TIMBER JOISTS

PADSTONE
P1: 440x100x215 DP
P2: 440x140x215 DP

STEEL BEAM

B2: 152x152x23 UC
B3: 203x203x46 UC
B4: 152x152x23 UC
B5: 203x203x46 UC
B6: 203x203x46 UC with 10mm steel plate over
B7: 203x203x46 UC with 10mm steel plate over
B8: 203x203x46 UC with 10mm steel plate over
B9: 203x203x46 UC
B14: 203x203x46 UC

NOTES

All BLOCKWORK 7.3 N/mm2 100mm WIDE IN MORTAR CLASS M4 UNO.

CONSTRUCTION TO BE IN ACCORDANCE WITH NHBC TECHNICAL STANDARDS

Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA

Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE

Phone: 01279 430 888

Project Name:
Redevelopment of East Court

Project Number:
10056

Drawing Title:
Apartment West Wing Structural Markup

Designed By:
VM

Checked By:
JGW

Date:
Aug 2024

Revision:
01



Second Floor Showing
Roof Over

LEGEND

FOUNDATION 600mm WIDE UNO

SPAN OF BEAM AND BLOCK FLOOR 150DP

PRECAST CONCRETE FLOOR 200DP

PRECAST CONCRETE ROOF

LOAD BEARING WALL BELOW

BUTTRESS PARTITION

WINDPOST IG U1

NON LOAD BEARING BLOCKWORK

10.4N Blockwork

17.5N Blockwork

PADSTONE
P1: 440x100x215 DP

LOAD BEARING TIMBER STUD

GLULAM BEAM BY SPECIALIST

TIMBER BEAM BY ROOF SPECIALIST

STEEL BEAM
B11: 203x203x60 UC

LINTEL
B15: IG L5/XHD 100 LINTEL

NOTES

All BLOCKWORK 7.3 N/mm2 100mm WIDE IN MORTAR CLASS M4 UNO.

CONSTRUCTION TO BE IN ACCORDANCE WITH NHBC TECHNICAL STANDARDS

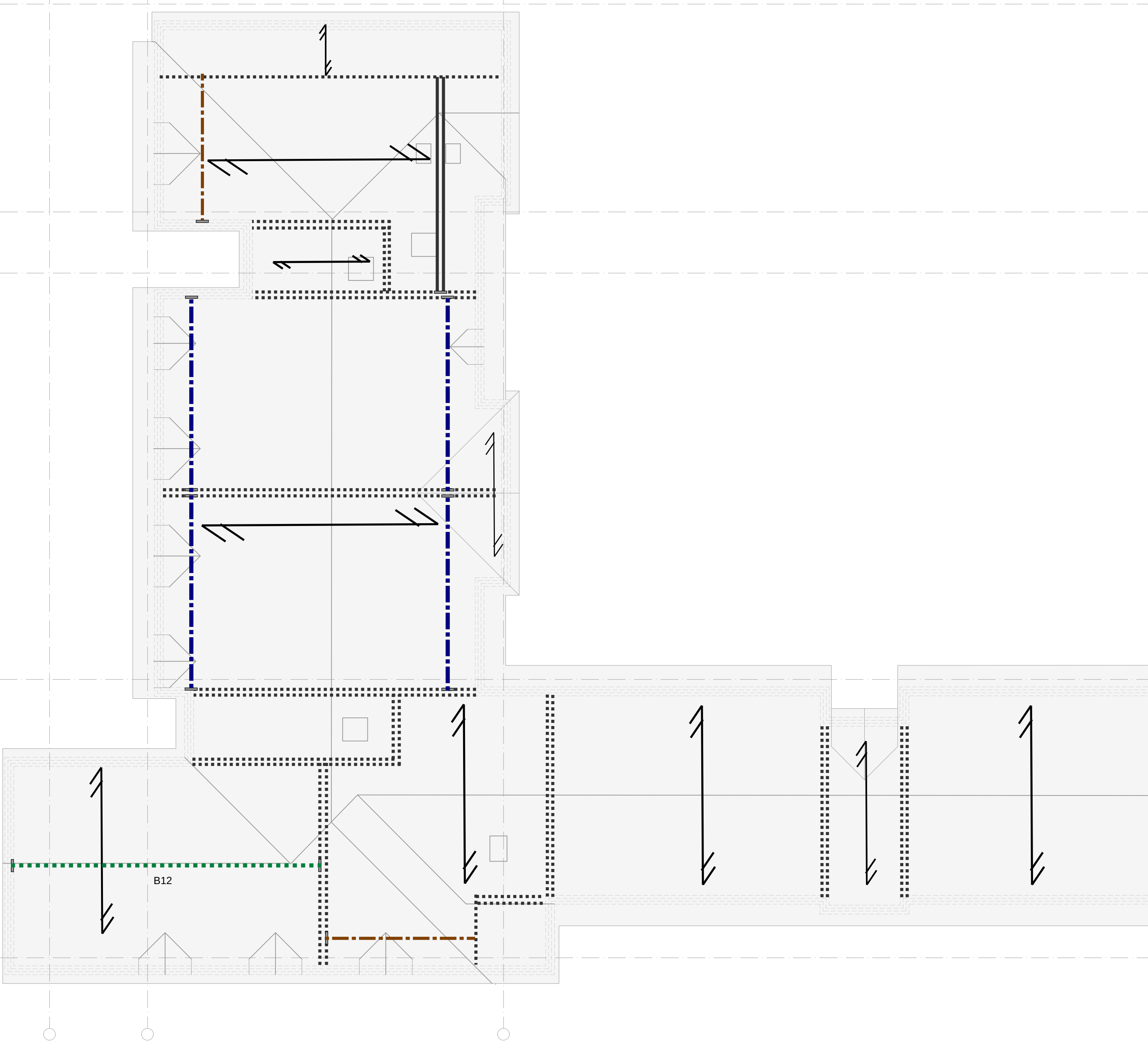
Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA

Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE

Phone: 01279 430 888

Project Name: Redevelopment of East Court			Project Number: 10056
Drawing Title: Apartment West Wing Structural Markup			
Designed By: VM	Checked By: JGW	Date: Aug 2024	Revision: 01



Roof Plan

LEGEND

TIMBER ROOF TRUSS/TIMBERS

LOAD BEARING WALL BELOW

GIRDER TRUSS

STEEL BEAM

PADSTONE
P1: 440x100x215 DP

GLULAM BEAM

TIMBER BEAM BY ROOF
SPECIALIST

NOTES

TIMBER ROOF TRUSSES TO BE DESIGNED BY
MANUFACTURER/SUPPLIER.

CONSTRUCTION TO BE IN ACCORDANCE WITH NHBC
TECHNICAL STANDARDS AND BUILDING
REGULATIONS PART A.

Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA

Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE

Phone: 01279 430 888

Project Name:
Redevelopment of East Court

Project Number:
10056

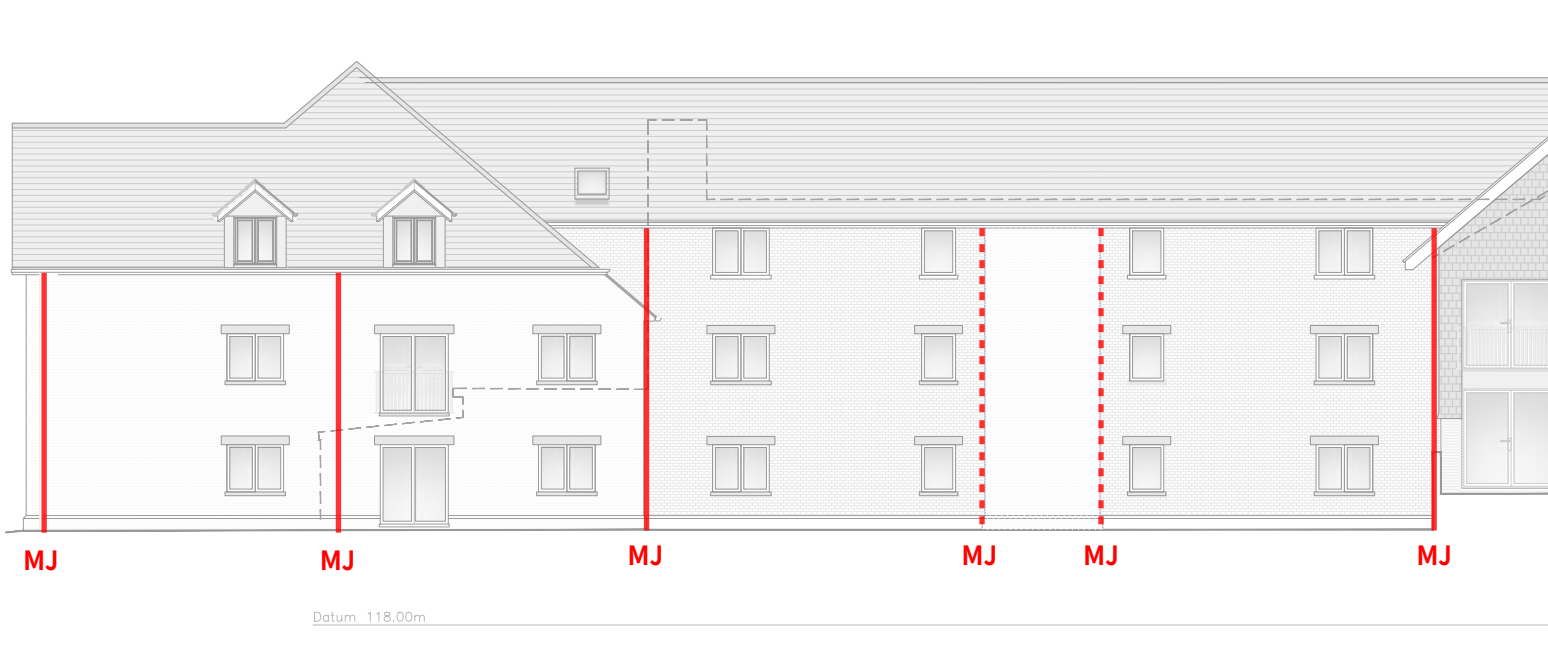
Drawing Title:
Apartment West Wing Structural Markup

Designed By:
VM

Checked By:
JGW

Date:
Aug 2024

Revision:
01



LEGEND

MJ

MOVEMENT JOINT

BED JOINT
REINFORCEMENT

barter hill

Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA

Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE

Phone: 01279 430 888

Project Name: Redevelopment of East Court			Project Number: 10056
Drawing Title: Apartment West Wing Movement Joint			
Designed By: VM	Checked By: JGW	Date: Aug 2024	Revision: 01

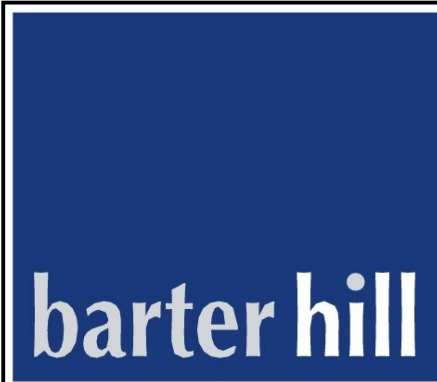


LEGEND

MJ

MOVEMENT JOINT

BED JOINT
REINFORCEMENT



Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA

Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE

Phone: 01279 430 888

Project Name: Redevelopment of East Court			Project Number: 10056
Drawing Title: Apartment West Wing Movement Joint			
Designed By: VM	Checked By: JGW	Date: Aug 2024	Revision: 01



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.1

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Rear

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)	0	3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor	0	3.00	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	1.00	5.15	1.50	5.15	1.50	6.65
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	1.80	5.15	1.50	9.27	2.70	11.97
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	1.80	5.90	1.50	10.62	2.70	13.32
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					59.8	8.4	68.2

Concentrated Loads

B5	1	0.14	16.94	16.34	2.42	2.33	4.75
----	---	------	-------	-------	------	------	------

Suspended PC Gnd. floor TOTAL	62.2	10.7	73.0
-------------------------------	------	------	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.2

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)	0	3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor	0	3.40	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	2.25	5.15	1.50	11.59	3.38	14.96
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	2.25	5.15	1.50	11.59	3.38	14.96
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	2.25	5.90	1.50	13.28	3.38	16.65
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					71.2	11.6	82.8

Concentrated Loads

B3	1	0.33	24.97	17.32	8.32	5.77	14.10
----	---	------	-------	-------	------	------	-------

Suspended PC Gnd. floor TOTAL

79.5	17.4	96.9
------	------	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.3

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**Wall Line Loadings:

Wall Ref:

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	0.50	1.00	1.00	0.50	0.50	1.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		0.50	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					41.9	2.8	44.6

Concentrated Loads

B13	1	0.33	12.50	12.50	4.17	4.17	8.33
-----	---	------	-------	-------	------	------	------

Suspended PC Gnd. floor TOTAL

46.0	6.9	53.0
------	-----	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.3

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**Wall Line Loadings:

Wall Ref:

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	0.50	1.00	1.00	0.50	0.50	1.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		0.50	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.35	5.15	1.50	17.25	5.03	22.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.35	5.15	1.50	17.25	5.03	22.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					71.2	11.3	82.5

Concentrated Loads

B11	1	0.33	38.86	38.86	12.95	12.95	25.91
-----	---	------	-------	-------	-------	-------	-------

Suspended PC Gnd. floor TOTAL

84.2	24.3	108.4
------	------	-------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.4

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Rear

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	3.20	1.00	1.00	3.20	3.20	6.40
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		0.90	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					44.6	5.5	50.0

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

44.6 5.5 50.0

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.5

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		2.40	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	1.85	5.90	1.50	10.92	2.78	13.69
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					50.8	5.8	56.6

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

50.8 5.8 56.6

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.6

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref:

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	3.15	1.00	1.00	3.15	3.15	6.30
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		1.00	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					75.4	14.4	89.8

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

75.4	14.4	89.8
------	------	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.7

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		0.50	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	4.50	1.08	0.00	4.86	0.00	4.86
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	10.50	2.25	0.00	23.63	0.00	23.63
PC Gnd Floor	1	1.80	5.90	1.50	10.62	2.70	13.32
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					55.0	5.2	60.2

Concentrated Loads

B12	1	0.29	36.00	36.00	10.29	10.29	20.57
-----	---	------	-------	-------	-------	-------	-------

Suspended PC Gnd. floor TOTAL

65.3 15.5 80.8

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.8

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Front

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		1.00	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					73.8	12.8	86.5

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

73.8 12.8 86.5

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.9

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: front

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		1.00	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					73.8	12.8	86.5

Concentrated Loads

B9	1	0.25	35.41	21.99	8.85	5.50	14.35
----	---	------	-------	-------	------	------	-------

Suspended PC Gnd. floor TOTAL

82.6	18.2	100.9
------	------	-------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.9

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	2.60	1.00	1.00	2.60	2.60	5.20
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		1.00	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	1.85	5.15	1.50	9.53	2.78	12.30
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	1.85	5.90	1.50	10.92	2.78	13.69
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					58.9	8.9	67.8

Concentrated Loads

B8	0.5	0.20	31.88	11.38	3.19	1.14	4.33
----	-----	------	-------	-------	------	------	------

Suspended PC Gnd. floor TOTAL

62.1	10.0	72.1
------	------	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.10

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Front

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	3.50	1.00	1.00	3.50	3.50	7.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		4.75	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					75.8	14.8	90.5

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.1

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Front

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	3.50	1.00	1.00	3.50	3.50	7.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		4.75	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	1.75	5.90	1.50	10.33	2.63	12.95
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					83.1	16.6	99.8

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

83.1 16.6 99.8

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.12

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	3.50	1.00	1.00	3.50	3.50	7.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		4.75	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	1.80	5.90	1.50	10.62	2.70	13.32
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					83.4	16.7	100.1

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

83.4 16.7 100.1

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.13

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**Wall Line Loadings:

Wall Ref:

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	3.70	1.00	1.00	3.70	3.70	7.40
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		1.85	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					45.1	6.0	51.0

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

45.1	6.0	51.0
------	-----	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.14

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref:

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	3.50	1.00	1.00	3.50	3.50	7.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		4.75	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	3.50	5.15	1.50	18.03	5.25	23.28
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					75.8	14.8	90.5

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

75.8	14.8	90.5
------	------	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.15

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref:

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		2.55	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	1.65	5.90	1.50	9.74	2.48	12.21
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					49.7	5.5	55.1

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.16

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		2.55	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	2.20	5.90	1.50	12.98	3.30	16.28
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					52.9	6.3	59.2

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

52.9 6.3 59.2

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.17

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Party Wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum.
			Char. Dead	Char. Live	Char. Dead	Char. Live	SLS (KN/m)
Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		1.70	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	2.80	5.15	1.50	14.42	4.20	18.62
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	2.80	5.15	1.50	14.42	4.20	18.62
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	2.80	5.90	1.50	16.52	4.20	20.72
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					82.8	13.6	96.4

Concentrated Loads

B6	1	0.29	22.64	5.75	6.47	1.64	8.11
----	---	------	-------	------	------	------	------

Suspended PC Gnd. floor TOTAL

89.2 15.2 104.5

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Party wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		1.70	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	4.60	5.15	1.50	23.69	6.90	30.59
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	4.60	5.15	1.50	23.69	6.90	30.59
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	1.20	5.90	1.50	7.08	1.80	8.88
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					91.9	16.6	108.5

Concentrated Loads

GT1	1	0.26	18.75	18.75	4.93	4.93	9.87
B11	1	0.26	38.86	38.86	10.23	10.23	20.45
B6	1	0.26	22.64	5.75	5.96	1.51	7.47

Suspended PC Gnd. floor TOTAL

113.0 33.3 146.3

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
PCC Roof & Ceiling	1	1.50	1.00	1.00	1.50	1.50	3.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		3.60	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					42.9	3.8	46.6

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

42.9 3.8 46.6

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Side

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum.
			Char. Dead	Char. Live	Char. Dead	Char. Live	SLS (KN/m)
PCC Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		0.50	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	4.50	1.08	0.00	4.86	0.00	4.86
2nd. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	0.50	5.15	1.50	2.58	0.75	3.33
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	10.50	2.25	0.00	23.63	0.00	23.63
PC Gnd Floor	1	0.50	5.90	1.50	2.95	0.75	3.70
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					47.4	3.3	50.6

Concentrated Loads

B14	1	0.33	22.44	14.22	7.48	4.74	12.22
-----	---	------	-------	-------	------	------	-------

Suspended PC Gnd. floor TOTAL

54.8 8.0 62.8

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Rear

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
PCC Roof & Ceiling	1	3.60	1.00	1.00	3.60	3.60	7.20
Wall (3F-RF)		3.00	1.08	0.00	0.00	0.00	0.00
3rd. Floor		0.50	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.08	0.00	3.24	0.00	3.24
2nd. Floor	1	1.20	5.15	1.50	6.18	1.80	7.98
Wall (1F-2F)	1	3.00	1.08	0.00	3.24	0.00	3.24
1st. Floor	1	1.20	5.15	1.50	6.18	1.80	7.98
Wall (GF-1F)	1	3.00	1.08	0.00	3.24	0.00	3.24
Brick Skin	1	9.00	2.25	0.00	20.25	0.00	20.25
PC Gnd Floor	1	1.20	5.90	1.50	7.08	1.80	8.88
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					56.3	9.0	65.3

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

56.3 9.0 65.3

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Party wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		7.00	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	6.75	5.15	1.50	34.76	10.13	44.89
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	6.75	5.15	1.50	34.76	10.13	44.89
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	1.00	5.90	1.50	5.90	1.50	7.40
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					112.8	22.8	135.6

Concentrated Loads

B11	2	0.18	38.86	38.86	14.13	14.13	28.26
-----	---	------	-------	-------	-------	-------	-------

Suspended PC Gnd. floor TOTAL	127.0	36.9	163.9
-------------------------------	-------	------	-------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Party wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum.
			Char. Dead	Char. Live	Char. Dead	Char. Live	SLS (KN/m)
Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.40	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	4.55	5.15	1.50	23.43	6.83	30.26
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	4.55	5.15	1.50	23.43	6.83	30.26
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	1.20	5.90	1.50	7.08	1.80	8.88
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					91.4	16.5	107.8

Concentrated Loads

B11	1	0.20	38.86	38.86	7.77	7.77	15.54
B7	1	0.29	37.52	15.24	10.72	4.35	15.07

Suspended PC Gnd. floor TOTAL

109.9 28.6 138.4

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Internal

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
PCC Roof & Ceiling	1	2.90	1.00	1.00	2.90	2.90	5.80
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	4.70	5.15	1.50	24.21	7.05	31.26
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	4.70	5.15	1.50	24.21	7.05	31.26
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	1.20	5.90	1.50	7.08	1.80	8.88
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					94.8	18.8	113.6

Concentrated Loads

B7	1	0.20	37.52	15.24	7.50	3.05	10.55
----	---	------	-------	-------	------	------	-------

Suspended PC Gnd. floor TOTAL

102.3	21.8	124.2
-------	------	-------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Party wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
PCC Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	1.00	5.15	1.50	5.15	1.50	6.65
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	1.00	5.15	1.50	5.15	1.50	6.65
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	3.80	5.90	1.50	22.42	5.70	28.12
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					70.1	9.7	79.8

Concentrated Loads

B10	1	0.20	14.04	14.04	2.81	2.81	5.62
B12	1	0.20	36.00	36.00	7.20	7.20	14.40

Suspended PC Gnd. floor TOTAL

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Party wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
PCC Roof & Ceiling	1	1.00	1.00	1.00	1.00	1.00	2.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	1.00	5.15	1.50	5.15	1.50	6.65
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	1.00	5.15	1.50	5.15	1.50	6.65
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	4.20	5.90	1.50	24.78	6.30	31.08
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					72.5	10.3	82.8

Concentrated Loads

B8	0.5	0.20	31.88	11.38	3.19	1.14	4.33
----	-----	------	-------	-------	------	------	------

Suspended PC Gnd. floor TOTAL

75.7 11.4 87.1

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: Party wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum.
			Char. Dead	Char. Live	Char. Dead	Char. Live	SLS (KN/m)
PCC Roof & Ceiling	1	1.30	1.00	1.00	1.30	1.30	2.60
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)	1	3.00	1.84	0.00	5.52	0.00	5.52
2nd. Floor	1	1.30	5.15	1.50	6.70	1.95	8.65
Wall (1F-2F)	1	3.00	1.84	0.00	5.52	0.00	5.52
1st. Floor	1	1.30	5.15	1.50	6.70	1.95	8.65
Wall (GF-1F)	1	3.00	1.84	0.00	5.52	0.00	5.52
Brick Skin	1	9.00	1.84	0.00	16.56	0.00	16.56
PC Gnd Floor	1	3.75	5.90	1.50	22.13	5.63	27.75
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					73.2	10.8	84.1

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

73.2 10.8 84.1

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: 140mm internal wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum.
			Char. Dead	Char. Live	Char. Dead	Char. Live	SLS (KN/m)
PCC Roof & Ceiling		1.30	1.00	1.00	0.00	0.00	0.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)		3.00	1.84	0.00	0.00	0.00	0.00
2nd. Floor	1	2.25	5.15	1.50	11.59	3.38	14.96
Wall (1F-2F)	1	3.00	2.25	0.00	6.75	0.00	6.75
1st. Floor	1	2.25	5.15	1.50	11.59	3.38	14.96
Wall (GF-1F)	1	3.00	2.25	0.00	6.75	0.00	6.75
Brick Skin	0	6.00	1.84	0.00	0.00	0.00	0.00
PC Gnd Floor	1	2.25	5.90	1.50	13.28	3.38	16.65
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					53.3	10.1	63.4

Concentrated Loads

B3	1	0.40	20.08	12.43	8.03	4.97	13.00
B4	1	0.40	15.85	7.63	6.34	3.05	9.39

Suspended PC Gnd. floor TOTAL

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: 140mm internal wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum.
			Char. Dead	Char. Live	Char. Dead	Char. Live	SLS (KN/m)
PCC Roof & Ceiling		1.30	1.00	1.00	0.00	0.00	0.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)		3.00	1.84	0.00	0.00	0.00	0.00
2nd. Floor	1	2.40	5.15	1.50	12.36	3.60	15.96
Wall (1F-2F)	1	3.00	2.25	0.00	6.75	0.00	6.75
1st. Floor	1	3.35	5.15	1.50	17.25	5.03	22.28
Wall (GF-1F)	1	3.00	2.25	0.00	6.75	0.00	6.75
Brick Skin	0	6.00	1.84	0.00	0.00	0.00	0.00
PC Gnd Floor	1	3.35	5.90	1.50	19.77	5.03	24.79
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					66.2	13.7	79.8

Concentrated Loads

B1	1	0.33	25.88	7.54	8.63	2.51	11.14
B2	1	0.25	18.54	5.40	4.64	1.35	5.99
B5	1	0.25	16.94	16.34	4.23	4.08	8.32

Suspended PC Gnd. floor TOTAL

83.7 21.6 105.3

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: 100mm internal wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
PCC Roof & Ceiling		1.30	1.00	1.00	0.00	0.00	0.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)		3.00	1.84	0.00	0.00	0.00	0.00
2nd. Floor	1	1.90	5.15	1.50	9.79	2.85	12.64
Wall (1F-2F)	1	3.00	2.25	0.00	6.75	0.00	6.75
1st. Floor	1	1.90	5.15	1.50	9.79	2.85	12.64
Wall (GF-1F)	1	3.00	2.25	0.00	6.75	0.00	6.75
Brick Skin	0	6.00	1.84	0.00	0.00	0.00	0.00
PC Gnd Floor	1	3.85	5.90	1.50	22.72	5.78	28.49
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					59.1	11.5	70.6

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

59.1 11.5 70.6

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**

Wall Line Loadings:

Wall Ref: 100mm internal wall

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum.
			Char. Dead	Char. Live	Char. Dead	Char. Live	SLS (KN/m)
PCC Roof & Ceiling		1.30	1.00	1.00	0.00	0.00	0.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)		3.00	1.84	0.00	0.00	0.00	0.00
2nd. Floor	1	1.75	5.15	1.50	9.01	2.63	11.64
Wall (1F-2F)	1	3.00	2.25	0.00	6.75	0.00	6.75
1st. Floor	1	1.75	5.15	1.50	9.01	2.63	11.64
Wall (GF-1F)	1	3.00	2.25	0.00	6.75	0.00	6.75
Brick Skin	0	6.00	1.84	0.00	0.00	0.00	0.00
PC Gnd Floor	1	1.00	5.90	1.50	5.90	1.50	7.40
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					40.7	6.8	47.5

Concentrated Loads

B9	1	0.27	36.81	16.95	9.95	4.58	14.53
----	---	------	-------	-------	------	------	-------

Suspended PC Gnd. floor TOTAL

50.7 11.3 62.0

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.18

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output**Wall Line Loadings:

Wall Ref:

Uniformly Distributed Loads

	Factor	W/H (m)	Unit Load (KN/m ²)		Actual Load (KN/m)		Sum. SLS (KN/m)
			Char. Dead	Char. Live	Char. Dead	Char. Live	
PCC Roof & Ceiling		1.30	1.00	1.00	0.00	0.00	0.00
Wall (3F-RF)		3.00	1.84	0.00	0.00	0.00	0.00
3rd. Floor		4.20	5.15	1.50	0.00	0.00	0.00
Wall (2F-3F)		3.00	1.84	0.00	0.00	0.00	0.00
2nd. Floor		1.75	5.15	1.50	0.00	0.00	0.00
Wall (1F-2F)		3.00	2.25	0.00	0.00	0.00	0.00
1st. Floor		1.75	5.15	1.50	0.00	0.00	0.00
Wall (GF-1F)		3.00	2.25	0.00	0.00	0.00	0.00
Brick Skin	0	0.00	1.84	0.00	0.00	0.00	0.00
PC Gnd Floor	1	4.65	5.90	1.50	27.44	6.98	34.41
Sub Wall	1	1.00	3.30	0.00	3.30	0.00	3.30
Suspended PC Gnd. floor SUM =					30.7	7.0	37.7

Concentrated Loads

				0.00	0.00	0.00
--	--	--	--	------	------	------

Suspended PC Gnd. floor TOTAL

30.7	7.0	37.7
------	-----	------

ALLOWABLE GROUND BEARING PRESSURE=

(KN/m²)

SUSPENDED PC GND. FLOOR WIDTH REQUIRED=

(m)



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.19

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by

Date

Ref.

Calculations

Output

B1 Steel beam

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
0	2.50	1.00	1.00	0.00	0.00	0.00
1	3.35	5.15	1.50	17.25	5.03	22.28
Sum =				17.25	5.03	22.28
Span (m) = 3				Reaction =	25.88	7.54
						33.4

B2

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
0	5.50	1.00	1.00	0.00	0.00	0.00
1	2.40	5.15	1.50	12.36	3.60	15.96
Sum =				12.36	3.60	15.96
Span (m) = 3				Reaction =	18.54	5.40
						23.9

B3

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
B13 point load	1.00	12.50	12.50	12.50	12.50	25.00
Roof	1.50	1.00	1.00	1.50	1.50	3.00
Timber frame	2.00	1.00		2.00	0.00	2.00
Concrete Floor	0.50	5.15	1.50	2.58	0.75	3.33
Timber Floor	1.00	1.00	1.50	1.00	1.50	2.50
Sum of UDL =				7.08	3.75	5.83
Span (m) = 4.6				Reaction LHS =	24.97	17.32
				Reaction RHS =	20.08	12.43
						32.5

B4

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
Concrete Floor	0.80	5.15	1.50	4.12	1.20	5.32
Roof	1.50	1.00	1.00	1.50	1.50	3.00
Timber frame	2.00	1.00		2.00	0.00	2.00
Timber Floor	0.95	1.00	1.50	0.95	1.43	2.38
Sum =				8.57	4.13	12.70
Span (m) = 3.7				Reaction =	15.85	7.63
						23.5

B5

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
B4 point load	1.00	15.85	7.63	15.85	7.63	23.49
B14 point load	1.00		19.79	0.00	19.79	19.79
Floor	1.00	5.15	1.50	5.15	1.50	6.65
Sum =				5.15	1.50	49.93
Span (m) = 3.5				Reaction =	16.94	16.34
						33.3

B6

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
Roof	3.50	1.00	1.00	3.50	3.50	7.00
party wall	3.00	3.68		11.04	0.00	11.04
Floor	1.00	5.15	1.50	5.15	1.50	6.65
Sum =				19.69	5.00	24.69
Span (m) = 2.3				Reaction =	22.64	5.75
						28.4



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.19

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by**Date****Ref.****Calculations****Output****B7 Steel beam****Concentrated Loads**

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	2.20	1.00	1.00	2.20	2.20	4.40
1	3.00	3.68		11.04	0.00	11.04
1	3.50	5.15	3.00	18.03	10.50	28.53
Sum =				31.27	12.70	43.97
Span (m) = 2.4				Reaction = 37.52	15.24	52.8

B8**Concentrated Loads**

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	3.50	1.00	1.00	3.50	3.50	7.00
1	3.00	1.00		3.00	0.00	3.00
1	3.50	5.15	1.50	18.03	5.25	23.28
Sum =				24.53	8.75	33.28
Span (m) = 2.6				Reaction = 31.88	11.38	43.3

B9**Concentrated Loads**

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	1.00	31.88	11.38	31.88	11.38	43.26
1	1.00	14.04	14.04	14.04	14.04	28.08
1	2.30	1.00	1.00	2.30	2.30	4.60
1	2.60	2.30	2.30	5.98	5.98	11.96
1	1.00	5.15	1.50	5.15	1.50	6.65
Sum =				5.15	1.50	6.65
Span (m) = 3.5				Reaction BOT = 35.41	21.99	57.4
				Reaction TOP = 36.81	16.95	53.8

B10**Glulam****Concentrated Loads**

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	5.40	1.00	1.00	5.40	5.40	10.80
0	0.95	1.00	1.50	0.00	0.00	0.00
Sum =				5.40	5.40	10.80
Span (m) = 5.2				Reaction = 14.04	14.04	28.1

B11**Concentrated Loads**

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	5.80	1.00	1.00	5.80	5.80	11.60
0	1.00		1.50	0.00	0.00	0.00
Sum =				5.80	5.80	11.60
Span (m) = 6.7				Reaction = 38.86	38.86	77.7

B12**Concentrated Loads**

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	3.60	1.00	1.00	3.60	3.60	7.20
0	1.00	5.15	1.50	0.00	0.00	0.00
Sum =				3.60	3.60	0.00
Span (m) = 10				Reaction = 36.00	36.00	72.0



Harlow - 01279 430888
Norwich - 01603 300360

Project

Redevelopment of East Court

Job Ref.

10056

Part of Structure

Load Run Down - Apartments west wing

Sheet No./ Rev.

4.19

Calc. by

VM

Date

Jan-25

Chck'd by

JGW

Date

Jan-25

Rev'd by

Date

Ref.

Calculations

Output

B13

Glulam

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	5.00	1.00	1.00	5.00	5.00	10.00
		5.15	3.00	0.00	0.00	0.00
Sum =				5.00	5.00	10.00
Span (m) = 5				Reaction =	12.50	12.50
						25.0

GT1

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	5.00	1.00	1.00	5.00	5.00	10.00
Sum =				5.00	5.00	10.00
Span (m) = 7.5				Reaction =	18.75	18.75
						37.5

B14

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	1.00	18.75	18.75	18.75	18.75	37.50
1	1.50	1.00	1.00	1.50	1.50	3.00
1	2.00	1.00		2.00	0.00	2.00
1	0.80	5.15	1.50	4.12	1.20	5.32
1	0.95	1.00	1.50	0.95	1.43	2.38
Sum =				8.57	4.13	7.70
Span (m) = 3.7				Reaction LHS =	28.02	19.79
				Reaction RHS =	22.44	14.22
						47.8
						36.7

B15

Concentrated Loads

Factor	W/H (m)	Unit Load (KN/m²)		Actual Load (KN/m)		Sum. SLS (KN/m)
		Char. Dead	Char. Live	Char. Dead	Char. Live	
1	0.50	18.00	18.00	9.00	9.00	18.00
1	0.50	1.00	1.00	0.50	0.50	1.00
1	2.00	3.30	0.00	6.60	0.00	6.60
Sum =				16.10	9.50	25.60
Span (m) = 2.2				Reaction =	17.71	10.45
						28.2

 Harlow - 01279 430888 Norwich - 01603 300360	Project				Job Ref.	
	Redevelopment of East Court				10056	
	Part of Structure				Sheet no./rev.	
Apartment				5.2		
Calc. by	Date	Chck'd by	Date	Rev'd by	Date	
VM	Sep 24	JGW	Sep 24			
Ref.	Calculations				Output	

PADSTONES: FOR STEELWORK AND GIRDER TRUSSES:-

<u>2 Storey building</u>	3.6N/mm ²	7.3N/mm ²
Ground Floor	13 kN	55 kN
First Floor	34 kN	N/A

<u>3 Storey building</u>	3.6N/mm ²	7.3N/mm ²
Ground Floor	N/A	34 kN
First Floor	13 kN	55 kN
Second Floor	34 kN	N/A

Padstone size: 330mm long x 215mm deep x 100mm wide Class 'B' Engineering brick, set in Mortar M6

NOTES:

- Allowable Beam end reactions specified in the above tables are based on ultimate reactions, values are based on the remaining capacity of the wall after taking into account the following line loads from above:

2 Storey Ground floor:	Characteristic Dead load = 12 kN/m and Characteristic Live = 10.5 kN/m
2 Storey First floor:	Characteristic Dead load = 9 kN/m and Characteristic Live = 6 kN/m
3 Storey Ground Floor:	Characteristic Dead load = 18 kN/m and Characteristic Live = 15 kN/m
3 Storey Ground Floor:	see 2 Storey Ground floor
3 Storey Ground Floor:	see 2 Storey First floor
- Minimum beam width 89mm or greater.
- Padstone must be at least 1500mm from end of wall panel
- Above tables are based on beam being perpendicular to wall, if beam is in the plane of the wall, a bespoke design is required.
- For corners provide L-Shape padstone.
- Bearing to be full width of leaf or a minimum of 150mm
- Maximum wall panel height 2700mm
- If any of the above conditions are not achieved, then bespoke design required.
- Based on Autoclaved aerated concrete blockwork group 1

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

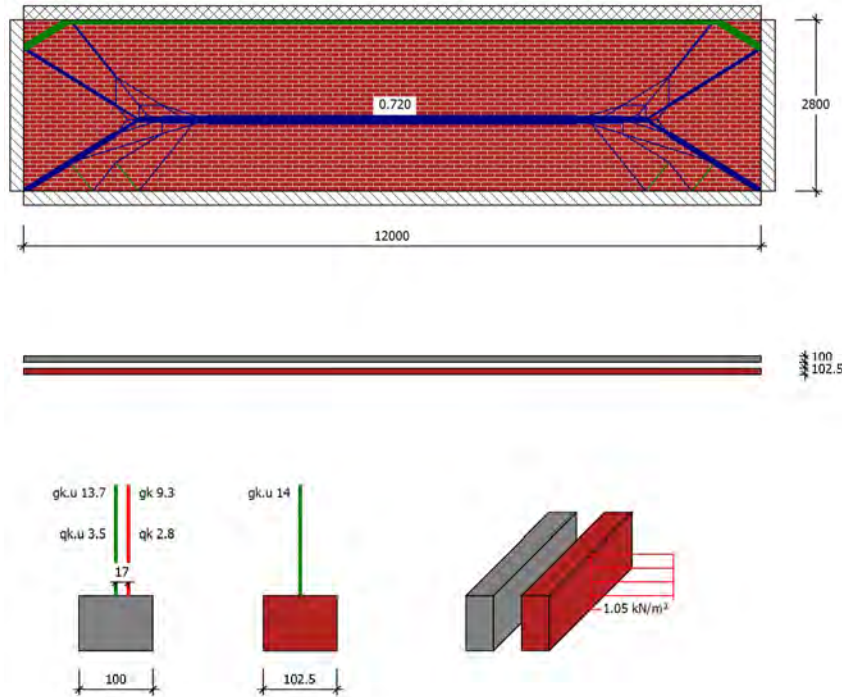
Sheet : /001

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall A GF****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.800$ m, $h_{ef}=2.352$ m (Eqn. 5.8), $L=12.000$ m, $L_{ef}=12.000$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=18.4 < \lambda_{lim}=27$, $L/t_{ef}=94$, $H/t_{ef}=21.9$, Hence $H/t_{ef} \leq 36.5$ (F.1) 0.683 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=14.0 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.161$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.771 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ 0.25 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_{ku}) + 0.75(W_x)$

25.74 kN/m

Moments from Lateral Load

 $X=0.513$ m, $Y=1.4$ m averaged over width Of 1.025 mCapacity reduction factor top, Φ $M_{w_x, top}=0.281$ kN.m, $M_{w_x, mid}=0.158$ kN.m

0.898

Capacity reduction factor mid, Φ_m $e_{hm}=0.235$ mm, $h_{ef}=2.352$

0.660

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.660 \times 4.5 \times 102.5/2.6$

117.1 kN/m

Fd/Fr

25.7/117.1

0.220

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.771 \times 1751/2.3$

0.587 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /002

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m³Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm²Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4$ N/mm²

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 13.7 kN/m, Live Load = 3.5 kN/m

Loads @ this level

Dead Load = 9.3 kN/m, Live Load = 2.8 kN/m, $e_x = 17$ mm

Section Properties

Area = 1000 cm²/m, $Z_p = 1667$ cm³/mFlexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.237$ N/mm² $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.795 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0$ m, $Y = 1.4$ m $< f_k / \gamma_{mc}$ 0.4 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 7.8$ m, $Y = 1.4$ m averaged over width Of 1 m

39.92 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.331$ kN.m, $M_{wx, mid} = 0.186$ kN.mCapacity reduction factor top, Φ

0.755

Capacity reduction factor mid, Φ_m $e_{hm} = 0.235$ mm, $e_{ef} = 2.352$

0.580

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.580 \times 5.73 \times 100 / 2.6$

127.8 kN/m

Fd/Fr

 $39.9 / 127.8$

0.312

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.795 \times 1667 / 2.3$

0.576 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.390

 $U_t = 1 / \lambda_p$ $1 / 1.390$

0.720

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /003

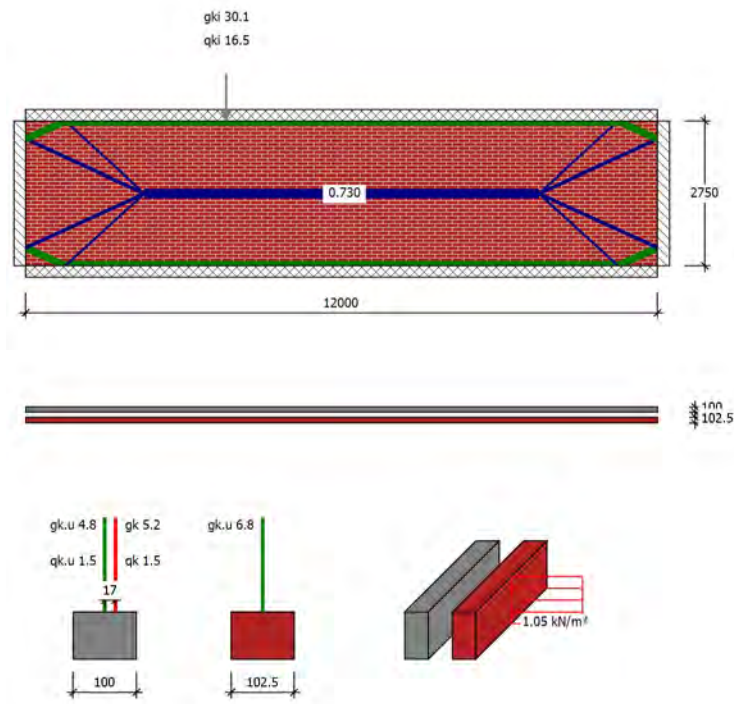
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall A 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=2.003$ m (Eqn. 5.8), $L=12.000$ m, $L_{ef}=12.000$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.7 < \lambda_{lim}=27$, $L/t_{ef}=94$, $H/t_{ef}=21.6$, Hence $H/t_{ef} \leq 36.5$ (F.1) 0.591 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=6.75 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk}.h+g_k)$ $X=0$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.15 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk}.h+g_k)$ $X=1.013$ m, $Y=1.375$ m averaged over width Of 1.025 m

15.83 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2003$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.003$

0.731

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.731 \times 4.5 \times 102.5/2.6$

129.7 kN/m

Fd/Fr

15.8/129.7

0.122

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /004

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class I, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b=7.3$ N/mm ²		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4$ N/mm ²		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load=4.8 kN/m, Live Load=1.5 kN/m		
Loads @ this level	Dead Load=5.15 kN/m, Live Load=1.5 kN/m, $e_x=17$ mm		
Section Properties	Area=1000 cm ² /m, $Z_p=1667$ cm ³ /m		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1}=0.25, g_d=0.107$ N/mm ²		
	$f_{xk1}=f_{xk1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})\gamma_{mf}$	0.496 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$		
Max local stress @	$X=2.849$ m, $Y=1.268$ m < f_k/γ_{mc}	0.51 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}+0.75(W_x)$		
Max axial buckling force @	$X=3.7$ m, $Y=1.268$ m averaged over width Of 1 m	51.39kN/m	
Moments from Lateral Load	$M_{wx,top}=0.216$ kN.m, $M_{wx,mid}=0.108$ kN.m		
Capacity reduction factor top, Φ	$e_x=3.0$ mm, $h_{ef}=2003$ mm, $t_{ef}=127.6$ mm, $t=100.0$ mm	0.852	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.107$ mm, $h_{ef}=2.003$	0.708	
$F_r=\Phi.f_{k,tk}/\gamma_{mc}$	$0.708 \times 5.73 \times 1000/2.6$	156.0 kN/m	
F_d/F_r	$51.4/156.0$	0.329	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 3.8m	g_k 30.1 kN, q_k 16.5 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	$(1.25 \cdot 30.1 + 1.5 \cdot 16.5) \cdot 1000/(440 \cdot 100)$	1.42 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.50 \cdot f_k/\gamma_{mc}$	3.3 N/mm ²	OK
$M_{ri}=f_{xk2}.Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{xk1}.Z_b/\gamma_{mf}$	$0.496 \times 1667/2.3$	0.359 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor, λ_p	1.370	
$U_t=1/\lambda_p$	1 / 1.370	0.730	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

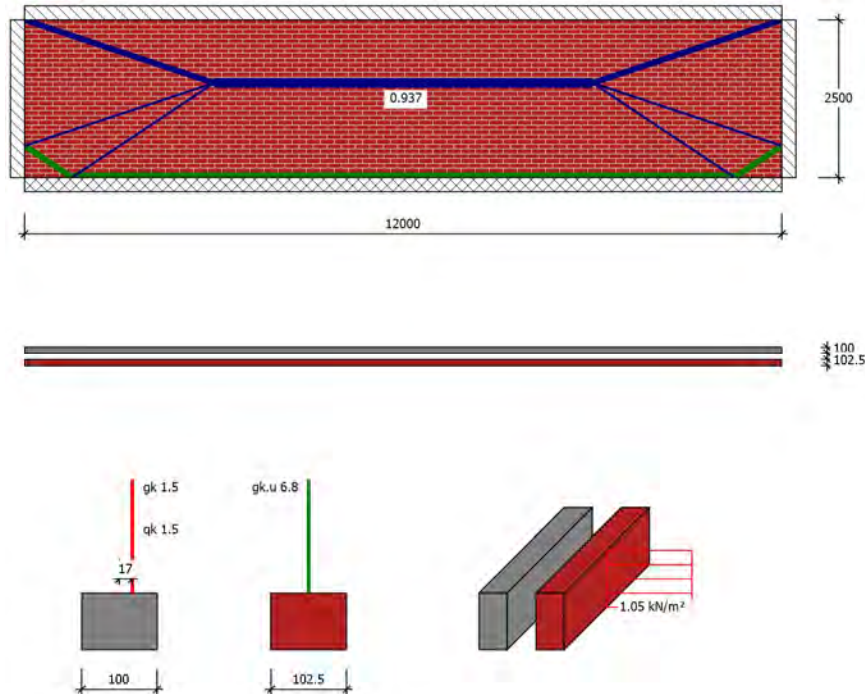
Sheet : /005

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall A 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=2.117$ m (Eqn. 5.8), $L=12.000$ m, $L_{ef}=12.000$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=16.6 \leq \lambda_{lim}=27$, $L/t_{ef}=94$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 36.5$ (F.1) 0.615 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=6.75 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.088$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.602 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=0$ m, $Y=1.25$ m < f_k/γ_{mc} 0.15 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=1.013$ m, $Y=1.25$ m averaged over width Of 1.025 m

15.22 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2117$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.117$

0.711

 $F_r=\Phi \cdot f_{k2} \cdot \gamma_{mc}$ $0.711 \times 4.5 \times 102.5/2.6$

126.1 kN/m

Fd/Fr

15.2/126.1

0.121

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.602 \times 1751/2.3$

0.458 kN.m/m

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Job Ref : 10056

Sheet : /006

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 1.5 kN/m, Live Load = 1.5 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.021 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.299 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ $X = 0 \text{ m}, Y = 1.25 \text{ m} < f_k / \gamma_{mc}$ 0.06 N/mm²

OK

Critical axial buckling Case

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k + 0.75(W_x)$

Max axial buckling force @

 $X = 7.8 \text{ m}, Y = 1.25 \text{ m}$ averaged over width Of 1 m

5.66 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.141 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 17.0 \text{ mm}, h_{ef} = 2117 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.566

Capacity reduction factor mid, Φ_m $e_{hm} = 0.142 \text{ mm}, h_{ef} = 2.117$

0.530

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.530 \times 5.73 \times 100 / 2.6$

116.8 kN/m

Fd/Fr

 $5.7 / 116.8$

0.048

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.299 \times 1667 / 2.3$

0.216 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.067

 $U_t = 1 / \lambda_p$ $1 / 1.067$

0.937

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /007

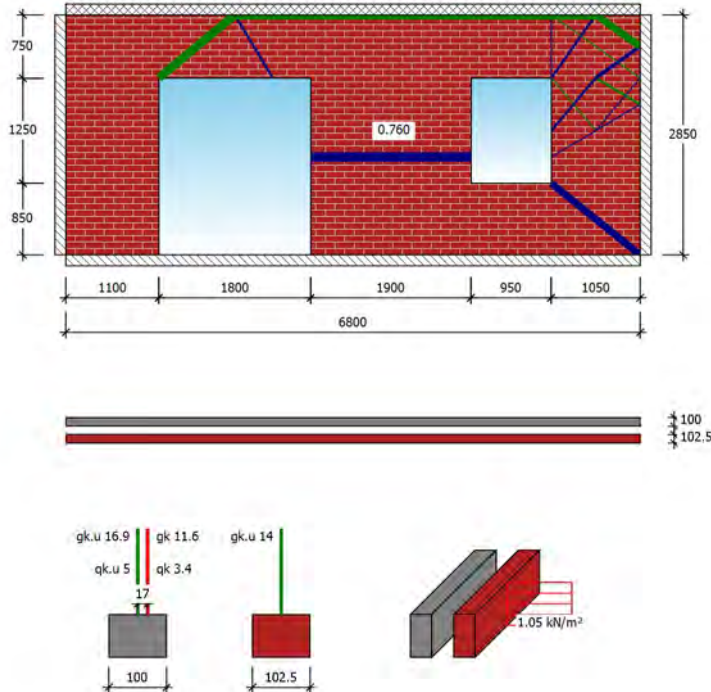
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall B GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.198$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X = 1.1$, $Y = 0$ - Two way spanningopening at $X = 4.8$, $Y = 0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=17.2 < \lambda_{lim}=27$, $1/t_{ef}=53.3$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 46.7$ (F.1) 0.638 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=14.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.162$ N/mm²0.772 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.506$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.53 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk}h+g_ku)+0.75(W_x)$

44.07 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.319$ kN.m, $M_{wx,mid}=0.179$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2494$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.277$ mm, $h_{ef}=2,494$

0.625

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mf}$ $0.625 \times 4.5 \times 102.5/2.6$

110.9 kN/m

Fd/Fr

44.1/110.9

0.397

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.772 \times 1751/2.3$

0.588 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /008

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 16.9 kN/m, Live Load = 5.0 kN/m

Loads @ this level

Dead Load = 11.6 kN/m, Live Load = 3.4 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.292 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.922 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.511 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 1.17 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 3.4 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

93.79 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.377 \text{ kN.m}, M_{wx, mid} = 0.212 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 6.9 \text{ mm}, h_{ef} = 2494 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.751

Capacity reduction factor mid, Φ_m $e_{hm} = 0.277 \text{ mm}, h_{ef} = 2.494$

0.547

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.547 \times 5.73 \times 100 / 2.6$

120.4 kN/m

 F_d / F_r $93.8 / 120.4$

0.779

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.922 \times 1667 / 2.3$

0.668 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.316

 $U_t = 1 / \lambda_p$ $1 / 1.316$

0.760

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /009

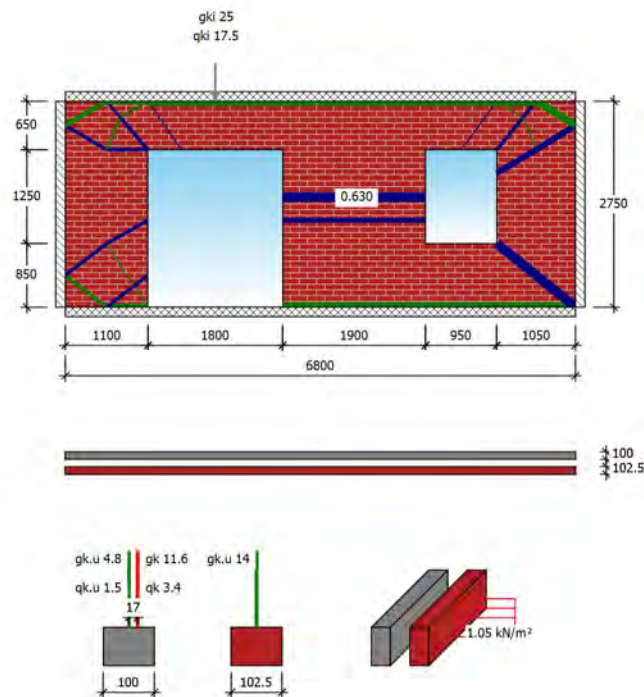
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall B 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.889$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1.1$, $Y=0$ - Two way spanningopening at $X=4.8$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=14.8 < \lambda_{lim}=27.1$, $t_{ef}=53.3$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 46.7$ (F.1) 0.548 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=14.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.161$ N/mm²0.77 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ $1.35(\gamma_{tk} \cdot h + g_k u)$ $X=0.477$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.52 N/mm² OK

Critical axial compressive Case

Max local stress @

Critical axial buckling Case

Max axial buckling force @

Moments from Lateral Load

 $M_{w, top}=0.000$ kN.m, $M_{w, mid}=0.000$ kN.m

43.61 kN/m

Capacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_{k, tk}/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

Fd/Fr

43.6/127.9

0.341

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.77 \times 1751/2.3$

0.586 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /010

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 4.8 kN/m, Live Load = 1.5 kN/m

Loads @ this level

Dead Load = 11.6 kN/m, Live Load = 3.4 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.171 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.644 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.42 \text{ m}, Y = 1.268 \text{ m} < f_k / \gamma_{mc}$ 1.09 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 3.4 \text{ m}, Y = 1.268 \text{ m}$ averaged over width Of 1 m

83.71 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.241 \text{ kN.m}, M_{wx, mid} = 0.121 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 7.8 \text{ mm}, h_{ef} = 2063 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.753

Capacity reduction factor mid, Φ_m $e_{hm} = 0.119 \text{ mm}, h_{ef} = 2.063$

0.643

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.643 \times 5.73 \times 100 / 2.6$

141.7 kN/m

Fd/Fr

83.7/141.7

0.591

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 2m

 $g_k = 25 \text{ kN}, q_k = 17.5 \text{ kN}$, Bearing Length 200 mm width 100 mm

Spreader details

Length 440 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 25 + 1.5 \cdot 17.5) \cdot 1000 / (440 \cdot 100)$ 1.31 N/mm²

Local Bearing Capacity

No Bearing enhancement, $1.00 \cdot f_k / \gamma_{mc}$ 2.2 N/mm²

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.644 \times 1667 / 2.3$

0.467 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.587

 $U_t = 1 / \lambda_p$

1 / 1.587

0.630

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

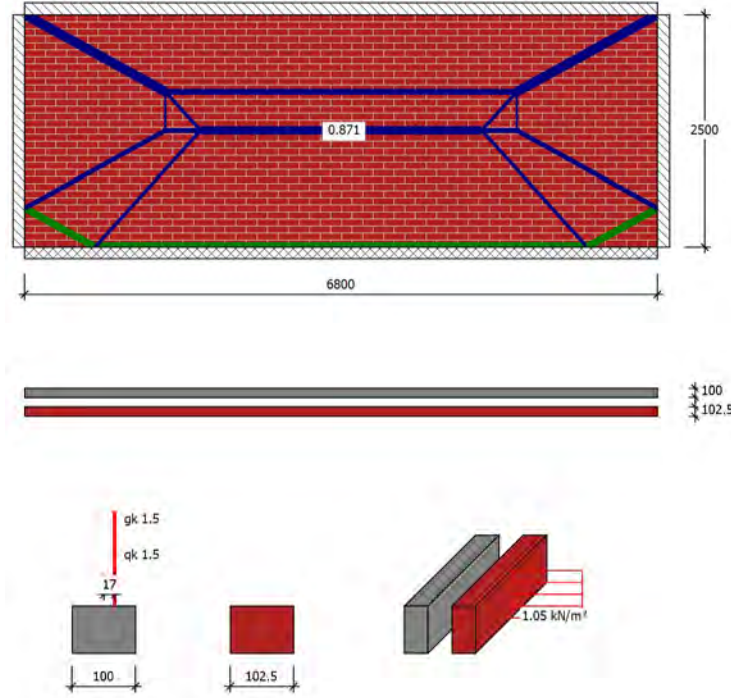
Sheet : /011

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall B 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.982$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.5 < \lambda_{lim}=27$, $L/t_{ef}=53.3$, $H/t_{ef}=19.6$. Hence $H/t_{ef} \leq 46.7$ (F.1) 0.575 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1: $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.06 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk}.h)$ $X=1.013$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.11 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ

0.900

Capacity reduction factor mid, Φ_m

0.734

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.734 \times 4.5 \times 102.5/2.6$

130.4 kN/m

 F_d/F_r

6.1/130.4

0.047

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751/2.3$

0.343 kN.m/m

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd**15 Meridian Way, Meridian Business Park****Norwich, GB****NR7 0TA****01279430888**

Cloud 3b89b

Job Ref : 10056**Sheet : /012****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b=7.3$ N/mm ²		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4$ N/mm ²		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads @ this level	Dead Load=1.5 kN/m, Live Load=1.5 kN/m, $e_x=17$ mm		
Section Properties	Area=1000 cm ² /m, $Z_p=1667$ cm ³ /m		
Flexural Strength f_{k2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{k1} (Parallel)	$f_{k1}=0.25, g_d=0.021$ N/mm ²		
	$f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$	0.299 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k$		
Max local stress @	$X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$	0.06 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k+0.75(W_x)$		
Max axial buckling force @	$X=6.3$ m, $Y=1.25$ m averaged over width Of 1 m	5.66kN/m	
Moments from Lateral Load	$M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.108$ kN.m		
Capacity reduction factor top, Φ	$e_x=17.0$ mm, $h_{ef}=1982$ mm, $t_{ef}=127.6$ mm, $t=100.0$ mm	0.572	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.109$ mm, $h_{ef}=1.982$	0.562	
$F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$	$0.562 \times 5.73 \times 100/2.6$	123.8 kN/m	
F_d/F_r	$5.7/123.8$	0.046	OK
$M_{ri}=f_{k2} \cdot Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{k1} \cdot Z_b/\gamma_{mf}$	$0.299 \times 1667/2.3$	0.216 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	1.149	
$U_t=1/\lambda_p$	1 / 1.149	0.871	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /013

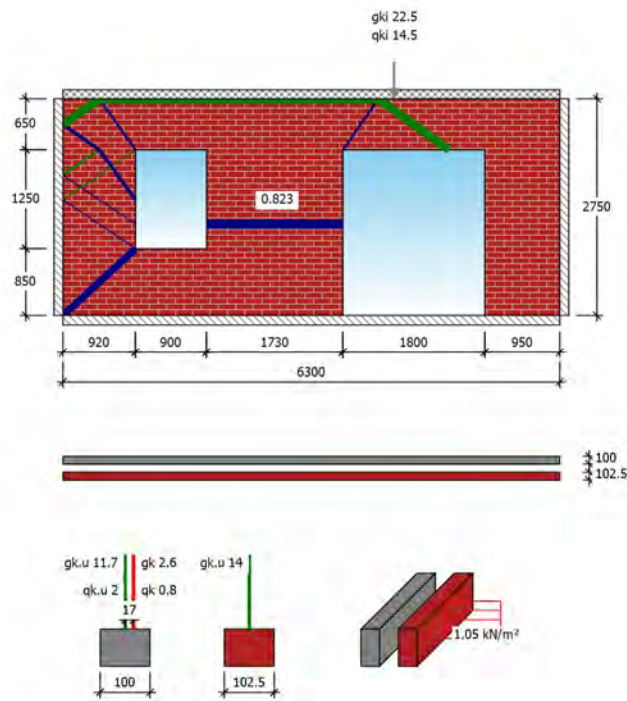
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall V GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=2.100$ m (Eqn. 5.8), $L=6.300$ m, $L_{ef}=6.300$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=3.55$, $Y=0$ - Two way spanningopening at $X=0.92$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=16.5 < \lambda_{lim}=27$, $1/t_{ef}=49.4$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 47.7$ (F.1) 0.610 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=14.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.161$ N/mm²0.77 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ $1.35(\gamma_{tk} \cdot h + g_k u)$

Critical axial compressive Case

Max local stress @

 $X=5.35$ m, $Y=1.375$ m $< f_k \cdot 0.99$ (small area red.) γ_{mc} 0.52 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k u) + 0.75(W_x)$

Moments from Lateral Load

 $X=3.033$ m, $Y=1.375$ m averaged over width Of 1.025 m

43.96 kN/m

Capacity reduction factor top, Φ $M_{w, top}=0.280$ kN.m, $M_{w, mid}=0.157$ kN.m

0.896

Capacity reduction factor mid, Φ_m $e_{hm}=0.226$ mm, $h_{ef}=2.406$

0.647

 $F_r=\Phi \cdot f_{k, tk}/\gamma_{mc}$ $0.647 \times 4.5 \times 102.5/2.6$

114.8 kN/m

Fd/Fr

44.0/114.8

0.383

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.77 \times 1751/2.3$

0.586 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /014

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 11.7 kN/m, Live Load = 2.0 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.75 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.15 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.596 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 2.87 \text{ m}, Y = 1.268 \text{ m} < f_k / \gamma_{mc}$ 0.9 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 3.05 \text{ m}, Y = 1.268 \text{ m}$ averaged over width Of 1 m

72.87 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.330 \text{ kN.m}, M_{wx, mid} = 0.186 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 2.0 \text{ mm}, h_{ef} = 2406 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.853

Capacity reduction factor mid, Φ_m $e_{hm} = 0.226 \text{ mm}, h_{ef} = 2.406$

0.622

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.622 \times 5.73 \times 100 / 2.6$

137.1 kN/m

Fd/Fr

 $72.9 / 137.1$

0.532

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 4.2m

 $g_k 22.5 \text{ kN}, q_k 14.5 \text{ kN}$, Bearing Length 200 mm width 100 mm

Spreader details

Length 2000 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 22.5 + 1.5 \cdot 14.5) \cdot 1000 / (2000 \cdot 100)$ 0.25 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.47 \cdot f_k / \gamma_{mc}$ 3.23 N/mm²

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.596 \times 1667 / 2.3$

0.432 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.216

 $U_t = 1 / \lambda_p$

1 / 1.216

0.823

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

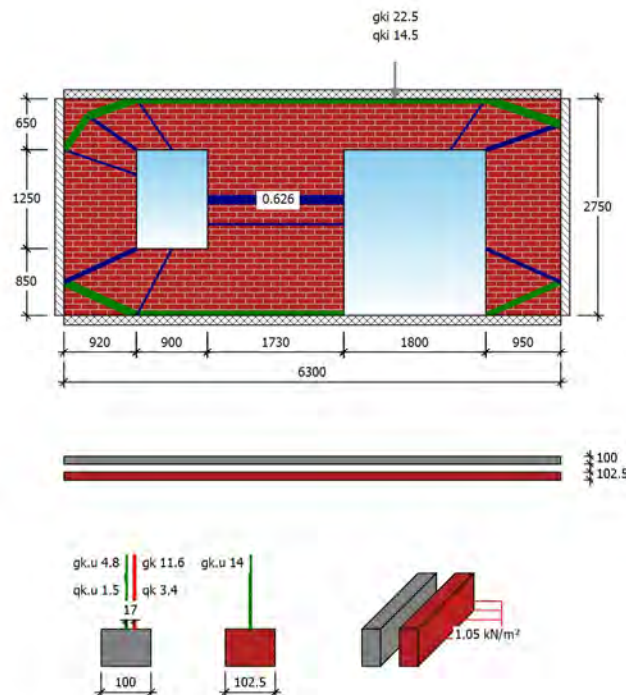
Sheet : /015

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall V 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.863$ m (Eqn. 5.8), $L=6.300$ m, $L_{ef}=6.300$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=3.55$, $Y=0$ - Two way spanningopening at $X=0.92$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=14.6 < \lambda_{lim}=27$, $1/t_{ef}=49.4$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 47.7$ (F.1) 0.541 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=14.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.161$ N/mm²0.77 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ $1.35(\gamma_{tk} \cdot h + g_k u)$

Critical axial compressive Case

Max local stress @

 $X=5.35$ m, $Y=1.375$ m $< f_k \cdot 0.99$ (small area red.) γ_{mc} 0.52 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k u)$

Moments from Lateral Load

 $X=3.033$ m, $Y=1.375$ m averaged over width Of 1.025 m

43.96 kN/m

Capacity reduction factor top, Φ $M_{w, top}=0.000$ kN.m, $M_{w, mid}=0.000$ kN.m

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.720 \times 4.5 \times 102.5 / 2.6$

127.9 kN/m

Fd/Fr

44.0/127.9

0.344

OK

 $M_{ro}=f_{k2} \cdot Z_p / \gamma_{mf}$ $1.1 \times 1751 / 2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b / \gamma_{mf}$ $0.77 \times 1751 / 2.3$

0.586 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /016

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 4.8 kN/m, Live Load = 1.5 kN/m

Loads @ this level

Dead Load = 11.6 kN/m, Live Load = 3.4 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.171 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.644 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 2.87 \text{ m}, Y = 1.268 \text{ m} < f_k / \gamma_{mc}$ 1.13 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 3.05 \text{ m}, Y = 1.268 \text{ m}$ averaged over width Of 1 m

86.84 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.239 \text{ kN.m}, M_{wx, mid} = 0.120 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 7.5 \text{ mm}, h_{ef} = 2063 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.759

Capacity reduction factor mid, Φ_m $e_{hm} = 0.119 \text{ mm}, h_{ef} = 2.063$

0.646

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.646 \times 5.73 \times 100 / 2.6$

142.3 kN/m

 F_d / F_r

86.8/142.3

0.610

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 4.2m

 $g_k 22.5 \text{ kN}, q_k 14.5 \text{ kN}$, Bearing Length 200 mm width 100 mm

Spreader details

Length 440 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 22.5 + 1.5 \cdot 14.5) \cdot 1000 / (440 \cdot 100)$ 1.13 N/mm²

Local Bearing Capacity

No Bearing enhancement, $1.00 \cdot f_k / \gamma_{mc}$ 2.2 N/mm²

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.644 \times 1667 / 2.3$

0.467 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.598

 $U_t = 1 / \lambda_p$

1 / 1.598

0.626

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

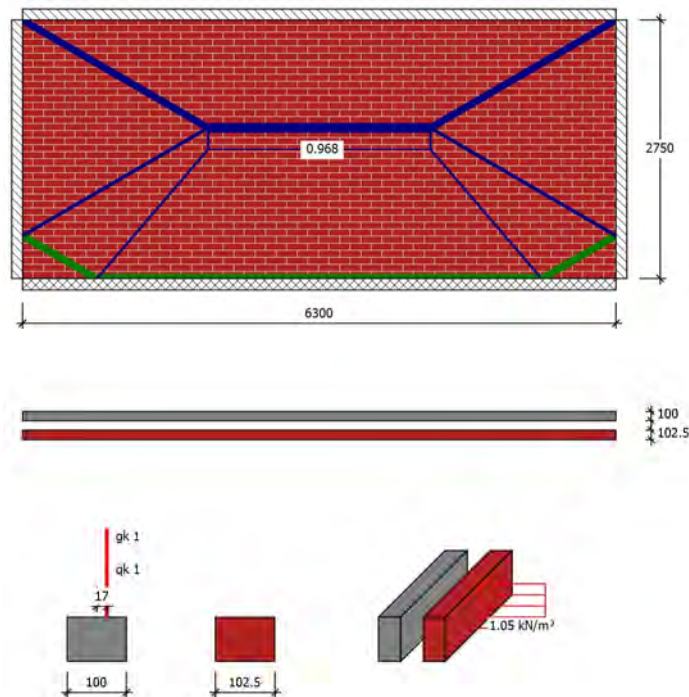
Sheet : /017

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall V 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=2.100$ m (Eqn. 5.8), $L=6.300$ m, $L_{ef}=6.300$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=16.5 < \lambda_{lim}=27$, $L/t_{ef}=49.4$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 47.7$ (F.1) 0.610 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Section Properties

Flexural Strength f_{k2} (Perpendicular)Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.024$ N/mm²1.1 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.456 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.07 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h)$ $X=1.013$ m, $Y=1.375$ m averaged over width Of 1.025 m

6.72 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ

0.900

Capacity reduction factor mid, Φ_m

0.714

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.714 \times 4.5 \times 102.5/2.6$

126.7 kN/m

 F_d/F_r $6.7/126.7$

0.053

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.456 \times 1751/2.3$

0.347 kN.m/m

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /018****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads @ this level	Dead Load=1.0 kN/m, Live Load=1.0 kN/m, $e_x=17 \text{ mm}$		
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$		
Flexural Strength f_{k2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{k1} (Parallel)	$f_{k1}=0.25, g_d=0.017 \text{ N/mm}^2$		
	$f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})\gamma_{mf}$	0.289 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k$		
Max local stress @	$X=0 \text{ m}, Y=1.375 \text{ m} < f_k/\gamma_{mc}$	0.04 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k+0.75(W_x)$		
Max axial buckling force @	$X=5.8 \text{ m}, Y=1.375 \text{ m}$ averaged over width Of 1 m	4.44kN/m	
Moments from Lateral Load	$M_{w_x, \text{top}}=0.000 \text{ kN.m}, M_{w_x, \text{mid}}=0.120 \text{ kN.m}$		
Capacity reduction factor top, Φ	$e_x=17.0 \text{ mm}, h_{ef}=2100 \text{ mm}, t_{ef}=127.6 \text{ mm}, t=100.0 \text{ mm}$	0.567	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.146 \text{ mm}, h_{ef}=2.100$	0.534	
$F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$	$0.534 \times 5.73 \times 100/2.6$	117.7 kN/m	
F_d/F_r	$4.4/117.7$	0.038	OK
$M_{ri}=f_{k2} \cdot Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{k1} \cdot Z_b/\gamma_{mf}$	$0.289 \times 1667/2.3$	0.209 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	1.033	
$U_t=1/\lambda_p$	$1/1.033$	0.968	OK
Node Density Caution	Consider increasing the node density as the solution is close to failure		Warning

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /019

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

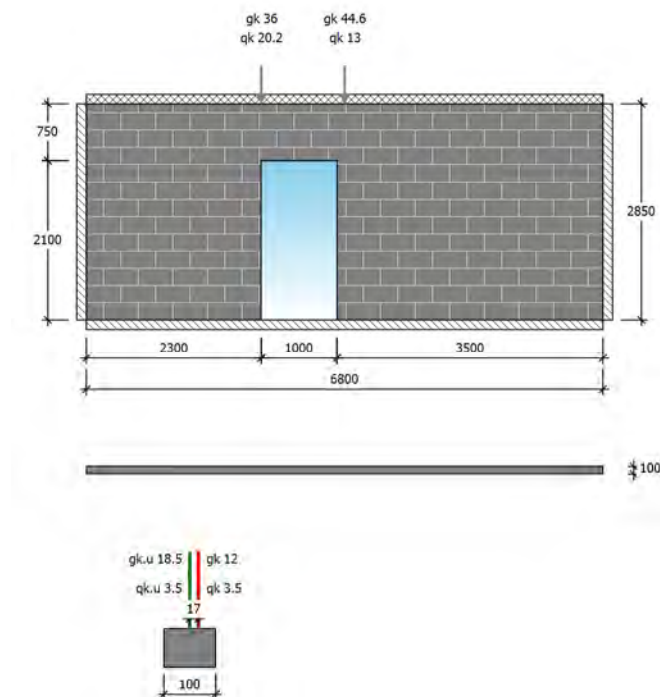
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AD GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.198$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t=100$, $t_{ef}=100$ $\lambda=22 \leq \lambda_{lim}=27$

0.814

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=17.5$ N/mm²Normalised mean compressive strength $f_b=17.5 \cdot 1.38$ 24.15 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 10.56 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, Φ Capacity reduction factor mid, Φ_m $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ F_d/F_r

Point load design method

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X=3.3$ m, $Y=1.318$ m $< f_k/\gamma_{mc}$ 1.84 N/mm²

OK

 $X=3.8$ m, $Y=1.318$ m averaged over width of 1 m

151.32 kN/m

 $ex=3.5$ mm, $h_{ef}=2361$ mm, $t_{ef}=100.0$ mm, $t=100.0$ mm

0.826

 $ehm=0.000$ mm, $h_{ef}=2.361$

0.494

 $0.494 \times 10.56 \times 100 / 2.6$

200.5 kN/m

151.3/200.5

0.755

OK

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

gk 18.6 kN, qk 5.5 kN, Bearing Length 200 mm width 100 mm

Length 2000 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 18.6 + 1.5 \cdot 5.5) \cdot 1000 / (2000 \cdot 100)$ 0.16 N/mm²Bearing enhancement eq 6.11, $1.50 \cdot f_k / \gamma_{mc}$ 6.09 N/mm²

OK

Point Load at 3.4m

Spreader details

Bearing Stress

Local Bearing Capacity

Point Load at 2.3m

Spreader details

Bearing Stress

Length 2000 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 20 + 1.5 \cdot 12.5) \cdot 1000 / (2000 \cdot 100)$ 0.22 N/mm²

Cloud 3b89b Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Job Ref : 10056 Sheet : /020 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :	
Local Bearing Capacity	Bearing enhancement eq 6.11, 1.50•fk/γmc	6.08 N/mm²	OK
Point Load at 2.3m	gk 16 kN, qk 7.7 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 2000 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	(1.25•16 + 1.5•7.7)•1000/(2000•100)	0.16 N/mm²	
Local Bearing Capacity	Bearing enhancement eq 6.11, 1.50•fk/γmc	6.08 N/mm²	OK
Point Load at 3.4m	gk 26 kN, qk 7.5 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	(1.25•26 + 1.5•7.5)•1000/(440•100)	0.99 N/mm²	
Local Bearing Capacity	No Bearing enhancement, 1.00•fk/γmc	4.06 N/mm²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /021

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

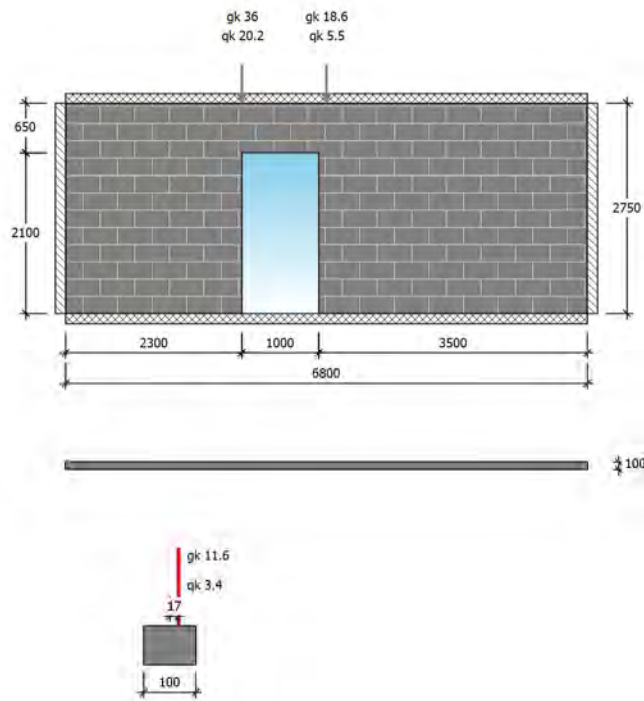
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AD 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.889$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t=100$, $t_{ef}=100$ $\lambda=18.9 < \lambda_{lim}=27$

0.700

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4Dead Load=11.6 kN/m, Live Load=3.4 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ $X=1.62$ m, $Y=1.268$ m $< f_k/\gamma_{mc}$ 1.21 N/mm²

OK

 $X=1.8$ m, $Y=1.268$ m averaged over width of 1 m

100.02 kN/m

 $e_x=5.1$ mm, $h_{ef}=1893$ mm, $t_{ef}=100.0$ mm, $t=100.0$ mm

0.814

 $e_{hm}=0.000$ mm, $h_{ef}=1.893$

0.617

 $0.617 \times 5.73 \times 100/2.6$

135.8 kN/m

 $100.0/135.8$

0.737

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

gk 18.6 kN, qk 5.5 kN, Bearing Length 200 mm width 100 mm

Length 440 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 18.6 + 1.5 \cdot 5.5) \cdot 1000 / (440 \cdot 100)$ 0.72 N/mm²No Bearing enhancement, $1.00 \cdot f_k/\gamma_{mc}$ 2.2 N/mm²

OK

Point Load at 2.3m

gk 20 kN, qk 12.5 kN, Bearing Length 200 mm width 100 mm

Length 440 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 20 + 1.5 \cdot 12.5) \cdot 1000 / (440 \cdot 100)$ 0.99 N/mm²No Bearing enhancement, $1.00 \cdot f_k/\gamma_{mc}$ 2.2 N/mm²

OK

Job Ref : 10056
Sheet : /022
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

gk 16 kN, qk 7.7 kN, Bearing Length 200 mm width 100 mm
Length 440 mm, Depth 215 mm, Thickness 100 mm
 $(1.25 \cdot 16 + 1.5 \cdot 7.7) \cdot 1000 / (440 \cdot 100)$
No Bearing enhancement, $1.00 \cdot f_k / \gamma_{mc}$

0.72 N/mm²
2.2 N/mm² OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /023

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

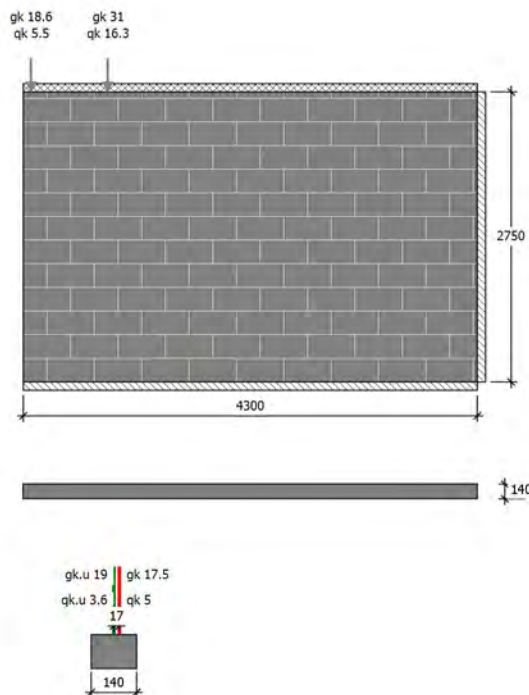
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AE GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=2.325$ m (Eqn. 5.6), $L=4.300$ m, $L_{ef}=4.300$ m

Bottom Simple, Top Cont., Left Free, Right Simple

 $t=140$, $t_{ef}=140$ $\lambda=16.6 < \lambda_{lim}=27$

0.615

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, Φ Capacity reduction factor mid, Φ_m $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ F_d/F_r

Point load design method

 $X=0$ m, $Y=1.268$ m $< f_k/\gamma_{mc}$ 0.74 N/mm²

OK

 $X=1$ m, $Y=1.268$ m averaged over width Of 1.4 m

103.28 kN/m

 $ex=5.0$ mm, $h_{ef}=2325$ mm, $t_{ef}=140.0$ mm, $t=140.0$ mm

0.855

 $ehm=0.000$ mm, $h_{ef}=2.325$

0.700

 $0.700 \times 5.73 \times 140 / 2.6$

215.9 kN/m

103.3/215.9

0.478

OK

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 0.075m

Spreader details

Bearing Stress

Local Bearing Capacity

Point Load at 0.8m

Spreader details

Bearing Stress

gk 18.6 kN, qk 5.5 kN, Bearing Length 200 mm width 140 mm

Length 2000 mm, Depth 215 mm, Thickness 140 mm

 $(1.25 \cdot 18.6 + 1.5 \cdot 5.5) \cdot 1000 / (1075 \cdot 140)$ 0.21 N/mm²Bearing enhancement eq 6.11, $1.01 \cdot f_k / \gamma_{mc}$ 2.21 N/mm²

OK

gk 31 kN, qk 16.3 kN, Bearing Length 200 mm width 140 mm

Length 2000 mm, Depth 215 mm, Thickness 140 mm

 $(1.25 \cdot 31 + 1.5 \cdot 16.3) \cdot 1000 / (1800 \cdot 140)$ 0.25 N/mm²

Job Ref : 10056
Sheet : /024
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /025

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

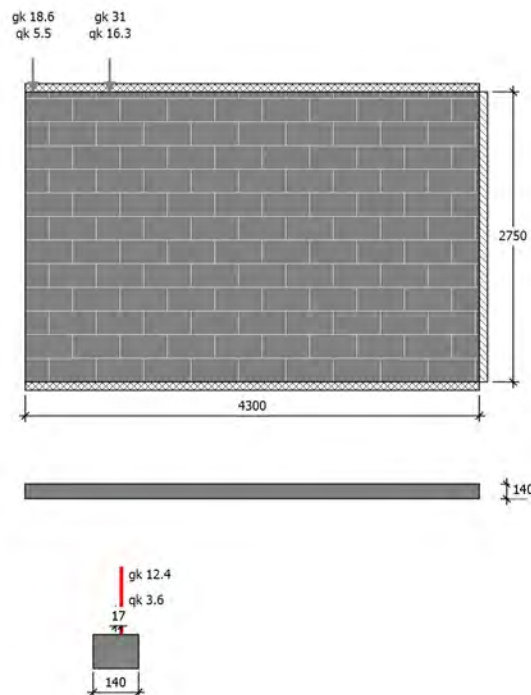
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AE 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=2.011$ m (Eqn. 5.6), $L=4.300$ m, $L_{ef}=4.300$ m

Bottom Cont., Top Cont., Left Free, Right Simple

 $t=140$, $t_{ef}=140$ $\lambda=14.4 < \lambda_{lim}=27$

0.532

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4Dead Load=12.4 kN/m, Live Load=3.6 kN/m, $e_x=17$ mmArea=1400 cm²/m, $Z_p=3267$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ $X=0$ m, $Y=1.268$ m $< f_k/\gamma_{mc}$ 0.64 N/mm²

OK

 $X=0.7$ m, $Y=1.268$ m averaged over width of 1.4 m

81.84 kN/m

Capacity reduction factor top, Φ $e_x=4.5$ mm, $h_{ef}=2011$ mm, $t_{ef}=140.0$ mm, $t=140.0$ mm

0.872

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.011$

0.759

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.759 \times 5.73 \times 140 / 2.6$

234.2 kN/m

Fd/Fr

81.8/234.2

0.349

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 0.075m

gk 18.6 kN, qk 5.5 kN, Bearing Length 200 mm width 140 mm

Spreader details

Length 440 mm, Depth 215 mm, Thickness 140 mm

Bearing Stress

 $(1.25 \cdot 18.6 + 1.5 \cdot 5.5) \cdot 1000 / (295 \cdot 140)$ 0.76 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.18 \cdot f_k / \gamma_{mc}$ 2.61 N/mm²

OK

Point Load at 0.8m

gk 31 kN, qk 16.3 kN, Bearing Length 200 mm width 140 mm

Spreader details

Length 440 mm, Depth 215 mm, Thickness 140 mm

Bearing Stress

 $(1.25 \cdot 31 + 1.5 \cdot 16.3) \cdot 1000 / (440 \cdot 140)$ 1.03 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.36 \cdot f_k / \gamma_{mc}$ 3.01 N/mm²

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /026

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

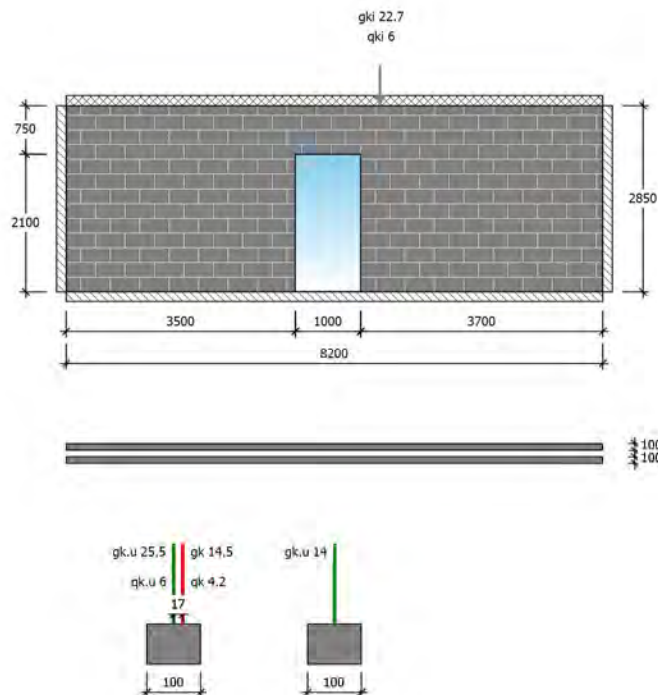
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall S GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.283$ m (Eqn. 5.8), $L=8.200$ m, $L_{ef}=8.200$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=18.1 < \lambda_{lim}=27$

0.671

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Dead Load=14.0 kN/m

Area=1000 cm²/m, $Z_p=1667$ cm³/m $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=2.911$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.35 N/mm²

OK

 $X=5$ m, $Y=1.425$ m averaged over width Of 1 m

30.49 kN/m

 $e_x=0.0$ mm, $h_{ef}=2374$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.894

 $e_{hm}=0.000$ mm, $h_{ef}=2.374$

0.651

 $0.651 \times 5.73 \times 100/2.6$

143.4 kN/m

 $F_r = \Phi_k \cdot f_k \cdot t_k / \gamma_{mc}$

Fd/Fr

30.5/143.4

0.213

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Dead Load=25.5 kN/m, Live Load=6.0 kN/m

Dead Load=14.5 kN/m, Live Load=4.2 kN/m, $e_x=17$ mm

Loads from above

Loads @ this level

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /027****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Section Properties

Area=1000 cm²/m, Z_p=1667 cm³/m

Critical axial compressive Case

 $1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$

Max local stress @

 $X=4.5\text{ m}, Y=1.318\text{ m} < f_k/\gamma_{mc}$ 1.37 N/mm²

OK

Max axial buckling force @

 $X=5\text{ m}, Y=1.318\text{ m}$ averaged over width Of 1 m

118.21kN/m

Capacity reduction factor top. Φ $e_x=5.4\text{ mm}, h_{ef}=2374\text{ mm}, t_{ef}=126.0\text{ mm}, t=100.0\text{ mm}$

0.787

Capacity reduction factor mid. Φ_m $e_{hm} = 0.000\text{ mm}, h_{ef} = 2.374$

0.593

 $F_r = \Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.593 \times 5.73 \times 100 / 2.6$

130.5 kN/m

Fd/Fr

118.2/130.5

0.906

OK

Point load design method

Design based on axial load take down for wall compression design.

Point Load at 4.8m

No design for bending due to point loads.

Spreader details

g_k 22.7 kN, q_k 6 kN, Bearing Length 200 mm width 100 mm

Bearing Stress

Length 2000 mm, Depth 215 mm, Thicknesss 100 mm

 $(1.25 \cdot 22.7 + 1.5 \cdot 6) \cdot 1000 / (2000 \cdot 100)$ 0.19 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.50 \cdot f_k/\gamma_{mc}$ 3.3 N/mm²

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /028

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

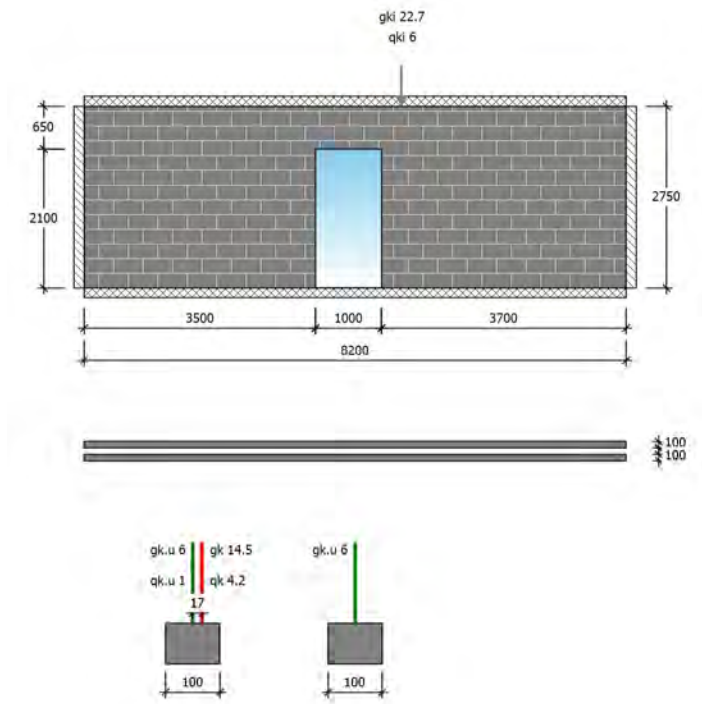
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall S 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.940$ m (Eqn. 5.8), $L=8.200$ m, $L_{ef}=8.200$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=15.4 < \lambda_{lim}=27$

0.570

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Dead Load=6.0 kN/m

Area=1000 cm²/m, $Z_p=1667$ cm³/m $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=2.882$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.16 N/mm²

OK

 $X=5$ m, $Y=1.375$ m averaged over width Of 1 m

14.19 kN/m

 $e_x=0.0$ mm, $h_{ef}=1994$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

 $e_{hm}=0.000$ mm, $h_{ef}=1.994$

0.728

 $0.728 \times 5.73 \times 100/2.6$

160.4 kN/m

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$

Fd/Fr

14.2/160.4

0.088

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Dead Load=6.0 kN/m, Live Load=1.0 kN/m

Dead Load=14.5 kN/m, Live Load=4.2 kN/m, $e_x=17$ mm

Loads from above

Loads @ this level

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /029****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Section Properties

Area=1000 cm²/m, Z_p=1667 cm³/m

Critical axial compressive Case

 $1.25(\gamma_{tk}h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$

Max local stress @

 $X=4.5 \text{ m}, Y=1.268 \text{ m} < f_k/\gamma_{mc}$ 0.93 N/mm²

OK

Max axial buckling force @

 $X=5 \text{ m}, Y=1.268 \text{ m}$ averaged over width Of 1 m

82.66kN/m

Capacity reduction factor top. Φ $e_x=7.7 \text{ mm}, h_{ef}=1994 \text{ mm}, t_{ef}=126.0 \text{ mm}, t=100.0 \text{ mm}$

0.757

Capacity reduction factor mid. Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.994$

0.657

 $F_r = \Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.657 \times 5.73 \times 100/2.6$

144.8 kN/m

Fd/Fr

82.7/144.8

0.571

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 4.8m

g_k 22.7 kN, q_k 6 kN, Bearing Length 200 mm width 100 mm

Spreader details

Length 440 mm, Depth 215 mm, Thicknesss 100 mm

Bearing Stress

 $(1.25 \cdot 22.7 + 1.5 \cdot 6) \cdot 1000/(440 \cdot 100)$ 0.85 N/mm²

Local Bearing Capacity

No Bearing enhancement, $1.00 \cdot f_k/\gamma_{mc}$ 2.2 N/mm²

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /030

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

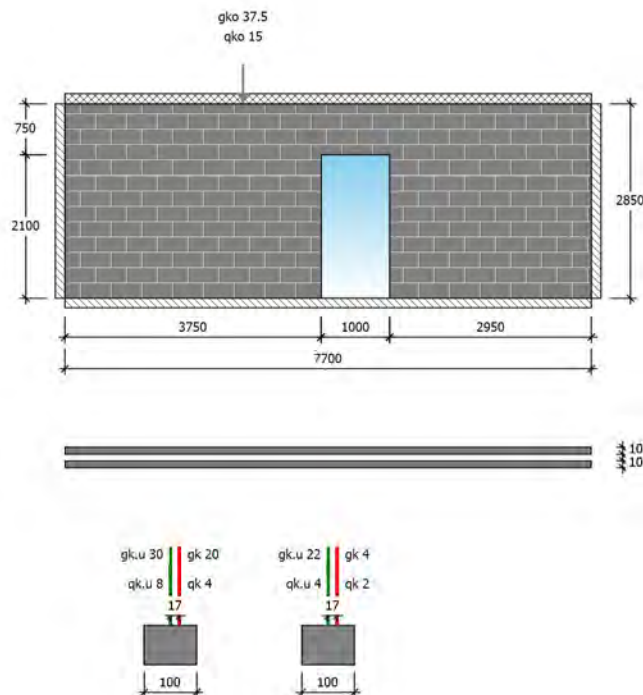
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall Z GF right

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.257$ m (Eqn. 5.8), $L=7.700$ m, $L_{ef}=7.700$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=17.9 < \lambda_{lim}=27$

0.663

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Dead Load=22.0 kN/m, Live Load=4.0 kN/m

Dead Load=4.0 kN/m, Live Load=2.0 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X=3.099$ m, $Y=1.318$ m $< f_k/\gamma_{mc}$ 1.02 N/mm²

OK

Max local stress @

Max axial buckling force @

 $X=3.25$ m, $Y=1.318$ m averaged over width Of 1 m

90.49 kN/m

Capacity reduction factor top, Φ $e_x=2.3$ mm, $h_{ef}=2377$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.848

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.377$

0.625

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.625 \times 5.73 \times 100 / 2.6$

137.7 kN/m

Fd/Fr

 $90.5 / 137.7$

0.657

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 2.6m

gk 37.5 kN, qk 15 kN, Bearing Length 200 mm width 100 mm

Spreader details

Length 2000 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 37.5 + 1.5 \cdot 15) \cdot 1000 / (2000 \cdot 100)$ 0.35 N/mm²

Local Bearing Capacity

No Bearing enhancement, $1.00 \cdot f_k / \gamma_{mc}$ 2.2 N/mm²

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /031****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load=30.0 kN/m, Live Load=8.0 kN/m		
Loads @ this level	Dead Load=20.0 kN/m, Live Load=4.0 kN/m, $e_x=17 \text{ mm}$		
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$		
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X=3.161 \text{ m}, Y=1.425 \text{ m} < f_k/\gamma_{mc}$	1.42 N/mm ²	OK
Max axial buckling force @	$X=3.25 \text{ m}, Y=1.425 \text{ m}$ averaged over width Of 1 m	122.73kN/m	
Capacity reduction factor top, Φ	$e_x=6.5 \text{ mm}, h_{ef}=2377 \text{ mm}, t_{ef}=126.0 \text{ mm}, t=100.0 \text{ mm}$	0.764	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000 \text{ mm}, h_{ef}=2.377$	0.579	
$F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$	$0.579 \times 5.73 \times 100/2.6$	127.6 kN/m	
F_d/F_r	$122.7/127.6$	0.962	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /032

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

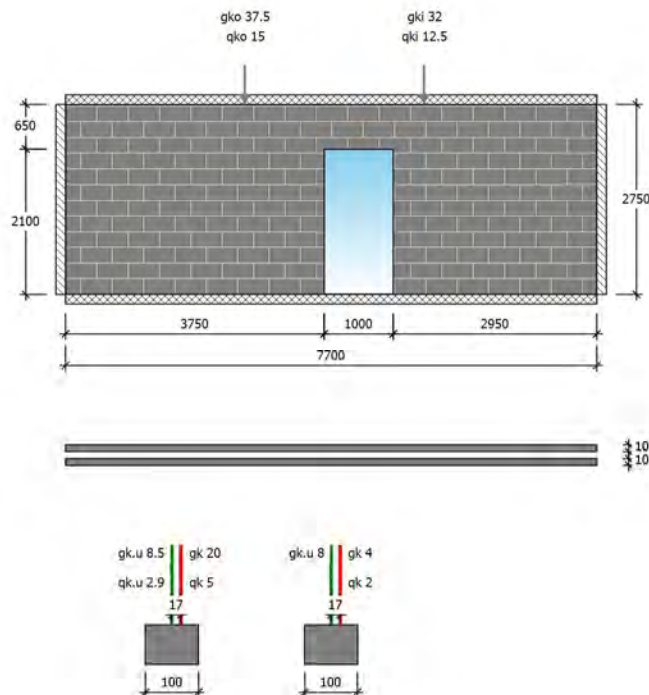
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall Z 1F right

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.924$ m (Eqn. 5.8), $L=7.700$ m, $L_{ef}=7.700$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=15.3 < \lambda_{lim}=27$

0.566

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Dead Load=8.0 kN/m

Dead Load=4.0 kN/m, Live Load=2.0 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5 q_k$ $X=3.07$ m, $Y=1.268$ m $< f_k/\gamma_{mc}$ 0.69 N/mm²

OK

 $X=3$ m, $Y=1.268$ m averaged over width of 1 m

62.03 kN/m

 $e_x=3.0$ mm, $h_{ef}=1995$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.852

 $e_{hm}=0.000$ mm, $h_{ef}=1.995$

0.708

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$

155.9 kN/m

 F_d/F_r

0.398

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

gk 37.5 kN, qk 15 kN, Bearing Length 200 mm width 100 mm

Length 440 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 37.5 + 1.5 \cdot 15) \cdot 1000 / (440 \cdot 100)$ 1.58 N/mm²Bearing enhancement eq 6.11, $1.50 \cdot f_k / \gamma_{mc}$ 3.3 N/mm²

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /033****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load=8.5 kN/m, Live Load=2.9 kN/m		
Loads @ this level	Dead Load=20.0 kN/m, Live Load=5.0 kN/m, $e_x=17 \text{ mm}$		
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$		
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X=4.75 \text{ m}, Y=1.268 \text{ m} < f_k/\gamma_{mc}$	1.26 N/mm ²	OK
Max axial buckling force @	$X=5.25 \text{ m}, Y=1.268 \text{ m}$ averaged over width Of 1 m	115.37kN/m	
Capacity reduction factor top, Φ	$e_x=7.3 \text{ mm}, h_{ef}=1956 \text{ mm}, t_{ef}=126.0 \text{ mm}, t=100.0 \text{ mm}$	0.767	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000 \text{ mm}, h_{ef}=1.956$	0.670	
$F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$	$0.670 \times 5.73 \times 100/2.6$	147.6 kN/m	
Fd/Fr	115.4/147.6	0.782	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 5.2m	$g_k 32 \text{ kN}, q_k 12.5 \text{ kN}$, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	$(1.25 \cdot 32 + 1.5 \cdot 12.5) \cdot 1000/(440 \cdot 100)$	1.34 N/mm ²	
Local Bearing Capacity	No Bearing enhancement, $1.00 \cdot f_k/\gamma_{mc}$	2.2 N/mm ²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /034

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

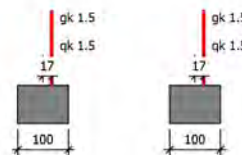
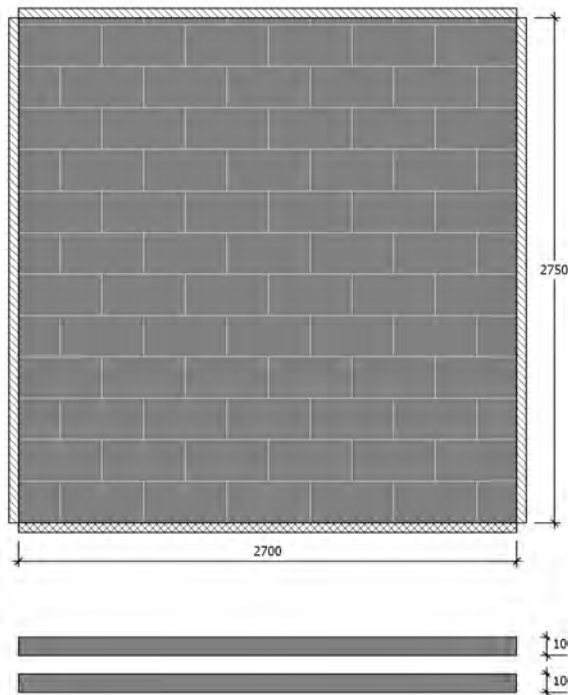
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall Z 2F right

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.341$ m (Eqn. 5.8), $L=2.700$ m, $L_{ef}=2.700$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=10.6 < \lambda_{lim}=27$

0.394

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load=1.5 kN/m, Live Load=1.5 kN/m, $e_x=17$ mm

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.25(\gamma_{tk}h+g_k)+1.5q_k$

Max local stress @

 $X=0$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.06 N/mm²

OK

Max axial buckling force @

 $X=1.6$ m, $Y=1.375$ m averaged over width of 1 m

5.81 kN/m

Capacity reduction factor top, Φ $e_x=17.0$ mm, $h_{ef}=1341$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.600

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.341$

0.693

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.600 \times 5.73 \times 100 / 2.6$

132.2 kN/m

Fd/Fr

5.8/132.2

0.044

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load=1.5 kN/m, Live Load=1.5 kN/m, $e_x=17$ mm

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Job Ref : 10056
Sheet : /035
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

OK

OK

OK

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /036

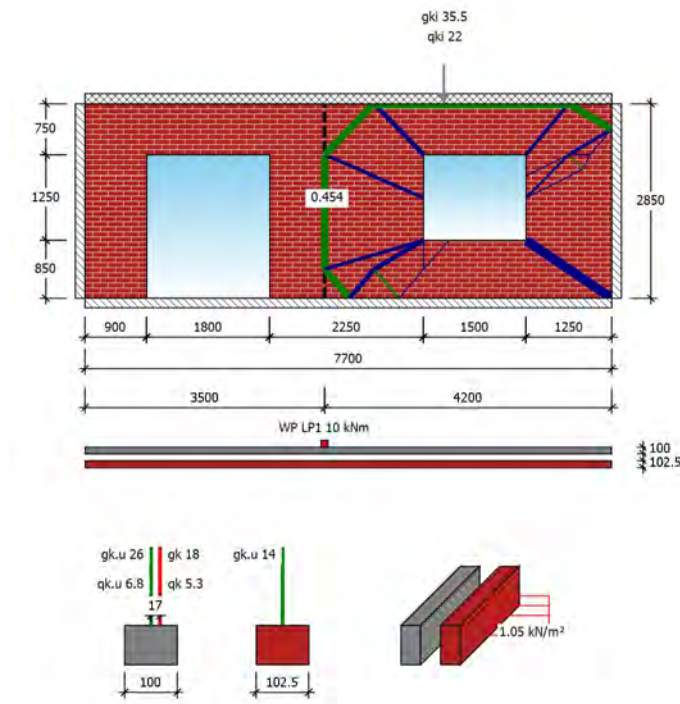
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall J GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Wind Post L reduction

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.844$ m (Eqn. 5.8), $L=7.700$ m, $L_{ef}=7.700$ mWind post assumed to act as stiffener, $L=4.200$ m, $L_{ef}=4.200$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.9$, $Y=0$ - Two way spanningopening at $X=4.95$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=14.4 < \lambda_{lim}=27$, $L_{wp}/t_{ef}=32.9$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 64.2$ (F.1)

0.535 OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=14.0 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{kk2} (Perpendicular)Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.162$ N/mm²1.1 N/mm² Table NA.6 $f_{kk1}=f_{-k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.772 N/mm² Table NA.6 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Critical axial compressive Case

Max local stress @

 $X=0.306$ m, $Y=1.425$ m $< f_k \cdot 0.98$ (small area red.) γ_{mc} 0.53 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=3.213$ m, $Y=1.425$ m averaged over width Of 1.025 m

44.07 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1877$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.877$

0.752

Wind Post Stiffening

Wind post is assumed To act As stiffener, influencing h_{ef} $F=\Phi \cdot f_{kt} \cdot \gamma_{mc}$ $0.752 \times 4.5 \times 102.5/2.6$

133.5 kN/m

Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Cloud 3b89b	Job Ref : 10056 Sheet : /037 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :
Fd/Fr	44.1/133.5	0.330	OK
Mro= $f_{kk2} \cdot Z_p / \gamma_{mf}$	1.1x1751/2.3	0.837 kN.m/m	
Mro= $f_{kk1} \cdot Z_b / \gamma_{mf}$	0.772x1751/2.3	0.588 kN.m/m	
Inner-Leaf Design			
Partial Safety Factor ($\gamma_{mc} / \gamma_{mf}$)	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b = 10.4$ N/mm ²		
	Normalised mean compressive strength $f_b = 10.4 \cdot 1.38$	14.35 N/mm ²	
Mortar Material	M4, $f_m = 4$ N/mm ²		
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	7.34 N/mm ²	Table NA.4
Loads from above	Dead Load=26.0 kN/m, Live Load=6.8 kN/m		
Loads @ this level	Dead Load=18.0 kN/m, Live Load=5.3 kN/m, $e_x = 17$ mm		
Section Properties	Area=1000 cm ² /m, $Z_p = 1667$ cm ³ /m		
Flexural Strength f_{kk2} (Perpendicular)		0.833 N/mm ²	Table NA.6
Flexural Strength f_{kk1} (Parallel)	$f_{kk1} = 0.25, g_d = 0.448$ N/mm ²		
	$f_{kk1} = f_{k1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$	1.224 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X = 4.299$ m, $Y = 1.318$ m $< f_k / \gamma_{mc}$	2.1 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$		
Max axial buckling force @	$X = 4.45$ m, $Y = 1.318$ m averaged over width Of 1 m	172.69 kN/m	
Moments from Lateral Load	$M_{wx, top} = 0.294$ kN.m, $M_{wx, mid} = 0.165$ kN.m		
Capacity reduction factor top, ϕ	$e_x = 5.3$ mm, $h_{ef} = 1877$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm	0.810	
Capacity reduction factor mid, ϕ_m	$e_{hm} = 0.169$ mm, $h_{ef} = 1.877$	0.710	
Wind Post Stiffening	Wind post Is assumed To act As stiffener, influencing h_{ef}		
$F_r = \phi \cdot f_k \cdot t_k / \gamma_{mc}$	$0.710 \times 7.34 \times 100 / 2.6$	200.2 kN/m	
Fd/Fr	172.7/200.2	0.862	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 5.25m	$g_k 35.5$ kN, $q_k 22$ kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 2000 mm, Depth 215 mm, Thickness 100 mm		
Bearing Stress	$(1.25 \cdot 35.5 + 1.5 \cdot 22) \cdot 1000 / (2000 \cdot 100)$	0.39 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.50 \cdot f_k / \gamma_{mc}$	4.23 N/mm ²	OK
$M_{ri} = f_{kk2} \cdot Z_p / \gamma_{mf}$	$0.833 \times 1667 / 2.3$	0.604 kN.m/m	
$M_{ri} = f_{kk1} \cdot Z_b / \gamma_{mf}$	$1.224 \times 1667 / 2.3$	0.887 kN.m/m	
Design For Lateral Loads			
Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Wind Post Data	Base pinned, Top pinned, Major axis bending		
Leaf Continuity at Wind Posts	Inner leaf continuous, outer leaf continuous		
Wind posts at 3.5m	WP LP1, $M_{ed} 10$ kN.m		
Yield Line Analysis	Load Factor, λ_p	2.204	
$U_t = 1 / \lambda_p$	$1 / 2.204$	0.454	OK
Wind Post Design	Full restrained moment capacity implicitly checked in yield line analysis.		
	The yield line analysis considers the combined bending of the post and wall.		
	Wind post service deflection not checked.		

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /038

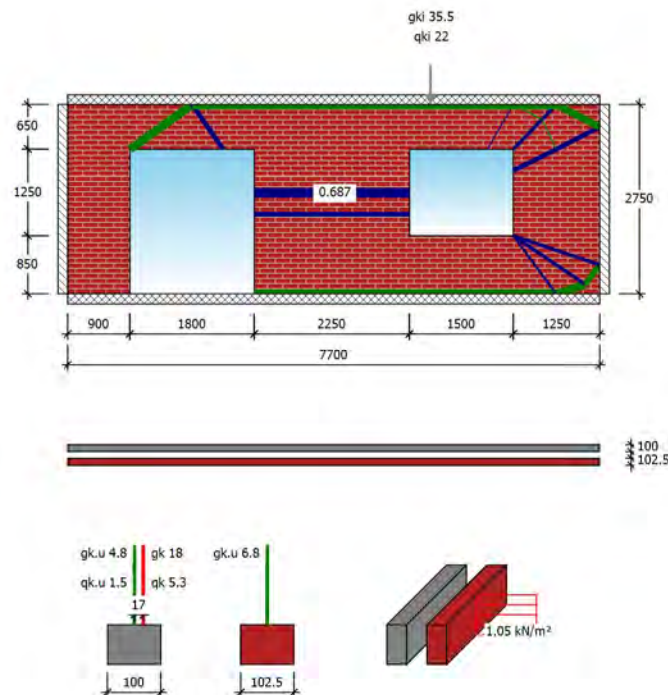
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall J 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.924$ m (Eqn. 5.8), $L=7.700$ m, $L_{ef}=7.700$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.9$, $Y=0$ - Two way spanningopening at $X=4.95$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.1 < \lambda_{lim}=27.1$, $t_{ef}/t=60.3$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 44.9$ (F.1) 0.559 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.277$ m, $Y=1.375$ m $< f_k \cdot 0.98$ (small area red.) γ_{mc} 0.3 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=3.213$ m, $Y=1.375$ m averaged over width Of 1.025 m

25.23 kN/m

Moments from Lateral Load

 $M_{w, top}=0.000$ kN.m, $M_{w, mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

 F_d/F_r $25.2/127.9$

0.197

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /039

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b=7.3$ N/mm ²		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4$ N/mm ²		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load=4.8 kN/m, Live Load=1.5 kN/m		
Loads @ this level	Dead Load=18.0 kN/m, Live Load=5.3 kN/m, $e_x=17$ mm		
Section Properties	Area=1000 cm ² /m, $Z_p=1667$ cm ³ /m		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1}=0.25, g_d=0.235$ N/mm ²		
	$f_{xk1}=f_{xk1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})\gamma_{mf}$	0.791 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$		
Max local stress @	$X=4.299$ m, $Y=1.268$ m $< f_k/\gamma_{mc}$	1.73 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}+0.75(W_x)$		
Max axial buckling force @	$X=4.45$ m, $Y=1.268$ m averaged over width Of 1 m	130.81 kN/m	
Moments from Lateral Load	$M_{wx,top}=0.255$ kN.m, $M_{wx,mid}=0.128$ kN.m		
Capacity reduction factor top, Φ	$e_x=7.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=100.0$ mm	0.768	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.126$ mm, $h_{ef}=2.063$	0.651	
$F_r=\Phi.f_{k,tk}/\gamma_{mc}$	$0.651 \times 5.73 \times 100/2.6$	143.3 kN/m	
F_d/F_r	130.8/143.3	0.913	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 5.25m	g_k 35.5 kN, q_k 22 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	$(1.25 \cdot 35.5 + 1.5 \cdot 22) \cdot 1000/(440 \cdot 100)$	1.76 N/mm ²	
Local Bearing Capacity	No Bearing enhancement, $1.00 \cdot f_k/\gamma_{mc}$	2.2 N/mm ²	OK
$M_{ri}=f_{xk2}.Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{xk1}.Z_b/\gamma_{mf}$	$0.791 \times 1667/2.3$	0.573 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor, λ_p	1.457	
$U_t=1/\lambda_p$	1 / 1.457	0.687	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /040

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

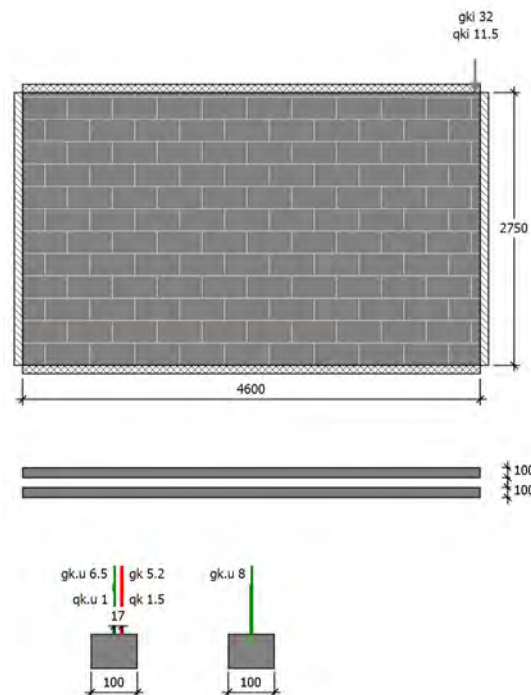
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AB 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.717$ m (Eqn. 5.8), $L=4.600$ m, $L_{ef}=4.600$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=13.6 < \lambda_{lim}=27$

0.505

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=8.0 kN/m

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.13 N/mm²

OK

Max axial buckling force @

 $X=4.1$ m, $Y=1.375$ m averaged over width of 1 m

12.62 kN/m

Capacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1717$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.717$

0.775

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.775 \times 5.73 \times 100 / 2.6$

170.6 kN/m

Fd/Fr

12.6/170.6

0.074

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=6.5 kN/m, Live Load=1.0 kN/m

Loads @ this level

Dead Load=5.15 kN/m, Live Load=1.5 kN/m, $e_x=17$ mm

Cloud 3b89b Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Job Ref : 10056 Sheet : /041 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :	
Section Properties Area=1000 cm²/m, Zp=1667 cm³/m Critical axial compressive Case 1.25(γ.tk.h+gk+gku)+1.5qk+1.5qku Max local stress @ X=3.599 m,Y=1.268 m < fk/γ_{mc} Max axial buckling force @ X=4.1 m, Y=1.268 m averaged over width Of 1 m Capacity reduction factor top.Φ ex=2.0 mm, hef=1717 mm, tef=126.0 mm, t=100.0 mm Capacity reduction factor mid.Φ_m ehm = 0.000 mm, h_{ef} = 1.717 Fr=Φ.f_k.tk/γ_{mc} 0.775x5.73x100/2.6 Fd/Fr 77.1/170.6 Point load design method Design based on axial load take down for wall compression design. No design for bending due to point loads. Point Load at 4.55m gk 32 kN, qk 11.5 kN, Bearing Length 200 mm width 100 mm Spreader details Length 440 mm, Depth 215 mm, Thicknesss 100 mm Bearing Stress (1.25•32 + 1.5•11.5)•1000/(270•100) Local Bearing Capacity Bearing enhancement eq 6.11, 1.20•fk/γ_{mc}		0.77 N/mm² 77.15kN/m 0.884 0.775 170.6 kN/m 0.452 2.12 N/mm² 2.65 N/mm²	OK OK OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /042

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

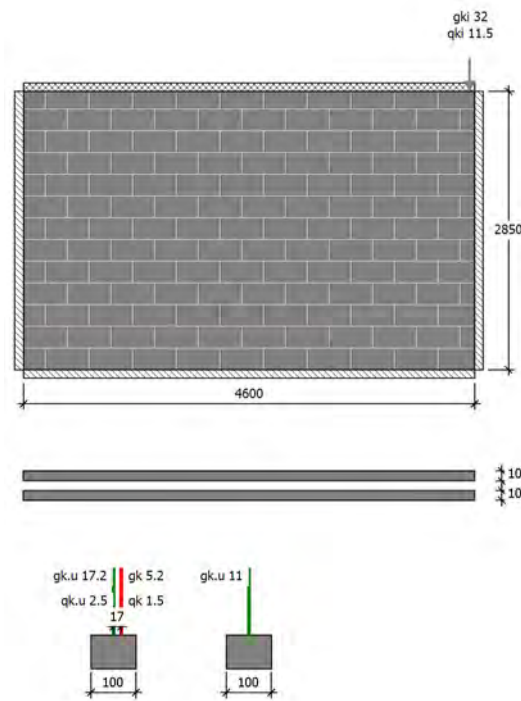
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AB GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.927$ m (Eqn. 5.8), $L=4.600$ m, $L_{ef}=4.600$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=15.3 < \lambda_{lim}=27$

0.567

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=11.0 kN/m

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.35(\gamma_{tk}h + g_{ku})$

Max local stress @

 $X=0$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.17 N/mm²

OK

Max axial buckling force @

 $X=4.1$ m, $Y=1.425$ m averaged over width of 1 m

16.74 kN/m

Capacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1927$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.927$

0.740

 $F_r=\Phi_k f_k t_k / \gamma_{mc}$ $0.740 \times 5.73 \times 100 / 2.6$

162.9 kN/m

Fd/Fr

16.7/162.9

0.103

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Unit Material

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=17.2 kN/m, Live Load=2.5 kN/m

Loads @ this level

Dead Load=5.15 kN/m, Live Load=1.5 kN/m, $e_x=17$ mm

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /043****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Section Properties

Critical axial compressive Case

Area=1000 cm²/m, Z_p=1667 cm³/m $1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$

Max local stress @

 $X=2.79 \text{ m}, Y=1.318 \text{ m} < f_k/\gamma_{mc}$ 0.67 N/mm²

OK

Max axial buckling force @

 $X=4.1 \text{ m}, Y=1.318 \text{ m}$ averaged over width Of 1 m

67.3kN/m

Capacity reduction factor top. Φ $e_x=2.3 \text{ mm}, h_{ef}=1927 \text{ mm}, t_{ef}=126.0 \text{ mm}, t=100.0 \text{ mm}$

0.869

Capacity reduction factor mid. Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.927$

0.731

 $F_r = \Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.731 \times 5.73 \times 100 / 2.6$

161.0 kN/m

Fd/Fr

67.3/161.0

0.418

OK

Point load design method

Design based on axial load take down for wall compression design.

Point Load at 4.55m

No design for bending due to point loads.

Spreader details

g_k 32 kN, q_k 11.5 kN, Bearing Length 200 mm width 100 mm

Bearing Stress

Length 2000 mm, Depth 215 mm, Thicknesss 100 mm

 $(1.25 \cdot 32 + 1.5 \cdot 11.5) \cdot 1000 / (1050 \cdot 100)$ 0.55 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.01 \cdot f_k/\gamma_{mc}$ 2.21 N/mm²

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /044

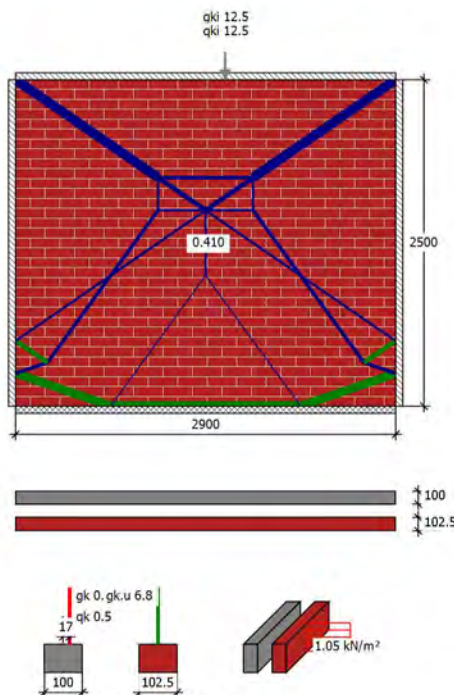
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall AF 2F



Summary of Design Data

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.394$ m (Eqn. 5.8), $L=2.900$ m, $L_{ef}=2.900$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=10.9 \leq \lambda_{lim}=27$, $L/t_{ef}=22.7$, $H/t_{ef}=19.6$. Hence $H/t_{ef} \leq 80$ (F.1) 0.405 OK

Outer-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=6.75 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.088$ N/mm² $f_{kk1}=f_{-k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.602 N/mm² Table NA.6 $1.35(\gamma_{tk}.h+g_ku)$

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.15 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk}.h+g_ku)$ $X=1.013$ m, $Y=1.25$ m averaged over width Of 1.025 m

15.22 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1394$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1394$

0.824

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.824 \times 4.5 \times 102.5/2.6$

146.2 kN/m

Fd/Fr

15.2/146.2

0.104

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.602 \times 1751/2.3$

0.458 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /045

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m = 4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4
Loads @ this level	Dead Load = 0.5 kN/m, Live Load = 0.5 kN/m, $e_x = 17 \text{ mm}$		
Section Properties	Area = 1000 cm ² /m, $Z_p = 1667 \text{ cm}^3/\text{m}$		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1} = 0.25, g_d = 0.012 \text{ N/mm}^2$		
	$f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$	0.277 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$		
Max local stress @	$X = 0.721 \text{ m}, Y = 1.143 \text{ m} < f_k / \gamma_{mc}$	0.22 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$		
Max axial buckling force @	$X = 1.6 \text{ m}, Y = 1.143 \text{ m}$ averaged over width Of 1 m	22.45 kN/m	
Moments from Lateral Load	$M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$		
Capacity reduction factor top, Φ	$e_x = 1.1 \text{ mm}, h_{ef} = 1394 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$	0.900	
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.394$	0.824	
$F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$	$0.824 \times 5.73 \times 100 / 2.6$	181.5 kN/m	
F_d / F_r	$22.4 / 181.5$	0.124	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.6m	$g_k 12.5 \text{ kN}, q_k 12.5 \text{ kN}$, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thickness 100 mm		
Bearing Stress	$(1.25 \cdot 12.5 + 1.5 \cdot 12.5) \cdot 1000 / (440 \cdot 100)$	0.78 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.49 \cdot f_k / \gamma_{mc}$	3.27 N/mm ²	OK
$M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m	
$M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$	$0.277 \times 1667 / 2.3$	0.201 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	2.442	
$U_t = 1 / \lambda_p$	$1 / 2.442$	0.410	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /046

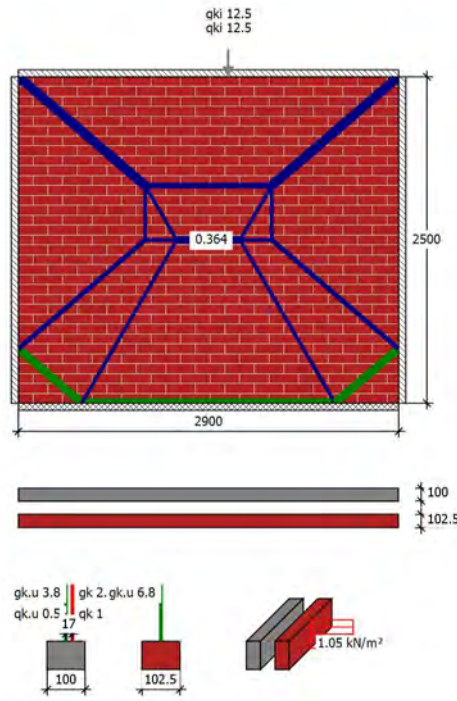
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall AF 1F



Summary of Design Data

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.394$ m (Eqn. 5.8), $L=2.900$ m, $L_{ef}=2.900$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=10.9 \leq \lambda_{lim}=27$, $L/t_{ef}=22.7$, $H/t_{ef}=19.6$. Hence $H/t_{ef} \leq 80$ (F.1) 0.405 OK

Outer-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=6.75 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.088$ N/mm² $f_{kk1}=f_{-k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.602 N/mm² Table NA.6 $1.35(\gamma_{tk} \cdot h + g_k)$

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.15 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k)$

15.22 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.394$

0.824

 $F_r=\Phi \cdot f_{kk} \cdot \gamma_{mc}$ $0.824 \times 4.5 \times 102.5/2.6$

146.2 kN/m

Fd/Fr

15.2/146.2

0.104

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.602 \times 1751/2.3$

0.458 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /047

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 3.8 kN/m, Live Load = 0.5 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 1.0 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{k2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1} = 0.25, g_d = 0.114 \text{ N/mm}^2$ $f_{k1} = f_{k1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.512 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0 \text{ m}, Y = 1.143 \text{ m} < f_k / \gamma_{mc}$ 0.24 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 2.4 \text{ m}, Y = 1.143 \text{ m}$ averaged over width Of 1 m

23.64 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 3.7 \text{ mm}, h_{ef} = 1394 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.865

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.394$

0.824

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.824 \times 5.73 \times 100 / 2.6$

181.5 kN/m

Fd/Fr

23.6/181.5

0.130

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 1.6m

 $g_k 12.5 \text{ kN}, q_k 12.5 \text{ kN}$, Bearing Length 200 mm width 100 mm

Spreader details

Length 2000 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 12.5 + 1.5 \cdot 12.5) \cdot 1000 / (2000 \cdot 100)$ 0.17 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.21 \cdot f_k / \gamma_{mc}$ 2.67 N/mm²

OK

 $M_{ri} = f_{k2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{k1} \cdot Z_b / \gamma_{mf}$ $0.512 \times 1667 / 2.3$

0.371 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

2.746

 $U_t = 1 / \lambda_p$

1 / 2.746

0.364

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /048

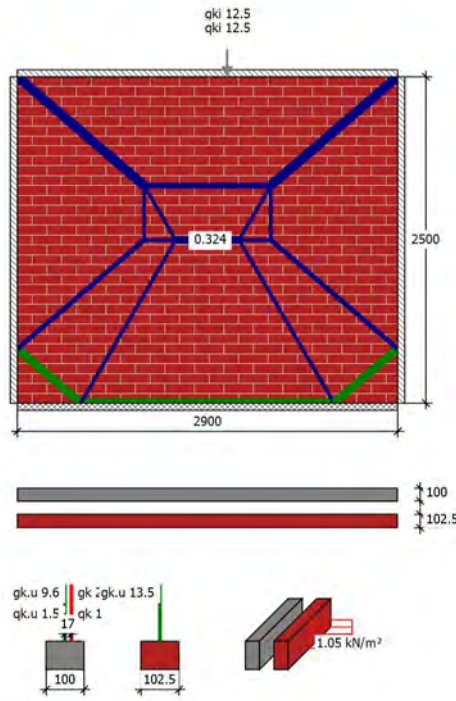
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall AF GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.394$ m (Eqn. 5.8), $L=2.900$ m, $L_{ef}=2.900$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=10.9 \leq \lambda_{lim}=27$, $L/t_{ef}=22.7$, $H/t_{ef}=19.6$. Hence $H/t_{ef} \leq 80$ (F.1) 0.405 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=13.5 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.154$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.754 N/mm² Table NA.6 $1.35(\gamma_{tk} \cdot h + g_k)$

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.24 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k)$

Moments from Lateral Load

 $X=1.013$ m, $Y=1.25$ m averaged over width Of 1.025 m

24.33 kN/m

Capacity reduction factor top, Φ $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.m

0.900

Capacity reduction factor mid, Φ_m $e_x=0.0$ mm, $h_{ef}=1394$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.824

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.824 \times 4.5 \times 102.5/2.6$

146.2 kN/m

Fd/Fr

24.3/146.2

0.166

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.754 \times 1751/2.3$

0.574 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /049

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b=7.3$ N/mm ²		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4$ N/mm ²		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load=9.6 kN/m, Live Load=1.5 kN/m		
Loads @ this level	Dead Load=2.6 kN/m, Live Load=1.0 kN/m, $e_x=17$ mm		
Section Properties	Area=1000 cm ² /m, $Z_p=1667$ cm ³ /m		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1}=0.25, g_d=0.172$ N/mm ²		
	$f_{xk1}=f_{xk1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})\gamma_{mf}$	0.645 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$		
Max local stress @	$X=0$ m, $Y=1.143$ m < f_k/γ_{mc}	0.32 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$		
Max axial buckling force @	$X=2.4$ m, $Y=1.143$ m averaged over width Of 1 m	32.39kN/m	
Moments from Lateral Load	$M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.m		
Capacity reduction factor top, Φ	$e_x=2.6$ mm, $h_{ef}=1394$ mm, $t_{ef}=127.6$ mm, $t=100.0$ mm	0.886	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000$ mm, $h_{ef}=1.394$	0.824	
$F_r=\Phi.f_{k,tk}/\gamma_{mc}$	$0.824 \times 5.73 \times 100/2.6$	181.5 kN/m	
F_d/F_r	$32.4/181.5$	0.178	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.6m	g_k 12.5 kN, q_k 12.5 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 2000 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	$(1.25 \cdot 12.5 + 1.5 \cdot 12.5) \cdot 1000/(2000 \cdot 100)$	0.17 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.21 \cdot f_k/\gamma_{mc}$	2.67 N/mm ²	OK
$M_{ri}=f_{xk2}.Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{xk1}.Z_b/\gamma_{mf}$	$0.645 \times 1667/2.3$	0.467 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor, λ_p	3.084	
$U_t=1/\lambda_p$	$1/3.084$	0.324	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /050

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

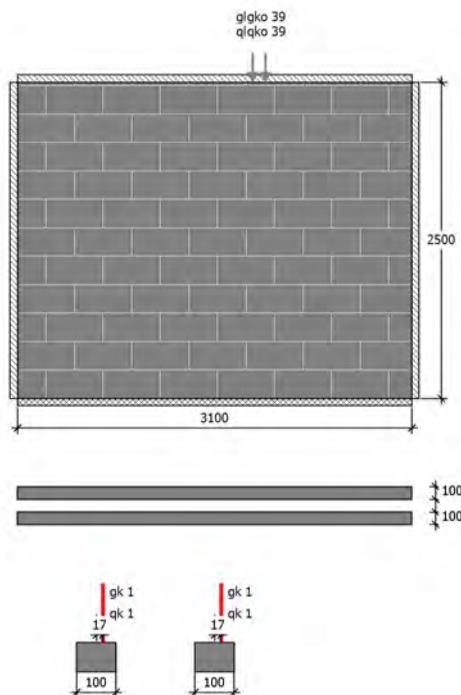
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall T 2F right

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.460$ m (Eqn. 5.8), $L=3.100$ m, $L_{ef}=3.100$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=11.6 < \lambda_{lim}=27$

0.429

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads @ this level

Dead Load=1.0 kN/m, Live Load=1.0 kN/m, $e_x=17$ mm

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.25(\gamma_{tk}h+g_k)+1.5q_k$

Max local stress @

 $X=1.071$ m, $Y=1.143$ m $< f_k/\gamma_{mc}$ 0.65 N/mm²

OK

Max axial buckling force @

 $X=1.6$ m, $Y=1.143$ m averaged over width Of 1 m

65.25 kN/m

Capacity reduction factor top, Φ $e_x=0.7$ mm, $h_{ef}=1460$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.460$

0.813

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.813 \times 5.73 \times 100 / 2.6$

179.0 kN/m

Fd/Fr

 $65.2 / 179.0$

0.365

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 1.95m

 $g_k 39$ kN, $q_k 39$ kN, Bearing Length 200 mm width 100 mm

Spreader details

Length 440 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000 / (440 \cdot 100)$ 2.44 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.45 \cdot f_k / \gamma_{mc}$ 3.2 N/mm²

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Unit Material

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /051****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Mortar Material	Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$		
Compressive Strength (f_k)	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²	
Loads @ this level	M4, $f_m = 4 \text{ N/mm}^2$		
Section Properties	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4
Critical axial compressive Case	Dead Load=1.0 kN/m, Live Load=1.0 kN/m, $e_x = 17 \text{ mm}$		
Max local stress @	Area=1000 cm ² /m, $Z_p = 1667 \text{ cm}^3/\text{m}$		
Max axial buckling force @	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5 q_k$		
Capacity reduction factor top, Φ	$X = 0.971 \text{ m}, Y = 1.143 \text{ m} < f_k / \gamma_{mc}$	0.34 N/mm ²	OK
Capacity reduction factor mid, Φ_m	$X = 1.6 \text{ m}, Y = 1.143 \text{ m}$ averaged over width Of 1 m	33.98 kN/m	
$F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$	$e_x = 1.4 \text{ mm}, h_{ef} = 1460 \text{ mm}, t_{ef} = 126.0 \text{ mm}, t = 100.0 \text{ mm}$	0.900	
Fd/Fr	$e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.460$	0.813	
Point load design method	$0.813 \times 5.73 \times 100 / 2.6$	179.0 kN/m	
	34.0/179.0	0.190	OK
Point Load at 1.85m	Design based on axial load take down for wall compression design.		
Spreader details	No design for bending due to point loads.		
Bearing Stress	gk 19 kN, qk 19 kN, Bearing Length 200 mm width 100 mm		
Local Bearing Capacity	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
	$(1.25 \cdot 19 + 1.5 \cdot 19) \cdot 1000 / (440 \cdot 100)$	1.19 N/mm ²	
	Bearing enhancement eq 6.11, $1.48 \cdot f_k / \gamma_{mc}$	3.25 N/mm ²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /052

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

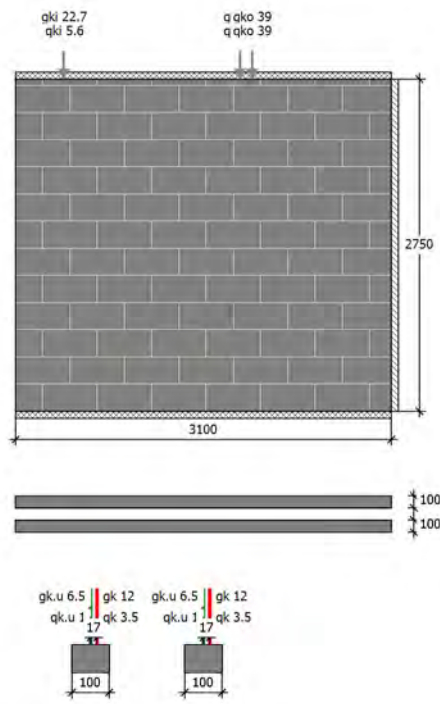
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall T 1F right

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.966$ m (Eqn. 5.6), $L=3.100$ m, $L_{ef}=3.100$ m

Bottom Cont., Top Cont., Left Free, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=15.6 < \lambda_{lim}=27$

0.578

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, Φ Capacity reduction factor mid, Φ_m $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$

Fd/Fr

Point load design method

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X=0.219$ m, $Y=1.268$ m $< f_k/\gamma_{mc}$ 0.69 N/mm²

OK

 $X=2.6$ m, $Y=1.268$ m averaged over width Of 1 m

68.78 kN/m

 $e_x=5.1$ mm, $h_{ef}=1966$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.810

 $e_{hm}=0.000$ mm, $h_{ef}=1.966$

0.691

 $0.691 \times 5.73 \times 100 / 2.6$

152.3 kN/m

68.8/152.3

0.452

OK

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 1.95m

Spreader details

Bearing Stress

Local Bearing Capacity

gk 39 kN, qk 39 kN, Bearing Length 200 mm width 100 mm

Length 2000 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000 / (2000 \cdot 100)$ 0.54 N/mm²Bearing enhancement eq 6.11, $1.12 \cdot f_k / \gamma_{mc}$ 2.47 N/mm²

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /053****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$	
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$ 5.73 N/mm ² Table NA.4	
Loads from above	Dead Load=6.5 kN/m, Live Load=1.0 kN/m	
Loads @ this level	Dead Load=12.0 kN/m, Live Load=3.5 kN/m, $e_x=17 \text{ mm}$	
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$	
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$	
Max local stress @	$X=0.119 \text{ m}, Y=1.268 \text{ m} < f_k/\gamma_{mc}$ 0.76 N/mm ²	OK
Max axial buckling force @	$X=0.7 \text{ m}, Y=1.268 \text{ m}$ averaged over width Of 1 m 76.29kN/m	
Capacity reduction factor top, Φ	$e_x=4.6 \text{ mm}, h_{ef}=1966 \text{ mm}, t_{ef}=126.0 \text{ mm}, t=100.0 \text{ mm}$ 0.820	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000 \text{ mm}, h_{ef}=1.966$ 0.697	
$F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$	$0.697 \times 5.73 \times 100/2.6$ 153.5 kN/m	
Fd/Fr	$76.3/153.5$ 0.497	OK
Point load design method	Design based on axial load take down for wall compression design. No design for bending due to point loads.	
Point Load at 1.85m	$g_k 19 \text{ kN}, q_k 19 \text{ kN}$, Bearing Length 200 mm width 100 mm	
Spreader details	Length 2000 mm, Depth 215 mm, Thicknesss 100 mm	
Bearing Stress	$(1.25 \cdot 19 + 1.5 \cdot 19) \cdot 1000/(2000 \cdot 100)$ 0.26 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.20 \cdot f_k/\gamma_{mc}$ 2.63 N/mm ²	OK
Point Load at 0.4m	$g_k 22.7 \text{ kN}, q_k 5.6 \text{ kN}$, Bearing Length 200 mm width 100 mm	
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm	
Bearing Stress	$(1.25 \cdot 22.7 + 1.5 \cdot 5.6) \cdot 1000/(440 \cdot 100)$ 0.84 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.29 \cdot f_k/\gamma_{mc}$ 2.83 N/mm ²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /054

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

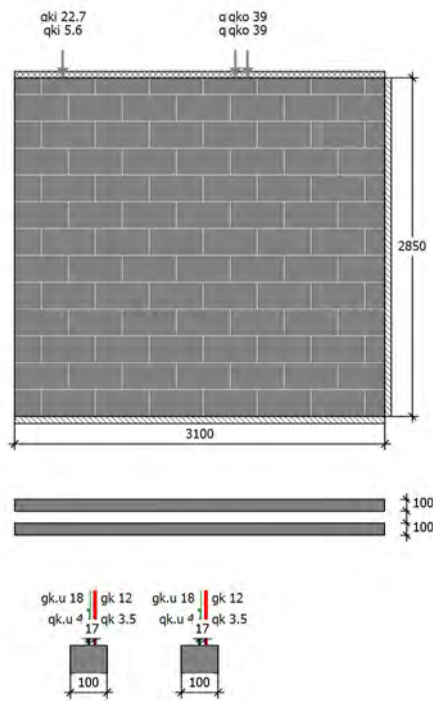
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall T GF right

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.326$ m (Eqn. 5.6), $L=3.100$ m, $L_{ef}=3.100$ m

Bottom Simple, Top Cont., Left Free, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=18.5 < \lambda_{lim}=27$

0.684

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Dead Load=18.0 kN/m, Live Load=4.0 kN/m

Dead Load=12.0 kN/m, Live Load=3.5 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$

Max local stress @

 $X=0.19$ m, $Y=1.318$ m $< f_k/\gamma_{mc}$ 0.87 N/mm²

OK

Max axial buckling force @

 $X=2.6$ m, $Y=1.318$ m averaged over width Of 1 m

87.34 kN/m

Capacity reduction factor top, Φ $e_x=4.0$ mm, $h_{ef}=2326$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.816

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.326$

0.619

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.619 \times 5.73 \times 100 / 2.6$

136.3 kN/m

Fd/Fr

87.3/136.3

0.641

OK

Point load design method

Design based on axial load take down for wall compression design.

Point Load at 1.95m

No design for bending due to point loads.

Spreader details

gk 39 kN, qk 39 kN, Bearing Length 200 mm width 100 mm

Bearing Stress

Length 2000 mm, Depth 215 mm, Thickness 100 mm

Local Bearing Capacity

 $(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000 / (2000 \cdot 100)$ 0.54 N/mm²Bearing enhancement eq 6.11, $1.12 \cdot f_k / \gamma_{mc}$ 2.48 N/mm²

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /055****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$	
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$ 5.73 N/mm ² Table NA.4	
Loads from above	Dead Load=18.0 kN/m, Live Load=4.0 kN/m	
Loads @ this level	Dead Load=12.0 kN/m, Live Load=3.5 kN/m, $e_x=17 \text{ mm}$	
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$	
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$	
Max local stress @	$X=0.09 \text{ m}, Y=1.318 \text{ m} < f_k/\gamma_{mc}$ 0.85 N/mm ²	OK
Max axial buckling force @	$X=1.6 \text{ m}, Y=1.318 \text{ m}$ averaged over width Of 1 m 84.87kN/m	
Capacity reduction factor top, Φ	$e_x=4.1 \text{ mm}, h_{ef}=2326 \text{ mm}, t_{ef}=126.0 \text{ mm}, t=100.0 \text{ mm}$ 0.814	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000 \text{ mm}, h_{ef}=2.326$ 0.617	
$F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$	$0.617 \times 5.73 \times 100/2.6$ 136.0 kN/m	
Fd/Fr	$84.9/136.0$ 0.624	OK
Point load design method	Design based on axial load take down for wall compression design. No design for bending due to point loads.	
Point Load at 1.85m	$g_k 19 \text{ kN}, q_k 19 \text{ kN}$, Bearing Length 200 mm width 100 mm	
Spreader details	Length 2000 mm, Depth 215 mm, Thicknesss 100 mm	
Bearing Stress	$(1.25 \cdot 19 + 1.5 \cdot 19) \cdot 1000/(2000 \cdot 100)$ 0.26 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.20 \cdot f_k/\gamma_{mc}$ 2.65 N/mm ²	OK
Point Load at 0.4m	$g_k 22.7 \text{ kN}, q_k 5.6 \text{ kN}$, Bearing Length 200 mm width 100 mm	
Spreader details	Length 2000 mm, Depth 215 mm, Thicknesss 100 mm	
Bearing Stress	$(1.25 \cdot 22.7 + 1.5 \cdot 5.6) \cdot 1000/(1400 \cdot 100)$ 0.26 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.01 \cdot f_k/\gamma_{mc}$ 2.21 N/mm ²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /056

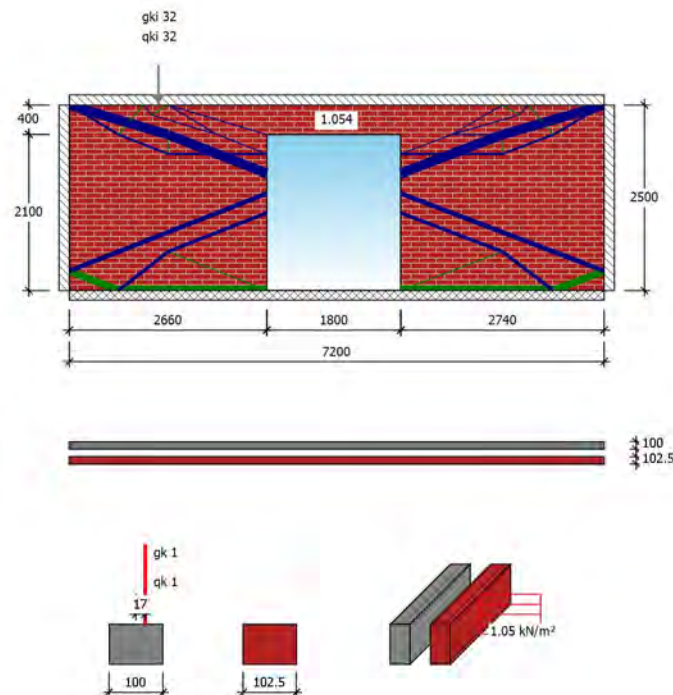
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall G 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=2.003$ m (Eqn. 5.8), $L=7.200$ m, $L_{ef}=7.200$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=2.66$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.7 < \lambda_{lim}=27$, $L/t_{ef}=56.4$, $H/t_{ef}=19.6$, Hence $H/t_{ef} < 45.9$ (F.1) 0.581 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.022$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

 $1.35(\gamma_{tk}.h)$

Max local stress @

 $X=1.965$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.07 N/mm²

OK

Critical axial buckling Case

 $1.35(\gamma_{tk}.h)$

Max axial buckling force @

 $X=4.973$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.97 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2043$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.043$

0.724

 $F_r=\Phi \cdot f_{k2} \cdot \gamma_{mc}$ $0.724 \times 4.5 \times 102.5/2.6$

128.5 kN/m

Fd/Fr

 $7.0/128.5$

0.054

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751/2.3$

0.343 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /057

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 1.0 kN/m, Live Load = 1.0 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.017 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$ 0.288 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ $X = 2.001 \text{ m}, Y = 1.143 \text{ m} < f_k / \gamma_{mc}$ 0.58 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k + 0.75(W_x)$ $X = 1.5 \text{ m}, Y = 1.143 \text{ m}$ averaged over width Of 1 m

54.6 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.128 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 1.0 \text{ mm}, h_{ef} = 2035 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.890

Capacity reduction factor mid, Φ_m $e_{hm} = 0.129 \text{ mm}, h_{ef} = 2.035$

0.722

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.722 \times 5.73 \times 100 / 2.6$

159.1 kN/m

Fd/Fr

54.6/159.1

0.343

OK

Point load design method

Design based on axial load take down for wall compression design.

Point Load at 1.2m

No design for bending due to point loads.

Spreader details

gk 32 kN, qk 32 kN, Bearing Length 200 mm width 100 mm

Bearing Stress

Length 440 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 32 + 1.5 \cdot 32) \cdot 1000 / (440 \cdot 100)$ 2 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.46 \cdot f_k / \gamma_{mc}$ 3.23 N/mm²

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.288 \times 1667 / 2.3$

0.209 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

0.949

 $U_t = 1 / \lambda_p$

1 / 0.949

1.054

Warning

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /058

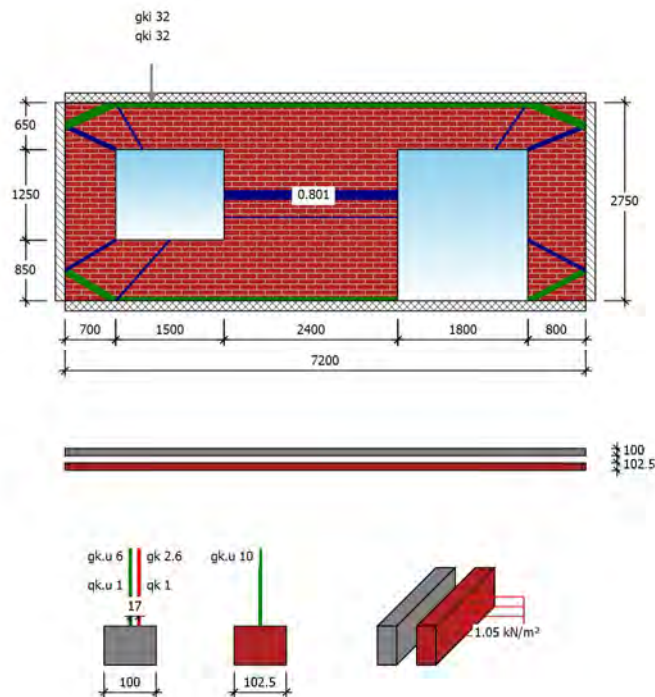
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall G 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.906$ m (Eqn. 5.8), $L=7.200$ m, $L_{ef}=7.200$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=4.6$, $Y=0$ - Two way spanningopening at $X=0.7$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=14.9 < \lambda_{lim}=27.1/t_{ef}=56.4$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 45.9$ (F.1) 0.553 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=10.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.122$ N/mm²0.68 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ $1.35(\gamma_{tk} \cdot h + g_{ku})$

Critical axial compressive Case

Max local stress @

 $X=6.4$ m, $Y=1.375$ m $< f_k \cdot 0.95$ (small area red.) γ_{mc} 0.4 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max axial buckling force @

 $X=4.088$ m, $Y=1.375$ m averaged over width Of 1.025 m

33.47 kN/m

Moments from Lateral Load

 $M_{w,x,top}=0.000$ kN.m, $M_{w,x,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_m=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

Fd/Fr

33.5/127.9

0.262

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.68 \times 1751/2.3$

0.518 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /059

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm ²		
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m = 4$ N/mm ²		
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load = 6.0 kN/m, Live Load = 1.0 kN/m		
Loads @ this level	Dead Load = 2.6 kN/m, Live Load = 1.0 kN/m, $e_x = 17$ mm		
Section Properties	Area = 1000 cm ² /m, $Z_p = 1667$ cm ³ /m		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1} = 0.25, g_d = 0.093$ N/mm ²		
	$f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$	0.465 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X = 0.02$ m, $Y = 1.268$ m < $f_k \cdot 0.91$ (small area red.) γ_{mc}	1.06 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max axial buckling force @	$X = 0.35$ m, $Y = 1.268$ m averaged over width Of 0.7 m	104.96 kN/m	
Moments from Lateral Load	$M_{wx, top} = 0.000$ kN.m, $M_{wx, mid} = 0.000$ kN.m		
Capacity reduction factor top, Φ	$e_x = 1.6$ mm, $h_{ef} = 1050$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm	0.900	
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.000$ mm, $h_{ef} = 1.050$	0.862	
$F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$	$0.862 \times 5.21 \times 100 / 2.6$	172.8 kN/m	
F_d / F_r	$105.0 / 172.8$	0.607	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.2m	g_k 32 kN, q_k 32 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 2000 mm, Depth 215 mm, Thickness 100 mm		
Bearing Stress	$(1.25 \cdot 32 + 1.5 \cdot 32) \cdot 1000 / (2000 \cdot 100)$	0.44 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.16 \cdot f_k / \gamma_{mc}$	2.55 N/mm ²	OK
$M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m	
$M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$	$0.465 \times 1667 / 2.3$	0.337 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor, λ_p	1.249	
$U_t = 1 / \lambda_p$	1 / 1.249	0.801	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /060

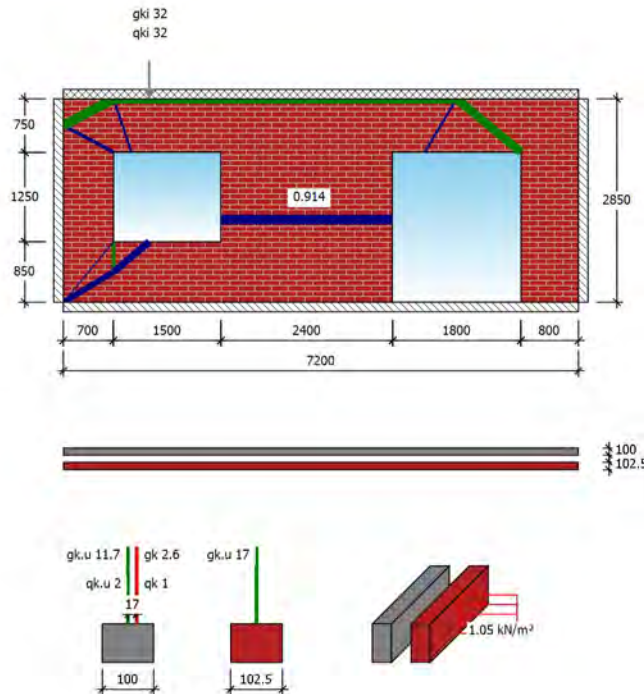
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall G GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.227$ m (Eqn. 5.8), $L=7.200$ m, $L_{ef}=7.200$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=4.6$, $Y=0$ - Two way spanningopening at $X=0.7$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=17.5 < \lambda_{lim}=27$, $1/t_{ef}=56.4$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 45.9$ (F.1) 0.646 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=17.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.191$ N/mm²0.839 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ $1.35(\gamma_{tk} \cdot h + g_{ku})$

Critical axial compressive Case

Max local stress @

 $X=6.4$ m, $Y=1.425$ m $< f_k \cdot 0.95$ (small area red.) γ_{mc} 0.63 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku}) + 0.75(W_x)$

Max axial buckling force @

 $X=4.088$ m, $Y=1.425$ m averaged over width Of 1.025 m

51.67 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.326$ kN.m, $M_{wx,mid}=0.183$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2494$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.283$ mm, $h_{ef}=2,494$

0.625

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.625 \times 4.5 \times 102.5/2.6$

110.9 kN/m

Fd/Fr

51.7/110.9

0.466

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.839 \times 1751/2.3$

0.639 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /061

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm ²		
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m = 4$ N/mm ²		
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load = 11.7 kN/m, Live Load = 2.0 kN/m		
Loads @ this level	Dead Load = 2.6 kN/m, Live Load = 1.0 kN/m, $e_x = 17$ mm		
Section Properties	Area = 1000 cm ² /m, $Z_p = 1667$ cm ³ /m		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1} = 0.25, g_d = 0.151$ N/mm ²		
	$f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$	0.596 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X = 0.049$ m, $Y = 1.318$ m < $f_k \cdot 0.91$ (small area red.) γ_{mc}	1.25 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max axial buckling force @	$X = 0.35$ m, $Y = 1.318$ m averaged over width Of 0.7 m	121.24 kN/m	
Moments from Lateral Load	$M_{wx, top} = 0.000$ kN.m, $M_{wx, mid} = 0.000$ kN.m		
Capacity reduction factor top, Φ	$e_x = 1.4$ mm, $h_{ef} = 1050$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm	0.900	
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.000$ mm, $h_{ef} = 1.050$	0.862	
$F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$	$0.862 \times 5.21 \times 100 / 2.6$	172.8 kN/m	
F_d / F_r	$121.2 / 172.8$	0.702	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.2m	g_k 32 kN, q_k 32 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 2000 mm, Depth 215 mm, Thickness 100 mm		
Bearing Stress	$(1.25 \cdot 32 + 1.5 \cdot 32) \cdot 1000 / (2000 \cdot 100)$	0.44 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.16 \cdot f_k / \gamma_{mc}$	2.56 N/mm ²	OK
$M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m	
$M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$	$0.596 \times 1667 / 2.3$	0.432 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	1.094	
$U_t = 1 / \lambda_p$	1 / 1.094	0.914	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /062

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

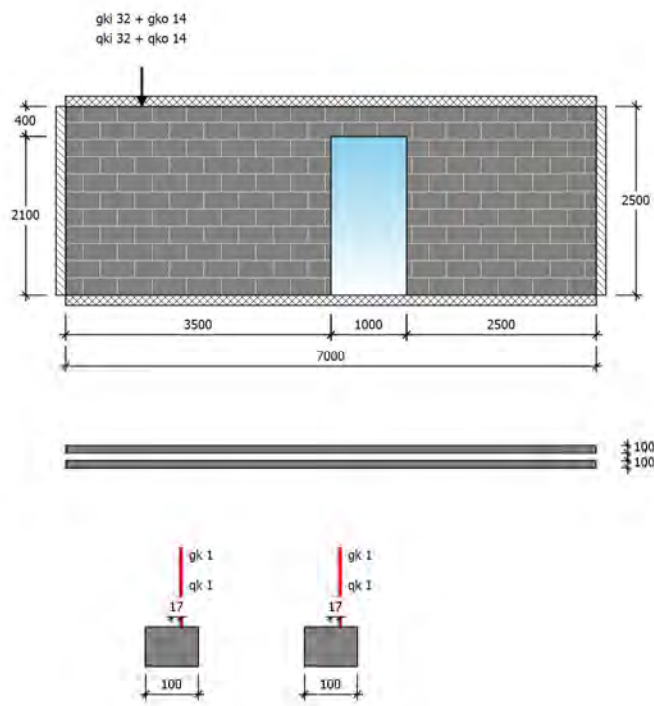
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AA 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.993$ m (Eqn. 5.8), $L=7.000$ m, $L_{ef}=7.000$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=15.8 < \lambda_{lim}=27$

0.586

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4Dead Load=1.0 kN/m, Live Load=1.0 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ $X=0.121$ m, $Y=1.143$ m $< f_k/\gamma_{mc}$ 0.26 N/mm²

OK

 $X=0.7$ m, $Y=1.143$ m averaged over width of 1 m

26.17 kN/m

 $e_x=1.9$ mm, $h_{ef}=2097$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.869

 $e_{hm}=0.000$ mm, $h_{ef}=2.097$

0.696

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$

153.4 kN/m

 F_d/F_r

0.171

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 1m

 $g_k 14$ kN, $q_k 14$ kN, Bearing Length 140 mm width 100 mm

Spreader details

Length 440 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 14 + 1.5 \cdot 14) \cdot 1000 / (440 \cdot 100)$ 0.88 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.42 \cdot f_k / \gamma_{mc}$ 3.13 N/mm²

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Unit Material

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /063****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Mortar Material	Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$		
Compressive Strength (f_k)	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²	
Loads @ this level	M4, $f_m = 4 \text{ N/mm}^2$		
Section Properties	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4
Critical axial compressive Case	Dead Load=1.0 kN/m, Live Load=1.0 kN/m, $e_x = 17 \text{ mm}$		
Max local stress @	Area=1000 cm ² /m, $Z_p = 1667 \text{ cm}^3/\text{m}$		
Max axial buckling force @	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5 q_k$		
Capacity reduction factor top, Φ	$X = 0.121 \text{ m}, Y = 1.143 \text{ m} < f_k / \gamma_{mc}$	0.54 N/mm ²	OK
Capacity reduction factor mid, Φ_m	$X = 0.7 \text{ m}, Y = 1.143 \text{ m}$ averaged over width Of 1 m	54.3 kN/m	
$F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$	$e_x = 0.9 \text{ mm}, h_{ef} = 2097 \text{ mm}, t_{ef} = 126.0 \text{ mm}, t = 100.0 \text{ mm}$	0.889	
Fd/Fr	$e_{hm} = 0.000 \text{ mm}, h_{ef} = 2.097$	0.707	
Point load design method	$0.707 \times 5.73 \times 100 / 2.6$	155.8 kN/m	
	54.3/155.8	0.349	OK
Point Load at 1m	Design based on axial load take down for wall compression design.		
Spreader details	No design for bending due to point loads.		
Bearing Stress	gk 32 kN, qk 32 kN, Bearing Length 200 mm width 100 mm		
Local Bearing Capacity	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
	$(1.25 \cdot 32 + 1.5 \cdot 32) \cdot 1000 / (440 \cdot 100)$	2 N/mm ²	
	Bearing enhancement eq 6.11, $1.42 \cdot f_k / \gamma_{mc}$	3.13 N/mm ²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /064

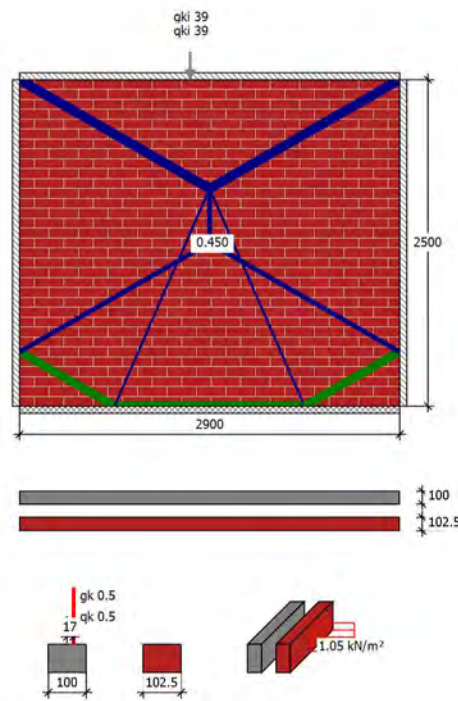
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall C 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.394$ m (Eqn. 5.8), $L=2.900$ m, $L_{ef}=2.900$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=10.9 \leq \lambda_{lim}=27$, $L/t_{ef}=22.7$, $H/t_{ef}=19.6$. Hence $H/t_{ef} \leq 80$ (F.1) 0.405 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1; $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Section Properties

Flexural Strength f_{k2} (Perpendicular)Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.06 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=1.013$ m, $Y=1.25$ m averaged over width Of 1.025 m 6.11 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1394$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm 0.900Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.394$ 0.824 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.824 \times 4.5 \times 102.5/2.6$ 146.2 kN/m F_d/F_r $6.1/146.2$ 0.042 OK $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$ 0.837 kN.m/m $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751/2.3$ 0.343 kN.m/m**Inner-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Cloud 3b89b	Job Ref : 10056 Sheet : /065 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads @ this level	Dead Load=0.5 kN/m, Live Load=0.5 kN/m, ex=17 mm		
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$		
Flexural Strength f_{kk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{kk1} (Parallel)	$f_{kk1}=0.25, g_d=0.012 \text{ N/mm}^2$		
	$f_{kk1}=f_{-k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$	0.277 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k$		
Max local stress @	$X=0.421 \text{ m}, Y=1.143 \text{ m} < f_k/\gamma_{mc}$	0.64 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k$		
Max axial buckling force @	$X=1.6 \text{ m}, Y=1.143 \text{ m}$ averaged over width Of 1 m	63.87kN/m	
Moments from Lateral Load	$M_{wx,top}=0.000 \text{ kN.m}, M_{wx,mid}=0.000 \text{ kN.m}$		
Capacity reduction factor top, Φ	ex=0.4 mm, hef=1394 mm, tef=127.6 mm, t=100.0 mm	0.900	
Capacity reduction factor mid, Φ_m	ehm = 0.000 mm, $e_{ef}=1.394$	0.824	
$Fr=\Phi \cdot f_k \cdot tk/\gamma_{mc}$	$0.824 \times 5.73 \times 100/2.6$	181.5 kN/m	
Fd/Fr	63.9/181.5	0.352	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.3m	gk 39 kN, qk 39 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thickness 100 mm		
Bearing Stress	$(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000/(440 \cdot 100)$	2.44 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.49 \cdot f_k/\gamma_{mc}$	3.27 N/mm ²	OK
$M_{ri}=f_{kk2} \cdot Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{kk1} \cdot Z_b/\gamma_{mf}$	$0.277 \times 1667/2.3$	0.201 kN.m/m	
Design For Lateral Loads			
Design Lateral Load Wd	1.5 Wx	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	2.221	
$U_t=1/\lambda_p$	1 / 2.221	0.450	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /066

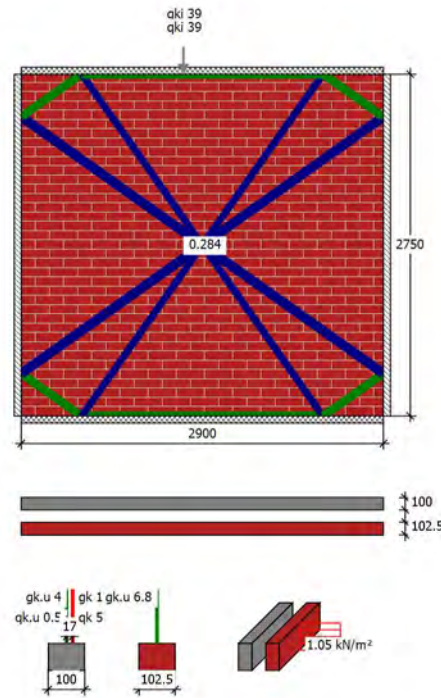
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall C 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.370$ m (Eqn. 5.8), $L=2.900$ m, $L_{ef}=2.900$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=10.7 < \lambda_{lim}=27$, $L/t_{ef}=22.7$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 80$ (F.1) 0.398 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=6.75 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_k u)$ $X=0$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.15 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k u)$ $X=1.013$ m, $Y=1.375$ m averaged over width Of 1.025 m

15.83 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1370$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1370$ mm

0.827

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.827 \times 4.5 \times 102.5/2.6$

146.8 kN/m

Fd/Fr

15.8/146.8

0.108

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /067

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m = 4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load = 4.0 kN/m, Live Load = 0.5 kN/m		
Loads @ this level	Dead Load = 17.5 kN/m, Live Load = 5.0 kN/m, $e_x = 17 \text{ mm}$		
Section Properties	Area = 1000 cm ² /m, $Z_p = 1667 \text{ cm}^3/\text{m}$		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1} = 0.25, g_d = 0.357 \text{ N/mm}^2$		
	$f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$	1.01 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X = 0 \text{ m}, Y = 1.268 \text{ m} < f_k / \gamma_{mc}$	0.74 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$		
Max axial buckling force @	$X = 2.4 \text{ m}, Y = 1.268 \text{ m}$ averaged over width Of 1 m	73.79 kN/m	
Moments from Lateral Load	$M_{wx, top} = 0.122 \text{ kN.m}, M_{wx, mid} = 0.061 \text{ kN.m}$		
Capacity reduction factor top, Φ	$e_x = 6.9 \text{ mm}, h_{ef} = 1370 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$	0.801	
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.060 \text{ mm}, h_{ef} = 1.370$	0.794	
$F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$	$0.794 \times 5.73 \times 100 / 2.6$	174.9 kN/m	
F_d / F_r	$73.8 / 174.9$	0.422	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.3m	$g_k 39 \text{ kN}, q_k 39 \text{ kN}$, Bearing Length 200 mm width 100 mm		
Spreader details	Length 2000 mm, Depth 215 mm, Thickness 100 mm		
Bearing Stress	$(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000 / (2000 \cdot 100)$	0.54 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.23 \cdot f_k / \gamma_{mc}$	2.72 N/mm ²	OK
$M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m	
$M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$	$1.01 \times 1667 / 2.3$	0.732 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor, λ_p	3.519	
$U_t = 1 / \lambda_p$	$1 / 3.519$	0.284	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /068

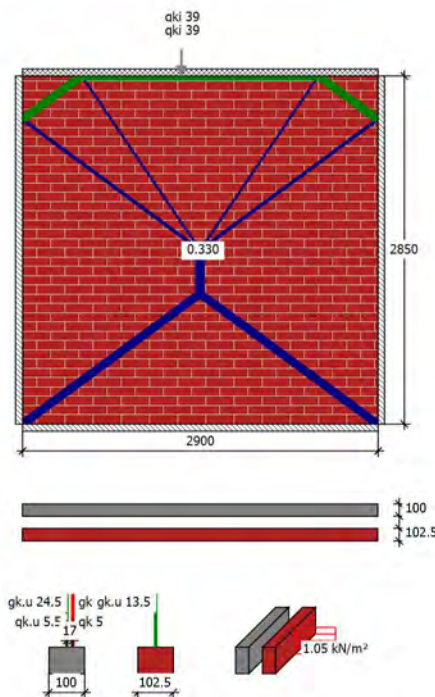
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall C GF



Summary of Design Data

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.434$ m (Eqn. 5.8), $L=2.900$ m, $L_{ef}=2.900$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=11.2 \leq \lambda_{lim}=27$, $L/t_{ef}=22.7$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.416 OK

Outer-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=13.5 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.157$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_k)$ $X=0$ m, $Y=1.425$ m < f_k/γ_{mc} 0.25 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k)$ $X=1.013$ m, $Y=1.425$ m averaged over width Of 1.025 m

25.19 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1434$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.434$

0.819

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.819 \times 4.5 \times 102.5/2.6$

145.3 kN/m

Fd/Fr

 $25.2/145.3$

0.173

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /069

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class I, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m = 4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load = 24.5 kN/m, Live Load = 5.5 kN/m		
Loads @ this level	Dead Load = 17.5 kN/m, Live Load = 5.0 kN/m, $e_x = 17 \text{ mm}$		
Section Properties	Area = 1000 cm ² /m, $Z_p = 1667 \text{ cm}^3/\text{m}$		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1} = 0.25, g_d = 0.562 \text{ N/mm}^2$		
	$f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$	1.01 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X = 0 \text{ m}, Y = 1.318 \text{ m} < f_k / \gamma_{mc}$	1.07 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$		
Max axial buckling force @	$X = 2.4 \text{ m}, Y = 1.318 \text{ m}$ averaged over width Of 1 m	106.98 kN/m	
Moments from Lateral Load	$M_{wx, top} = 0.170 \text{ kN.m}, M_{wx, mid} = 0.096 \text{ kN.m}$		
Capacity reduction factor top, Φ	$e_x = 4.8 \text{ mm}, h_{ef} = 1434 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$	0.841	
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.125 \text{ mm}, h_{ef} = 1.434$	0.804	
$F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$	$0.804 \times 5.73 \times 100 / 2.6$	177.2 kN/m	
F_d / F_r	$107.0 / 177.2$	0.604	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.3m	$g_k 39 \text{ kN}, q_k 39 \text{ kN}$, Bearing Length 200 mm width 100 mm		
Spreader details	Length 2000 mm, Depth 215 mm, Thickness 100 mm		
Bearing Stress	$(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000 / (2000 \cdot 100)$	0.54 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.24 \cdot f_k / \gamma_{mc}$	2.74 N/mm ²	OK
$M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m	
$M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$	$1.01 \times 1667 / 2.3$	0.732 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor, λ_p	3.027	
$U_t = 1 / \lambda_p$	$1 / 3.027$	0.330	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /071

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 3.3 kN/m, Live Load = 3.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.084 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.442 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X = 0 \text{ m}, Y = 1.2 \text{ m} < f_k \cdot 0.82 \text{ (small area red.)} / \gamma_{mc}$ 0.21 N/mm²

OK

Critical axial buckling Case

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$

Max axial buckling force @

 $X = 0.2 \text{ m}, Y = 1.4 \text{ m}$ averaged over width Of 0.4 m

21.28 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 17.0 \text{ mm}, h_{ef} = 840 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.623

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 0.840$

0.770

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.623 \times 4.7 \times 100 / 2.6$

112.5 kN/m

Fd/Fr

21.3/112.5

0.189

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.442 \times 1667 / 2.3$

0.32 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

2.993

 $U_t = 1 / \lambda_p$

1 / 2.993

0.334

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

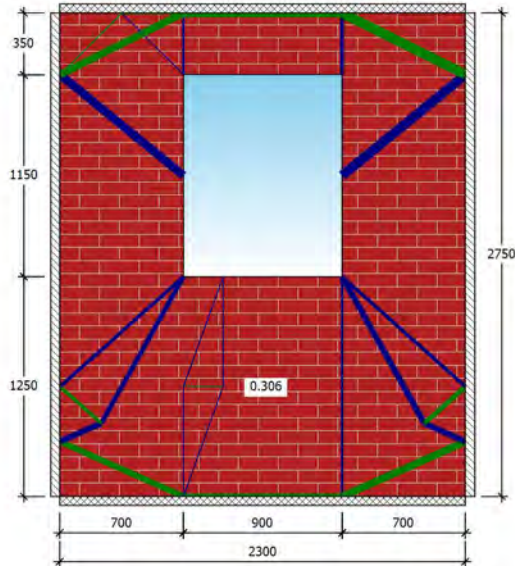
Sheet : /072

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall D 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.150$ m (Eqn. 5.9), $L=2.300$ m, $L_{ef}=2.300$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.7$, $Y=1.25$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9 < \lambda_{lim}=27$, $L/t_{ef}=18$, $H/t_{ef}=21.6$, Hence $H/t_{ef} \leq 80$ (F.1)

0.334

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.142$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.726 N/mm² Table NA.6 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.2$ m $< f_k \cdot 0.92$ (small area red.) γ_{mc} 0.22 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=0.35$ m, $Y=1.375$ m averaged over width Of 0.7 m

22.24 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1050$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.050$

0.862

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.862 \times 4.12 \times 102.5/2.6$

140.0 kN/m

 F_d/F_r $22.2/140.0$

0.159

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.726 \times 1751/2.3$

0.552 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /073

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m³Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm²Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4$ N/mm²

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 2.6 kN/m, Live Load = 1.0 kN/m

Loads @ this level

Dead Load = 6.5 kN/m, Live Load = 3.2 kN/m, $e_x = 17$ mm

Section Properties

Area = 1000 cm²/m, $Z_p = 1667$ cm³/mFlexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.164$ N/mm² $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.627 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0$ m, $Y = 1.2$ m < $f_k \cdot 0.91$ (small area red.) / γ_{mc} 0.31 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.35$ m, $Y = 1.375$ m averaged over width Of 0.7 m

30.86 kN/m

Moments from Lateral Load

 $M_{wx,top} = 0.000$ kN.m, $M_{wx,mid} = 0.000$ kN.mCapacity reduction factor top, Φ $e_x = 12.4$ mm, $h_{ef} = 1050$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm

0.705

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000$ mm, $h_{ef} = 1.050$

0.789

 $F_r = \Phi \cdot f_{k,tk} / \gamma_{mc}$ $0.705 \times 5.21 \times 100 / 2.6$

141.3 kN/m

 F_d / F_r $30.9 / 141.3$

0.218

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.627 \times 1667 / 2.3$

0.454 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

3.273

 $U_t = 1 / \lambda_p$ $1 / 3.273$

0.306

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /074

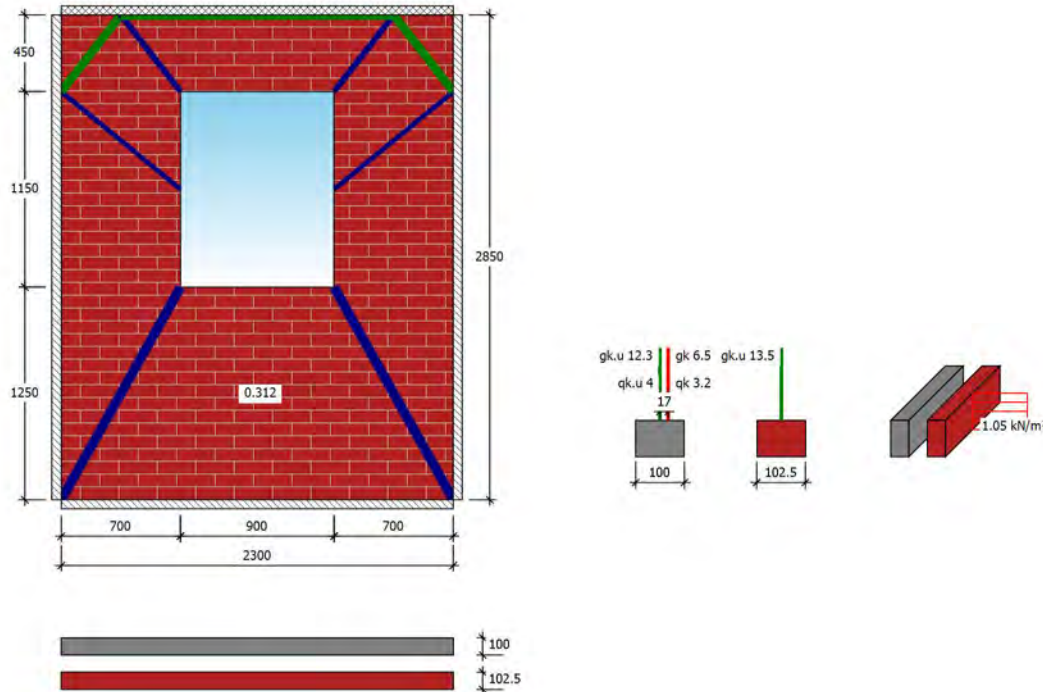
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall D GF

**Summary of Design Data**

EuroCode National Annex	Using UK values A1 2012		
Wall Dimensions	$h=2.850$ m, $h_{ef}=1.150$ m (Eqn. 5.9), $L=2.300$ m, $L_{ef}=2.300$ m		
Support Conditions	Bottom Simple, Top Cont., Left Simple, Right Simple		
Lateral Loads	$W_x=1.05$ kN/m ²		
Opening load span direction	opening at $X=0.7$, $Y=1.25$ - Two way spanning		
Cavity Wall (mm)	$t_1=100$, $t_2=102.5$, $t_{ef}=127.6$		
Limiting Dimensions	$\lambda=9 \leq \lambda_{lim}=27$, $L/t_{ef}=18$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1)	0.334	OK

Outer-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b=15$ N/mm ²		
	Normalised mean compressive strength $f_b=15 \cdot 0.85$	12.75 N/mm ²	
Mortar Material	M4, $f_m=4$ N/mm ²		
Compressive Strength (f_k)	$k=0.5$, $\alpha=0.7$, $\beta=0.3$	4.5 N/mm ²	Table NA.4
Loads from above	Dead Load=13.5 kN/m		
Section Properties	Area=1025 cm ² /m, $Z_p=1751$ cm ³ /m		
Flexural Strength f_{kk2} (Perpendicular)		1.1 N/mm ²	Table NA.6
Flexural Strength f_{kk1} (Parallel)	$f_{kk1}=0.4$, $gd=0.257$ N/mm ²		
	$f_{kk1}=f_{k1}+\min(gd, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$	0.947 N/mm ²	Table NA.6
Critical axial compressive Case	$1.35(\gamma_{tk} \cdot h + g_{ku})$		
Max local stress @	$X=0$ m, $Y=1.2$ m $< f_k \cdot 0.92$ (small area red.) γ_{mc}	0.37 N/mm ²	OK
Critical axial buckling Case	$1.35(\gamma_{tk} \cdot h + g_{ku})$		
Max axial buckling force @	$X=1.95$ m, $Y=1.425$ m averaged over width Of 0.7 m	37.61 kN/m	
Moments from Lateral Load	$M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.m		
Capacity reduction factor top, Φ	$e_x=0.0$ mm, $h_{ef}=1050$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm	0.900	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000$ mm, $h_{ef}=1.050$	0.862	
$F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$	$0.862 \times 4.12 \times 102.5/2.6$	140.0 kN/m	
F_d/F_r	$37.6/140.0$	0.269	OK
$M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$	$1.1 \times 1751/2.3$	0.837 kN.m/m	
$M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$	$0.947 \times 1751/2.3$	0.721 kN.m/m	

Software produced by www.MasterSeries.com © Civil and Structural Computer Services Limited.

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

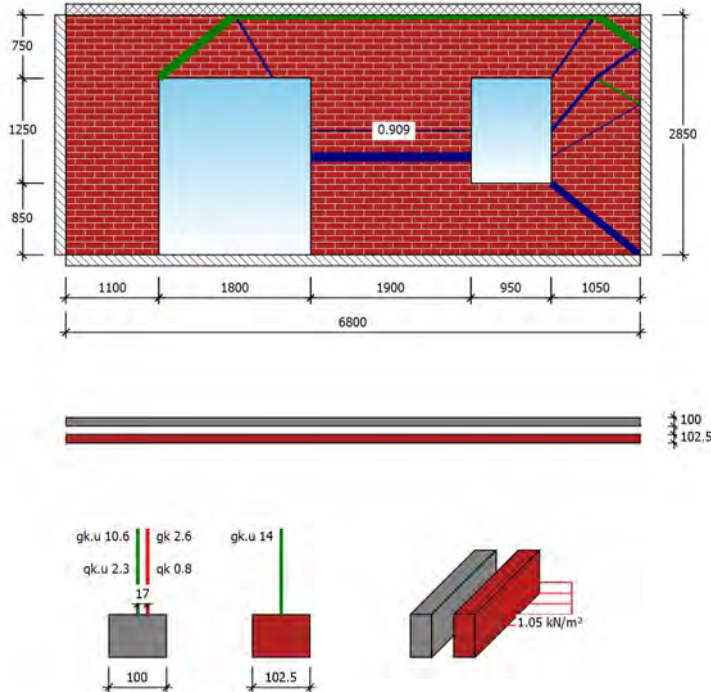
Sheet : /076

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall E GF****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.198$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X = 1.1$, $Y = 0$ - Two way spanningopening at $X = 4.8$, $Y = 0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=17.2 < \lambda_{lim}=27$, $1/t_{ef}=53.3$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 46.7$ (F.1) 0.638 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=14.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.162$ N/mm²0.772 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.506$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.53 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=3.413$ m, $Y=1.425$ m averaged over width Of 1.025 m

44.07 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.303$ kN.m, $M_{wx,mid}=0.170$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2494$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.263$ mm, $h_{ef}=2,494$

0.625

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mf}$ $0.625 \times 4.5 \times 102.5 / 2.6$

111.0 kN/m

Fd/Fr

44.1/111.0

0.397

OK

 $M_{ro}=f_{k2} \cdot Z_p / \gamma_{mf}$ $1.1 \times 1751 / 2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b / \gamma_{mf}$ $0.772 \times 1751 / 2.3$

0.588 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /077

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 10.6 kN/m, Live Load = 2.3 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.8 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.139 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.57 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.05q_k + 1.05q_{ku}$ $X = 0.511 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 0.53 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 3.4 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

42.35 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.358 \text{ kN.m}, M_{wx, mid} = 0.201 \text{ kN.m}$ Capacity reduction factor top, Φ

0.818

Capacity reduction factor mid, Φ_m

0.583

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.583 \times 5.73 \times 100 / 2.6$

128.4 kN/m

Fd/Fr

42.3/128.4

0.330

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.57 \times 1667 / 2.3$

0.413 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.101

 $U_t = 1 / \lambda_p$

1 / 1.101

0.909

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

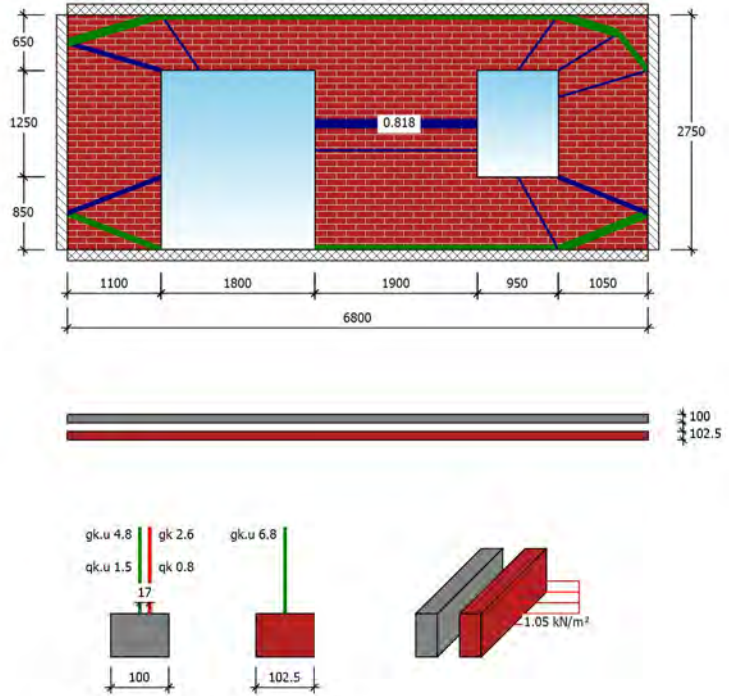
Sheet : /078

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall E 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.889$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1.1$, $Y=0$ - Two way spanningopening at $X=4.8$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=14.8 < \lambda_{lim}=27$, $1/t_{ef}=53.3$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 46.7$ (F.1) 0.548 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm²0.607 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ $1.35(\gamma_{tk} \cdot h + g_k u)$

Critical axial compressive Case

Max local stress @

 $X=0.477$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.3 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=3.413$ m, $Y=1.375$ m averaged over width Of 1.025 m

25.23 kN/m

Moments from Lateral Load

 $M_{w, top}=0.000$ kN.m, $M_{w, mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_{k, tk}/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

Fd/Fr

25.2/127.9

0.197

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /079

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 4.8 kN/m, Live Load = 1.5 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.8 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.081 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.436 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.482 \text{ m}, Y = 1.375 \text{ m} < f_k / \gamma_{mc}$ 0.32 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 3.4 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 1 m

26.17 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.230 \text{ kN.m}, M_{wx, mid} = 0.115 \text{ kN.m}$ Capacity reduction factor top, Φ

0.789

Capacity reduction factor mid, Φ_m

0.663

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.663 \times 5.73 \times 100 / 2.6$

145.9 kN/m

Fd/Fr

26.2/145.9

0.179

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.436 \times 1667 / 2.3$

0.316 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.223

 $U_t = 1 / \lambda_p$

1 / 1.223

0.818

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

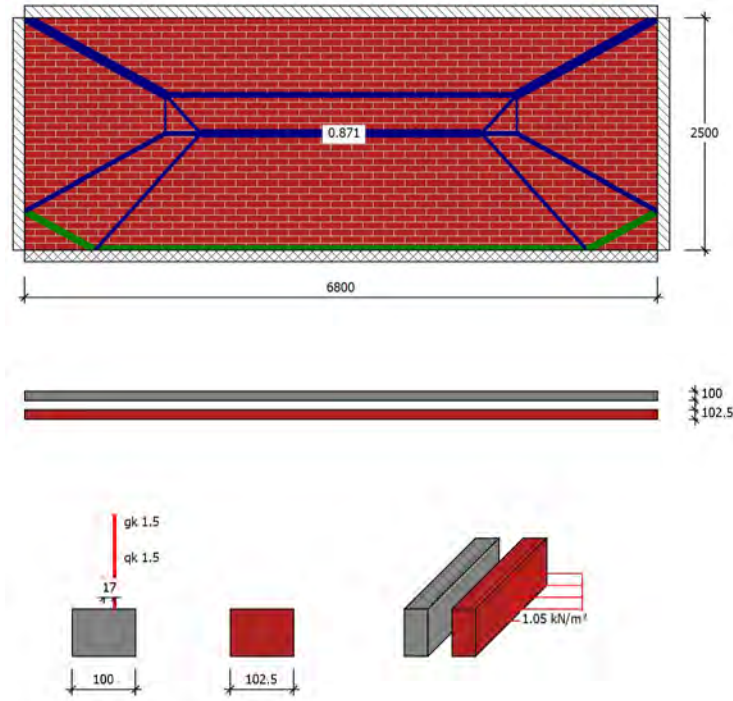
Sheet : /080

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall E 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.982$ m (Eqn. 5.8), $L=6.800$ m, $L_{ef}=6.800$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.5 < \lambda_{lim}=27$, $L/t_{ef}=53.3$, $H/t_{ef}=19.6$. Hence $H/t_{ef} \leq 46.7$ (F.1) 0.575 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1; $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Section Properties

Flexural Strength f_{k2} (Perpendicular)Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm²1.1 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6 $1.35(\gamma_{tk}.h)$

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.06 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk}.h)$

Moments from Lateral Load

 $X=1.013$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.11 kN/m

Capacity reduction factor top, Φ $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor mid, Φ_m $e_x=0.0$ mm, $h_{ef}=1982$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $e_{hm}=0.000$ mm, $h_{ef}=1.982$

0.734

 F_d/F_r $0.734 \times 4.5 \times 102.5/2.6$

130.4 kN/m

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$

6.1/130.4

0.047

OK

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN/m/m

 $0.451 \times 1751/2.3$

0.343 kN/m/m

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /081****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads @ this level	Dead Load=1.5 kN/m, Live Load=1.5 kN/m, $e_x=17 \text{ mm}$		
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$		
Flexural Strength f_{k2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{k1} (Parallel)	$f_{k1}=0.25, g_d=0.021 \text{ N/mm}^2$		
	$f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$	0.299 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k$		
Max local stress @	$X=0 \text{ m}, Y=1.25 \text{ m} < f_k/\gamma_{mc}$	0.06 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k+0.75(W_x)$		
Max axial buckling force @	$X=6.3 \text{ m}, Y=1.25 \text{ m}$ averaged over width Of 1 m	5.66kN/m	
Moments from Lateral Load	$M_{wx,top}=0.000 \text{ kN.m}, M_{wx,mid}=0.108 \text{ kN.m}$		
Capacity reduction factor top, Φ	$e_x=17.0 \text{ mm}, h_{ef}=1982 \text{ mm}, t_{ef}=127.6 \text{ mm}, t=100.0 \text{ mm}$	0.572	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.109 \text{ mm}, h_{ef}=1.982$	0.562	
$F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$	$0.562 \times 5.73 \times 100/2.6$	123.8 kN/m	
F_d/F_r	$5.7/123.8$	0.046	OK
$M_{ri}=f_{k2} \cdot Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{k1} \cdot Z_b/\gamma_{mf}$	$0.299 \times 1667/2.3$	0.216 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	1.149	
$U_t=1/\lambda_p$	1 / 1.149	0.871	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

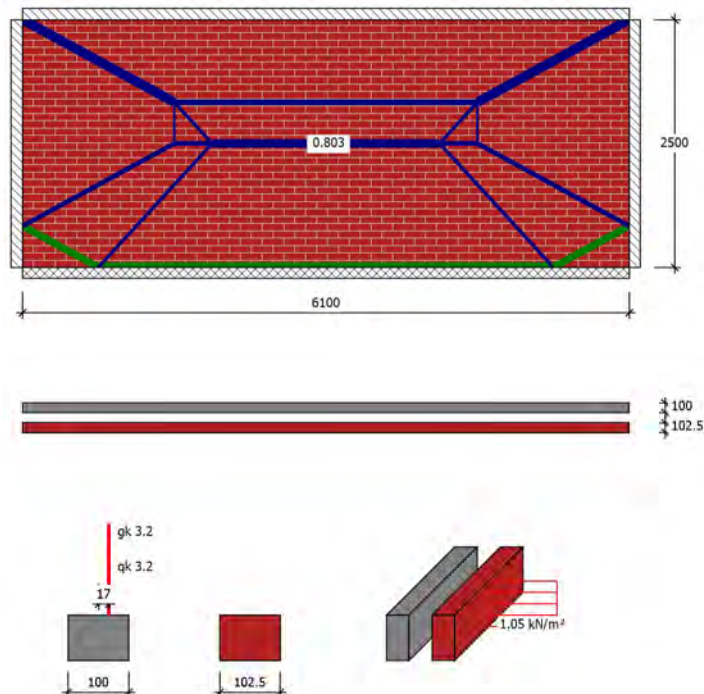
Sheet : /082

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall F 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.938$ m (Eqn. 5.8), $L=6.100$ m, $L_{ef}=6.100$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.2 < \lambda_{lim}=27$, $L/t_{ef}=47.8$, $H/t_{ef}=19.6$. Hence $H/t_{ef} \leq 48$ (F.1) 0.563 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm²

Mortar Material

Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.06 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h)$ $X=1.013$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.11 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1938$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.938$

0.742

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.742 \times 4.5 \times 102.5/2.6$

131.7 kN/m

Fd/Fr

6.1/131.7

0.046

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751/2.3$

0.343 kN.m/m

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Cloud 3b89b	Job Ref : 10056 Sheet : /083 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$ $k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads @ this level	Dead Load=3.2 kN/m, Live Load=3.2 kN/m, $e_x=17 \text{ mm}$		
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$		
Flexural Strength f_{xk2} (Perpendicular)		0.734 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1}=0.25, g_d=0.038 \text{ N/mm}^2$ $f_{xk1}=f_{xk1}+\min(g_d, 0.15 \cdot f_{tk}/\gamma_{mc})/\gamma_{mf}$	0.338 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k$ $X=0 \text{ m}, Y=1.25 \text{ m} < f_k/\gamma_{mc}$	0.1 N/mm ²	OK
Max local stress @			
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k+0.75(W_x)$ $X=5.6 \text{ m}, Y=1.25 \text{ m}$ averaged over width Of 1 m	10.33kN/m	
Max axial buckling force @			
Moments from Lateral Load	$M_{wx, \text{top}}=0.000 \text{ kN.m}, M_{wx, \text{mid}}=0.103 \text{ kN.m}$		
Capacity reduction factor top, Φ	$e_x=17.0 \text{ mm}, h_{ef}=1938 \text{ mm}, t_{ef}=127.6 \text{ mm}, t=100.0 \text{ mm}$	0.574	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.104 \text{ mm}, h_{ef}=1.938$	0.572	
$F_r=\Phi \cdot f_{tk}/\gamma_{mc}$	$0.572 \times 5.73 \times 100/2.6$	126.0 kN/m	
F_d/F_r	$10.3/126.0$	0.082	OK
$M_{ri}=f_{xk2}.Z_p/\gamma_{mf}$	$0.734 \times 1667/2.3$	0.532 kN.m/m	
$M_{ri}=f_{xk1}.Z_b/\gamma_{mf}$	$0.338 \times 1667/2.3$	0.245 kN.m/m	
Design For Lateral Loads			
Design Lateral Load W_d	$1.5 W_x$	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	1.246	
$U_t=1/\lambda_p$	$1 / 1.246$	0.803	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /084

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

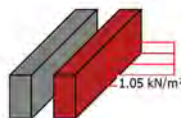
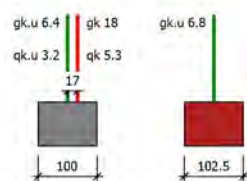
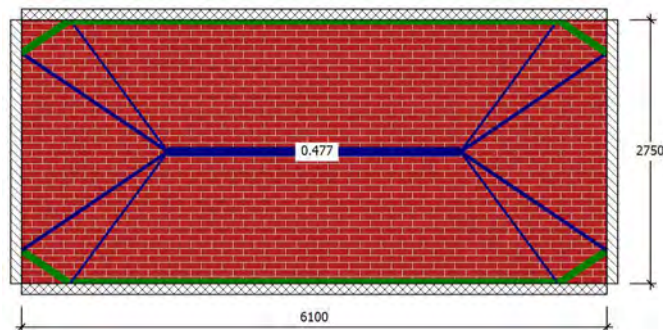
Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall F 1F



Summary of Design Data

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.851$ m (Eqn. 5.8), $L=6.100$ m, $L_{ef}=6.100$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=14.5 \leq \lambda_{lim}=27$, $L/t_{ef}=47.8$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 48$ (F.1) 0.537 OK

Outer-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=6.75 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.09$ N/mm² $f_{kk1}=f_{kk1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=0$ m, $Y=1.375$ m < f_k/γ_{mc} 0.15 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=1.013$ m, $Y=1.375$ m averaged over width Of 1.025 m

15.83 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1851$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.851$

0.757

 $F_r=\Phi \cdot f_{kk} \cdot t_k/\gamma_{mc}$ $0.757 \times 4.5 \times 102.5/2.6$

134.3 kN/m

 F_d/F_r

15.8/134.3

0.118

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /085

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 6.4 kN/m, Live Load = 3.2 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.251 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.827 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0 \text{ m}, Y = 1.375 \text{ m} < f_k / \gamma_{mc}$ 0.45 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 5.6 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 1 m

44.94 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.182 \text{ kN.m}, M_{wx, mid} = 0.091 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 12.0 \text{ mm}, h_{ef} = 1851 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.678

Capacity reduction factor mid, Φ_m $e_{hm} = 0.090 \text{ mm}, h_{ef} = 1.851$

0.646

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.646 \times 5.73 \times 100 / 2.6$

142.2 kN/m

Fd/Fr

 $44.9 / 142.2$

0.316

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.827 \times 1667 / 2.3$

0.599 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

2.098

 $U_t = 1 / \lambda_p$ $1 / 2.098$

0.477

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

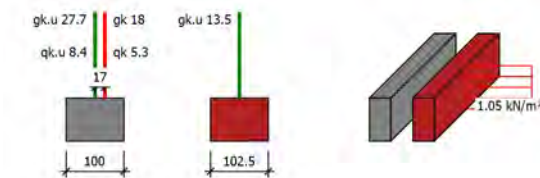
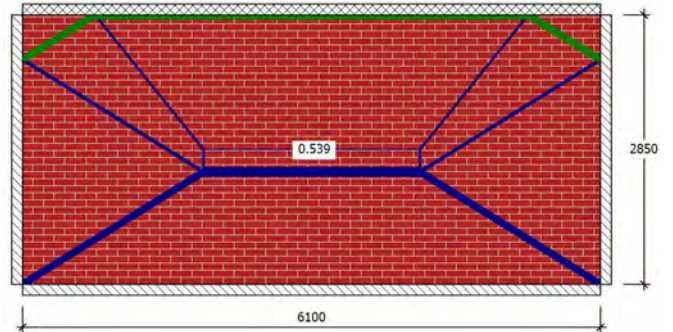
Sheet : /086

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall F GF****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.137$ m (Eqn. 5.8), $L=6.100$ m, $L_{ef}=6.100$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=16.7 < \lambda_{lim}=27$, $L/t_{ef}=47.8$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 48$ (F.1) 0.620 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=13.5 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.157$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=0$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.25 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=1.013$ m, $Y=1.425$ m averaged over width Of 1.025 m

25.19 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2137$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.137$

0.707

 $F_r=\Phi \cdot f_{k2} \cdot \gamma_{mc}$ $0.707 \times 4.5 \times 102.5/2.6$

125.5 kN/m

 F_d/F_r $25.2/125.5$

0.201

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /087

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 27.7 kN/m, Live Load = 8.4 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.464 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 1.01 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 0.79 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 5.6 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

79.42 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.278 \text{ kN.m}, M_{wx, mid} = 0.156 \text{ kN.m}$ Capacity reduction factor top, Φ

0.772

Capacity reduction factor mid, Φ_m

0.636

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.636 \times 5.73 \times 100 / 2.6$

140.1 kN/m

Fd/Fr

 $79.4 / 140.1$

0.567

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $1.01 \times 1667 / 2.3$

0.732 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.856

 $U_t = 1 / \lambda_p$ $1 / 1.856$

0.539

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /088

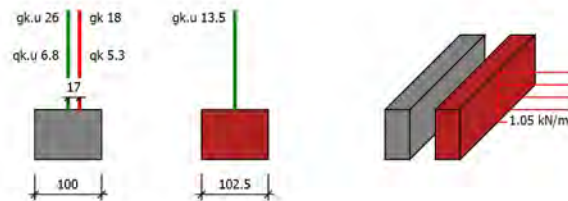
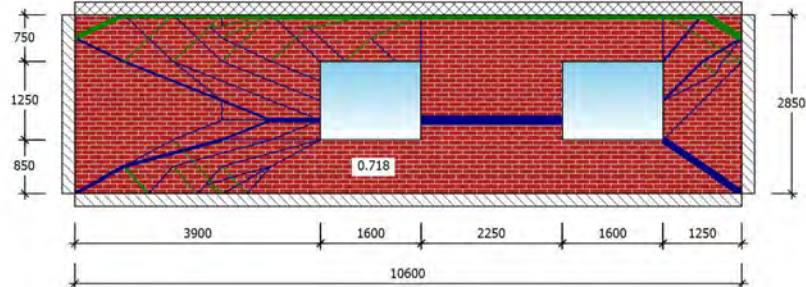
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall H GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.363$ m (Eqn. 5.8), $L=10.600$ m, $L_{ef}=10.600$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=3.9$, $Y=0.85$ - Two way spanningopening at $X=7.75$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=18.5 < \lambda_{lim}=27$, $l/t_{ef}=83.1$, $H/t_{ef}=22.3$. Hence $H/t_{ef} \leq 39.2$ (F.1) 0.686 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.157$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=9.35$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.48 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=7.238$ m, $Y=1.425$ m averaged over width Of 1.025 m

40.84 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.305$ kN.m, $M_{wx,mid}=0.172$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2494$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.265$ mm, $h_{ef}=2,494$

0.625

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.625 \times 4.5 \times 102.5/2.6$

111.0 kN/m

 F_d/F_r

40.8/111.0

0.368

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /089

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b = 10.4$ N/mm ²		
	Normalised mean compressive strength $f_b = 10.4 \cdot 1.38$	14.35 N/mm ²	
Mortar Material	M4, $f_m = 4$ N/mm ²		
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	7.34 N/mm ²	Table NA.4
Loads from above	Dead Load = 26.0 kN/m, Live Load = 6.75 kN/m		
Loads @ this level	Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17$ mm		
Section Properties	Area = 1000 cm ² /m, $Z_p = 1667$ cm ³ /m		
Flexural Strength f_{xk2} (Perpendicular)		0.833 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1} = 0.25, g_d = 0.447$ N/mm ²		
	$f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$	1.224 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X = 9.35$ m, $Y = 1.425$ m < f_k / γ_{mc}	1.65 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$		
Max axial buckling force @	$X = 6$ m, $Y = 1.425$ m averaged over width Of 1 m	133.65 kN/m	
Moments from Lateral Load	$M_{wx, top} = 0.462$ kN.m, $M_{wx, mid} = 0.260$ kN.m		
Capacity reduction factor top, Φ	$e_x = 7.1$ mm, $h_{ef} = 2494$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm	0.747	
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.265$ mm, $h_{ef} = 2.494$	0.545	
$F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$	$0.545 \times 7.34 \times 100 / 2.6$	153.8 kN/m	
F_d / F_r	$133.7 / 153.8$	0.869	OK
$M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$	$0.833 \times 1667 / 2.3$	0.604 kN.m/m	
$M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$	$1.224 \times 1667 / 2.3$	0.887 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor λ_p	1.393	
$U_t = 1 / \lambda_p$	1 / 1.393	0.718	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

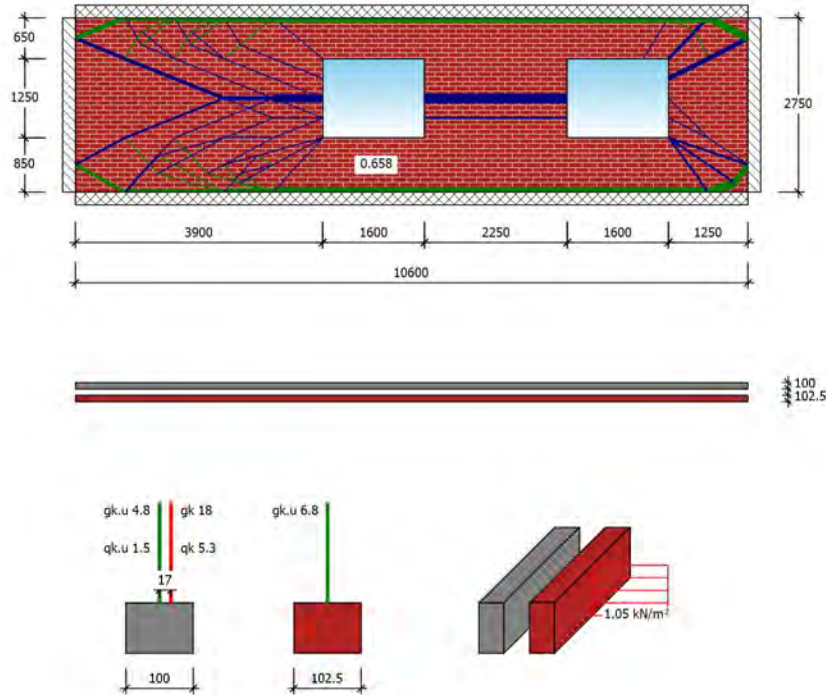
Sheet : /090

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall H 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.987$ m (Eqn. 5.8), $L=10.600$ m, $L_{ef}=10.600$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=3.9$, $Y=0.85$ - Two way spanningopening at $X=7.75$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.6 < \lambda_{lim}=27.1$, $t_{ef}/t=83.1$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 39.2$ (F.1) 0.577 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=7.127$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.28 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=7.238$ m, $Y=1.375$ m averaged over width Of 1.025 m

24.18 kN/m

Moments from Lateral Load

 $M_{w,x,top}=0.000$ kN.m, $M_{w,x,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

 F_d/F_r $24.2/127.9$

0.189

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /091

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 4.8 kN/m, Live Load = 1.5 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.235 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.79 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 7.132 \text{ m}, Y = 1.375 \text{ m} < f_k / \gamma_{mc}$ 0.87 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 6 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 1 m

71.66 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.245 \text{ kN.m}, M_{wx, mid} = 0.122 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 13.4 \text{ mm}, h_{ef} = 2063 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.641

Capacity reduction factor mid, Φ_m $e_{hm} = 0.121 \text{ mm}, h_{ef} = 2.063$

0.582

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.582 \times 5.73 \times 100 / 2.6$

128.3 kN/m

 F_d / F_r $71.7 / 128.3$

0.559

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.79 \times 1667 / 2.3$

0.572 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.520

 $U_t = 1 / \lambda_p$ $1 / 1.520$

0.658

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /092

Made by : VM

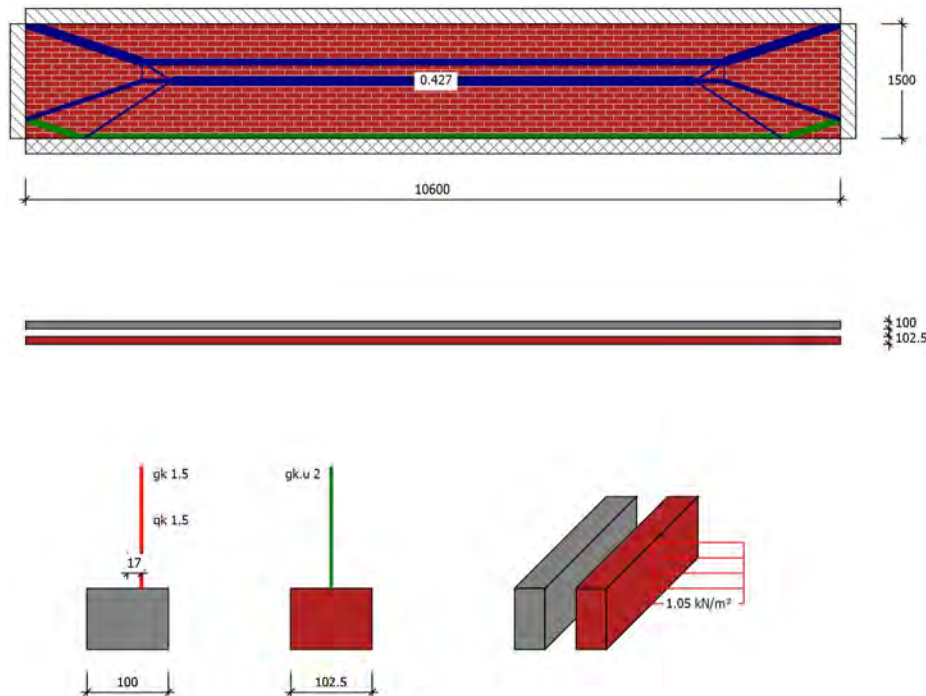
Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall H 2F**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=1.500$ m, $h_{ef}=1.112$ m (Eqn. 5.8), $L=10.600$ m, $L_{ef}=10.600$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=8.7 < \lambda_{lim}=27$, $L/t_{ef}=83.1$, $H/t_{ef}=11.8$, Hence $H/t_{ef} \leq 39.2$ (F.1) 0.323 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=2.0 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.033$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.475 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk}.h+g_k)$ $X=0$ m, $Y=0.75$ m $< f_k/\gamma_{mc}$ 0.06 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk}.h+g_k)$ $X=1.013$ m, $Y=0.75$ m averaged over width Of 1.025 m

6.37 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1112$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.112$

0.856

 $F_r=\Phi \cdot f_{k2} \cdot \gamma_{mc}$ $0.856 \times 4.5 \times 102.5/2.6$

151.9 kN/m

Fd/Fr

 $6.4/151.9$

0.042

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.475 \times 1751/2.3$

0.362 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /093

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 1.5 kN/m, Live Load = 1.5 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.019 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.293 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X = 0 \text{ m}, Y = 0.75 \text{ m} < f_k / \gamma_{mc}$ 0.05 N/mm²

OK

Critical axial buckling Case

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$

Max axial buckling force @

 $X = 7.8 \text{ m}, Y = 0.75 \text{ m}$ averaged over width Of 1 m

5.04 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 17.0 \text{ mm}, h_{ef} = 1112 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.611

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.112$

0.733

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.611 \times 5.73 \times 100 / 2.6$

134.6 kN/m

Fd/Fr

5.0/134.6

0.037

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.293 \times 1667 / 2.3$

0.212 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

2.344

 $U_t = 1 / \lambda_p$

1 / 2.344

0.427

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /094

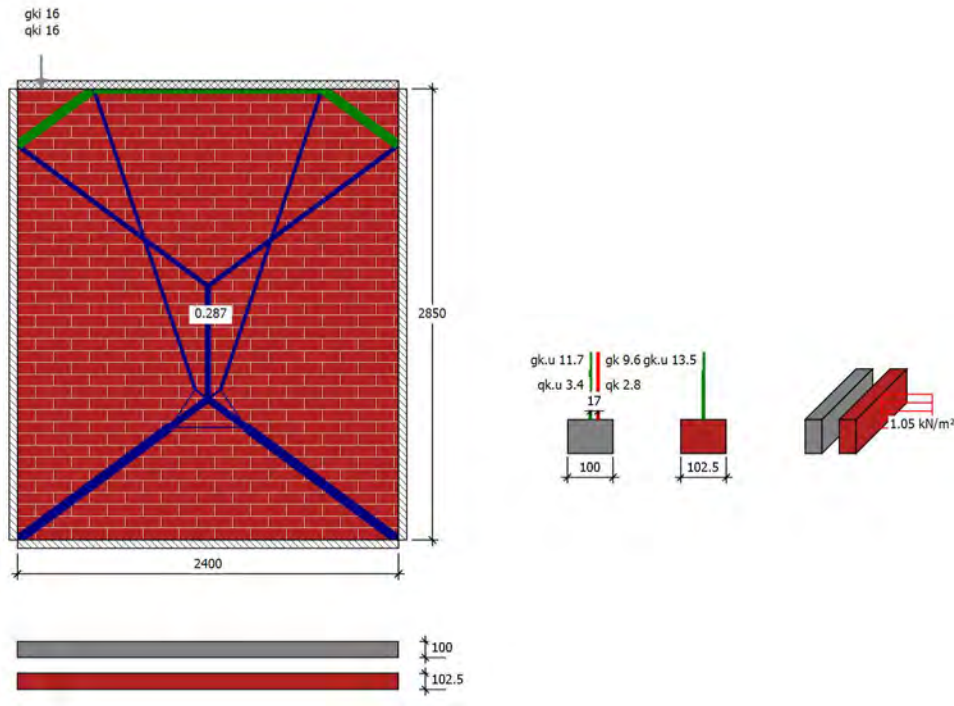
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall AG GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.200$ m (Eqn. 5.9), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.4 < \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.348 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm²

Mortar Material

Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.157$ N/mm² $f_{kk1}=f_{kk1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.25 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max axial buckling force @

 $X=1.013$ m, $Y=1.425$ m averaged over width Of 1.025 m

25.19 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1200$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.200$

0.847

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.847 \times 4.5 \times 102.5/2.6$

150.3 kN/m

Fd/Fr

 $25.2/150.3$

0.168

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /095

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 10.4 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 10.4 \cdot 1.38$ 14.35 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 7.34 N/mm² Table NA.4

Loads from above

Dead Load = 11.7 kN/m, Live Load = 3.4 kN/m

Loads @ this level

Dead Load = 9.6 kN/m, Live Load = 2.8 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.833 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.221 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.757 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0 \text{ m}, Y = 1.318 \text{ m} < f_k / \gamma_{mc}$ 0.61 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 0.5 \text{ m}, Y = 1.318 \text{ m}$ averaged over width Of 1 m

60.7 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.142 \text{ kN.m}, M_{wx, mid} = 0.080 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 4.7 \text{ mm}, h_{ef} = 1200 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.853

Capacity reduction factor mid, Φ_m $e_{hm} = 0.082 \text{ mm}, h_{ef} = 1.200$

0.845

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.845 \times 7.34 \times 100 / 2.6$

238.5 kN/m

Fd/Fr

60.7/238.5

0.255

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 0.15m

 $g_k 16 \text{ kN}, q_k 16 \text{ kN}$, Bearing Length 200 mm width 100 mm

Spreader details

Length 2000 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 16 + 1.5 \cdot 16) \cdot 1000 / (1150 \cdot 100)$ 0.38 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.01 \cdot f_k / \gamma_{mc}$ 2.84 N/mm²

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.833 \times 1667 / 2.3$

0.604 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.757 \times 1667 / 2.3$

0.549 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

3.479

 $U_t = 1 / \lambda_p$

1 / 3.479

0.287

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /096

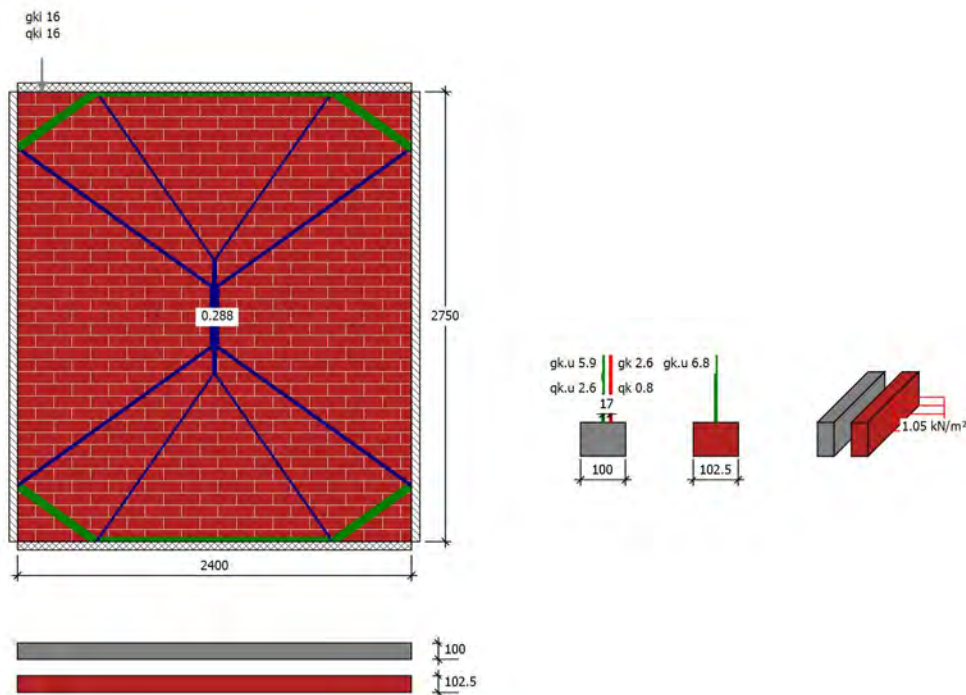
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall AG 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.186$ m (Eqn. 5.8), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m² $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.3 < \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=21.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.344 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1; $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²M4, $f_m=4$ N/mm² $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Dead Load=6.75 kN/m

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Mortar Material

Compressive Strength (f_k)

Loads from above

Section Properties

Flexural Strength f_{k2} (Perpendicular)Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm²1.1 N/mm² Table NA.6 $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_k)$ $X=0$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.15 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k)$ $X=1.013$ m, $Y=1.375$ m averaged over width Of 1.025 m

15.83 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1186$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.186$

0.848

 $F_r=\Phi \cdot f_{k2} \cdot \gamma_{mc}$ $0.848 \times 4.5 \times 102.5/2.6$

150.6 kN/m

 F_d/F_r $15.8/150.6$

0.105

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /097

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m ³		
	Compressive strength (equiv. air dried) $f_b=10.4$ N/mm ²		
	Normalised mean compressive strength $f_b=10.4 \cdot 1.38$	14.35 N/mm ²	
Mortar Material	M4, $f_m=4$ N/mm ²		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	7.34 N/mm ²	Table NA.4
Loads from above	Dead Load=5.9 kN/m, Live Load=2.6 kN/m		
Loads @ this level	Dead Load=2.6 kN/m, Live Load=0.8 kN/m, $e_x=17$ mm		
Section Properties	Area=1000 cm ² /m, $Z_p=1667$ cm ³ /m		
Flexural Strength f_{xk2} (Perpendicular)		0.833 N/mm ²	Table NA.6
Flexural Strength f_{xk1} (Parallel)	$f_{xk1}=0.25, g_d=0.092$ N/mm ²		
	$f_{xk1}=f_{xk1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})\gamma_{mf}$	0.462 N/mm ²	Table NA.6
Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$		
Max local stress @	$X=0$ m, $Y=1.268$ m < f_k/γ_{mc}	0.57 N/mm ²	OK
Critical axial buckling Case	$1.25(\gamma_{tk}.h+g_k+g_{ku})+1.5q_k+1.5q_{ku}$		
Max axial buckling force @	$X=0.5$ m, $Y=1.268$ m averaged over width Of 1 m	57.35kN/m	
Moments from Lateral Load	$M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.m		
Capacity reduction factor top, Φ	$e_x=1.4$ mm, $h_{ef}=1186$ mm, $t_{ef}=127.6$ mm, $t=100.0$ mm	0.900	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000$ mm, $h_{ef}=1.186$	0.848	
$F_r=\Phi.f_{k,tk}/\gamma_{mc}$	$0.848 \times 7.34 \times 100/2.6$	239.4 kN/m	
F_d/F_r	$57.3/239.4$	0.240	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 0.15m	g_k 16 kN, q_k 16 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	$(1.25 \cdot 16 + 1.5 \cdot 16) \cdot 1000/(370 \cdot 100)$	1.19 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.13 \cdot f_k/\gamma_{mc}$	3.19 N/mm ²	OK
$M_{ri}=f_{xk2}.Z_p/\gamma_{mf}$	$0.833 \times 1667/2.3$	0.604 kN.m/m	
$M_{ri}=f_{xk1}.Z_b/\gamma_{mf}$	$0.462 \times 1667/2.3$	0.335 kN.m/m	

Design For Lateral Loads

Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²	
Yield Line Analysis	Load Factor, λ_p	3.478	
$U_t=1/\lambda_p$	$1/3.478$	0.288	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

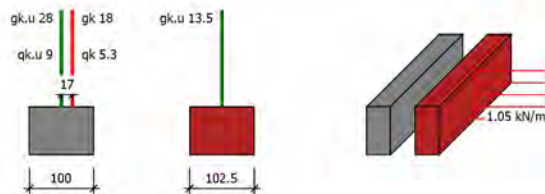
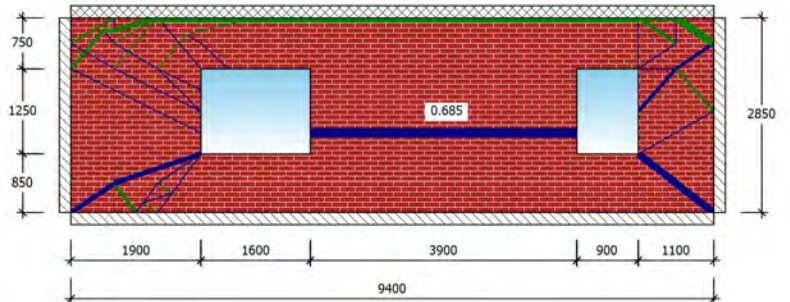
Sheet : /098

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall K GF****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.330$ m (Eqn. 5.8), $L=9.400$ m, $L_{ef}=9.400$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1.9$, $Y=0.85$ - Two way spanningopening at $X=7.4$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=18.3 < \lambda_{lim}=27$, $1/t_{ef}=73.7$, $H/t_{ef}=22.3$. Hence $H/t_{ef} \leq 41.6$ (F.1) 0.676 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.157$ N/mm²0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=1.306$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.48 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=4.013$ m, $Y=1.425$ m averaged over width Of 1.025 m

40.84 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.291$ kN.m, $M_{wx,mid}=0.164$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2494$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.253$ mm, $h_{ef}=2,494$

0.625

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.625 \times 4.5 \times 102.5/2.6$

111.0 kN/m

Fd/Fr

40.8/111.0

0.368

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /099

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 10.4 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 10.4 \cdot 1.38$ 14.35 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 7.34 N/mm² Table NA.4

Loads from above

Dead Load = 28.0 kN/m, Live Load = 9.0 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.833 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.467 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 1.224 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 3.5 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 1.78 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 4 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

144.23 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.441 \text{ kN.m}, M_{wx, mid} = 0.248 \text{ kN.m}$ Capacity reduction factor top, Φ

0.758

Capacity reduction factor mid, Φ_m

0.551

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.551 \times 7.34 \times 100 / 2.6$

155.5 kN/m

Fd/Fr

144.2/155.5

0.928

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.833 \times 1667 / 2.3$

0.604 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $1.224 \times 1667 / 2.3$

0.887 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.459

 $U_t = 1 / \lambda_p$

1 / 1.459

0.685

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

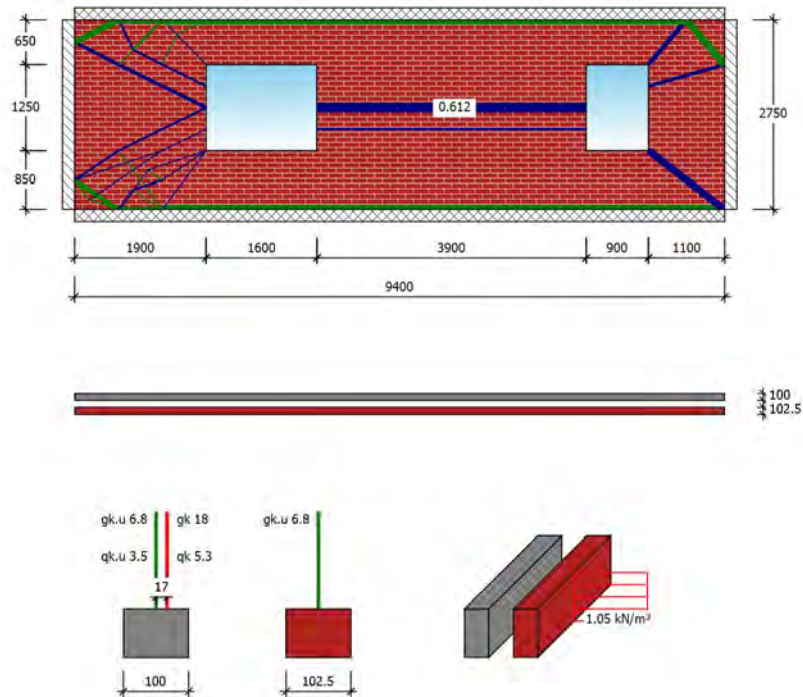
Sheet : /100

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall K 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.968$ m (Eqn. 5.8), $L=9.400$ m, $L_{ef}=9.400$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1.9$, $Y=0.85$ - Two way spanningopening at $X=7.4$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.4 < \lambda_{lim}=27.1$, $l/t_{ef}=73.7$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 41.6$ (F.1) 0.571 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_k u)$ $X=1.277$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.28 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k u)$ $X=4.013$ m, $Y=1.375$ m averaged over width Of 1.025 m

24.18 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_{k1} \cdot t_k/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

 F_d/F_r $24.2/127.9$

0.189

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /101

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 6.8 kN/m, Live Load = 3.5 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.255 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.836 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 1.282 \text{ m}, Y = 1.375 \text{ m} < f_k / \gamma_{mc}$ 0.99 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 4 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 1 m

81.56 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.237 \text{ kN.m}, M_{wx, mid} = 0.118 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 11.7 \text{ mm}, h_{ef} = 2063 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.674

Capacity reduction factor mid, Φ_m $e_{hm} = 0.117 \text{ mm}, h_{ef} = 2.063$

0.600

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.600 \times 5.73 \times 100 / 2.6$

132.2 kN/m

 F_d / F_r

81.6 / 132.2

0.617

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.836 \times 1667 / 2.3$

0.606 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.633

 $U_t = 1 / \lambda_p$

1 / 1.633

0.612

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /102

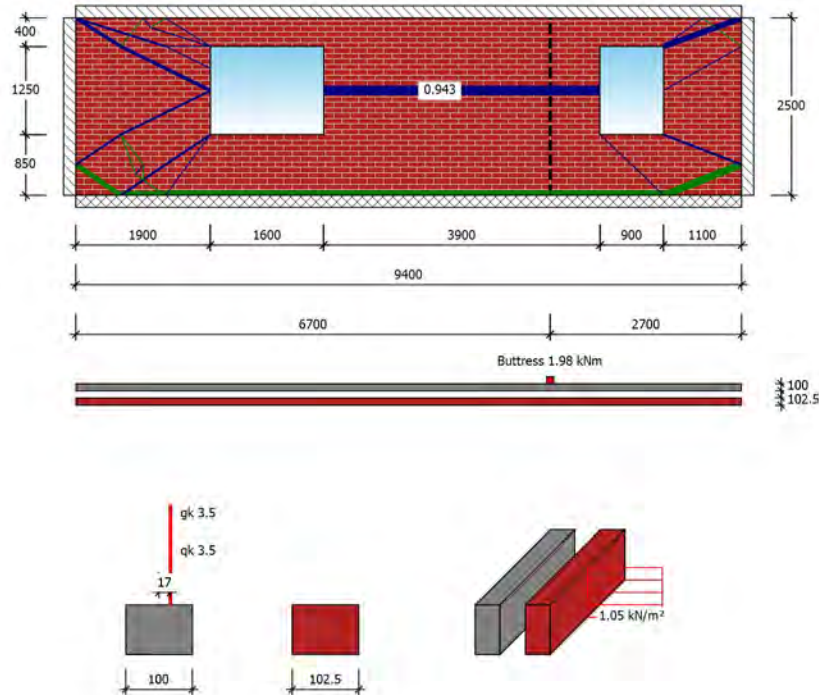
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall K 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Wind Post L reduction

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.977$ m (Eqn. 5.8), $L=9.400$ m, $L_{ef}=9.400$ mWind post assumed to act as stiffener, $L=6.700$ m, $L_{ef}=6.700$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1.9$, $Y=0.85$ - Two way spanningopening at $X=7.4$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.5 < \lambda_{lim}=27$, $L_{wp}/t_{ef}=52.5$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 46.9$ (F.1)

0.574

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.022$ N/mm² $f_{kk1}=f_{-k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=1.205$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.07 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=4.013$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.87 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2080$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.080$

0.717

Wind Post Stiffening

Wind post Is assumed To act As stiffener, influencing h_{ef} $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.717 \times 4.5 \times 102.5/2.6$

127.3 kN/m

 F_d/F_r $6.9/127.3$

0.054

OK

Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Cloud 3b89b	Job Ref : 10056 Sheet : /103 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :	
Mro= $f_{kk2} \cdot Z_p / \gamma_{mf}$	1.1x1751/2.3		0.837 kN.m/m	
Mro= $f_{kk1} \cdot Z_b / \gamma_{mf}$	0.451x1751/2.3		0.343 kN.m/m	
Inner-Leaf Design				
Partial Safety Factor ($\gamma_{mc} / \gamma_{mf}$)	Construction Class I, Unit Manufacture II	2.6/2.3	Table NA.1	
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m ³			
	Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm ²			
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²		
Mortar Material	M4, $f_m = 4$ N/mm ²			
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4	
Loads @ this level	Dead Load=3.5 kN/m, Live Load=3.5 kN/m, $e_x = 17$ mm			
Section Properties	Area=1000 cm ² /m, $Z_p = 1667$ cm ³ /m			
Flexural Strength f_{kk2} (Perpendicular)		0.734 N/mm ²	Table NA.6	
Flexural Strength f_{kk1} (Parallel)	$f_{kk1} = 0.25, g_d = 0.041$ N/mm ²			
	$f_{kk1} = f_{k1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$	0.345 N/mm ²	Table NA.6	
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$			
Max local stress @	$X = 3.5$ m, $Y = 1.25$ m < f_k / γ_{mc}	0.22 N/mm ²	OK	
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k + 0.75(W_x)$			
Max axial buckling force @	$X = 4$ m, $Y = 1.25$ m averaged over width Of 1 m	19.05 kN/m		
Moments from Lateral Load	$M_{wx, top} = 0.000$ kN.m, $M_{wx, mid} = 0.123$ kN.m			
Capacity reduction factor top, Φ	$e_x = 17.0$ mm, $h_{ef} = 2080$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm	0.567		
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.124$ mm, $h_{ef} = 2.080$	0.539		
Wind Post Stiffening	Wind post Is assumed To act As stiffener, influencing h_{ef}			
$F_r = \Phi \cdot f_{kt} / \gamma_{mc}$	$0.539 \times 5.73 \times 100 / 2.6$	118.8 kN/m		
F_d / F_r	$19.1 / 118.8$	0.160	OK	
$M_{ri} = f_{kk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m		
$M_{ri} = f_{kk1} \cdot Z_b / \gamma_{mf}$	$0.345 \times 1667 / 2.3$	0.25 kN.m/m		
Design For Lateral Loads				
Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²		
Wind Post Data	Base pinned, Top pinned, Major axis bending			
Leaf Continuity at Wind Posts	Inner leaf continuous, outer leaf continuous			
Wind posts at 6.7m	Buttress, $M_{el} = 1.98$ kN.m			
Yield Line Analysis	Load Factor λ_p	1.060		
$U_t = 1 / \lambda_p$	$1 / 1.060$	0.943	OK	
Wind Post Design	Full restrained moment capacity implicitly checked in yield line analysis. The yield line analysis considers the combined bending of the post and wall. Wind post service deflection not checked.			

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /104

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

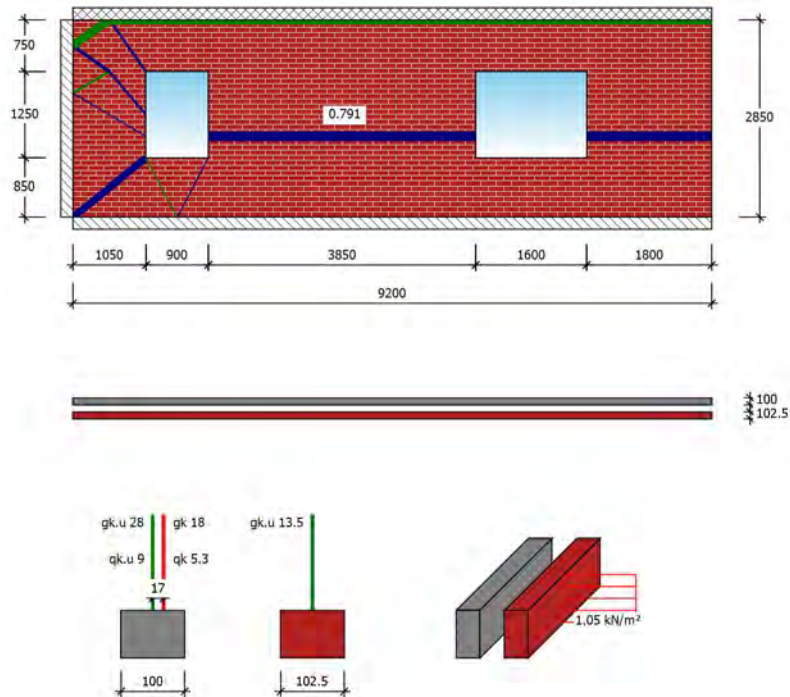
Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall L GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.474$ m (Eqn. 5.6), $L=9.200$ m, $L_{ef}=9.200$ m

Bottom Simple, Top Cont., Left Simple, Right Free

 $W_x=1.05$ kN/m²opening at $X=5.8$, $Y=0.85$ - Two way spanningopening at $X=1.05$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=19.4 < \lambda_{lim}=27.1$, $1/t_{ef}=72.1$, $H/t_{ef}=22.3$. Hence $H/t_{ef} \leq 30$ (F.2) 0.745 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.157$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=7.4$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.48 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=5.288$ m, $Y=1.425$ m averaged over width Of 1.025 m

40.84 kN/m

Moments from Lateral Load

 $M_{w, top}=0.336$ kN.m, $M_{w, mid}=0.189$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2494$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.292$ mm, $h_{ef}=2,494$

0.624

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.624 \times 4.5 \times 102.5/2.6$

110.9 kN/m

 F_d/F_r

40.8/110.9

0.368

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /105

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 10.4 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 10.4 \cdot 1.38$ 14.35 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 7.34 N/mm² Table NA.4

Loads from above

Dead Load = 28.0 kN/m, Live Load = 9.0 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.833 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.467 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 1.224 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 7.4 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 1.78 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 7.9 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

144.23 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.508 \text{ kN.m}, M_{wx, mid} = 0.286 \text{ kN.m}$ Capacity reduction factor top, Φ

0.758

Capacity reduction factor mid, Φ_m

0.550

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.550 \times 7.34 \times 100 / 2.6$

155.2 kN/m

Fd/Fr

144.2/155.2

0.929

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.833 \times 1667 / 2.3$

0.604 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $1.224 \times 1667 / 2.3$

0.887 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.265

 $U_t = 1 / \lambda_p$

1 / 1.265

0.791

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

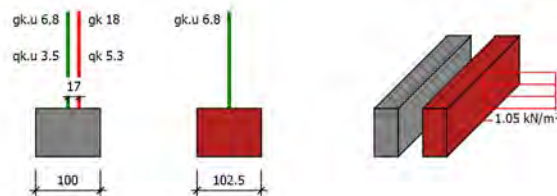
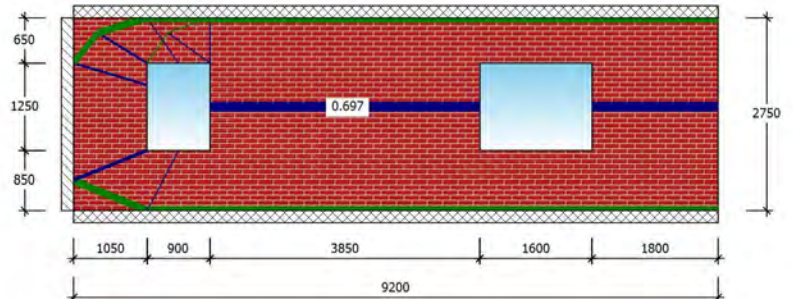
Sheet : /106

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012**Wall L 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=2.051$ m (Eqn. 5.6), $L=9.200$ m, $L_{ef}=9.200$ m

Bottom Cont., Top Cont., Left Simple, Right Free

 $W_x=1.05$ kN/m²opening at $X=5.8$, $Y=0.85$ - Two way spanningopening at $X=1.05$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=16.1 < \lambda_{lim}=27.1$, $l/t_{ef}=72.1$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 30$ (F.2) 0.718 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$

12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$

4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)

1.1 N/mm² Table NA.6

Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$

0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=5.177$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$

0.28 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=7.913$ m, $Y=1.375$ m averaged over width Of 1.025 m

24.18 kN/m

Moments from Lateral Load

 $M_{w,x,top}=0.000$ kN.m, $M_{w,x,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

Fd/Fr

24.2/127.9

0.189

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /107

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 6.8 kN/m, Live Load = 3.5 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.255 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.836 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 7.4 \text{ m}, Y = 1.375 \text{ m} < f_k / \gamma_{mc}$ 0.99 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 7.9 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 1 m

81.56 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.269 \text{ kN.m}, M_{wx, mid} = 0.135 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 11.7 \text{ mm}, h_{ef} = 2063 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.674

Capacity reduction factor mid, Φ_m $e_{hm} = 0.133 \text{ mm}, h_{ef} = 2.063$

0.600

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.600 \times 5.73 \times 100 / 2.6$

132.2 kN/m

Fd/Fr

81.6/132.2

0.617

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.836 \times 1667 / 2.3$

0.606 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.435

 $U_t = 1 / \lambda_p$

1 / 1.435

0.697

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

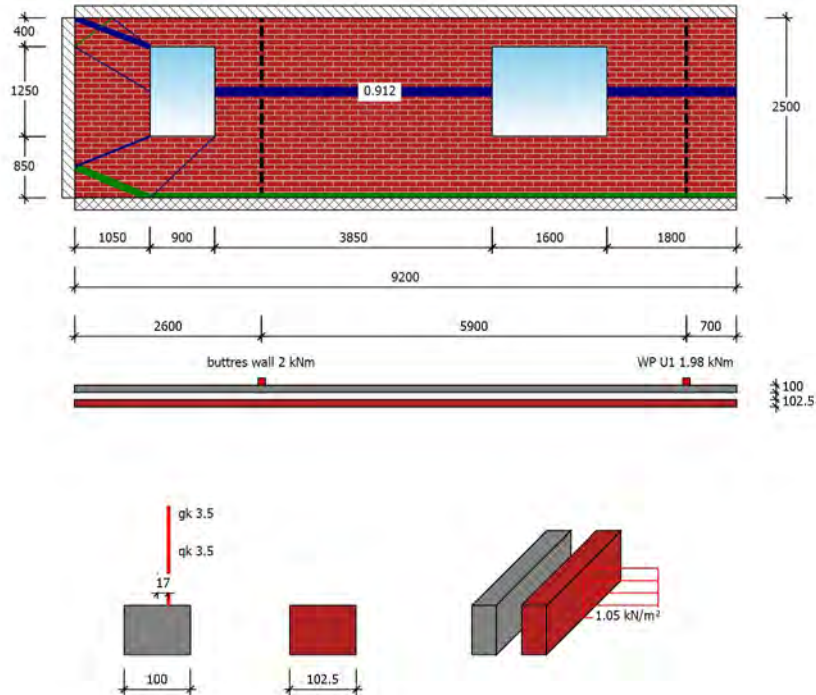
Sheet : /108

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall L 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Wind Post L reduction

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.923$ m (Eqn. 5.8), $L=9.200$ m, $L_{ef}=9.200$ mWind post assumed to act as stiffener, $L=5.900$ m, $L_{ef}=5.900$ m

Bottom Cont., Top Simple, Left Simple, Right Free

 $W_x=1.05$ kN/m²opening at $X=5.8$, $Y=0.85$ - Two way spanningopening at $X=1.05$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.1 < \lambda_{lim}=27$, $L_{wp}/t_{ef}=46.2$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 43.8$ (F.2)

0.558

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$

12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$

4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)

1.1 N/mm² Table NA.6

Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.022$ N/mm² $f_{kk1}=f_{-k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$

0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=5.105$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$

0.07 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=5.288$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.87 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2080$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.080$

0.717

Wind Post Stiffening

Wind post Is assumed To act As stiffener, influencing h_{ef} $F_r=\Phi \cdot f_k \cdot tk/\gamma_{mc}$ $0.717 \times 4.5 \times 102.5/2.6$

127.3 kN/m

 F_d/F_r $6.9/127.3$

0.054

OK

Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Cloud 3b89b	Job Ref : 10056 Sheet : /109 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :	
Mro= $f_{kk2} \cdot Z_p / \gamma_{mf}$	1.1x1751/2.3		0.837 kN.m/m	
Mro= $f_{kk1} \cdot Z_b / \gamma_{mf}$	0.451x1751/2.3		0.343 kN.m/m	
Inner-Leaf Design				
Partial Safety Factor ($\gamma_{mc} / \gamma_{mf}$)	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1	
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m ³			
	Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm ²			
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²		
Mortar Material	M4, $f_m = 4$ N/mm ²			
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4	
Loads @ this level	Dead Load=3.5 kN/m, Live Load=3.5 kN/m, $e_x = 17$ mm			
Section Properties	Area=1000 cm ² /m, $Z_p = 1667$ cm ³ /m			
Flexural Strength f_{kk2} (Perpendicular)		0.734 N/mm ²	Table NA.6	
Flexural Strength f_{kk1} (Parallel)	$f_{kk1} = 0.25, g_d = 0.041$ N/mm ²			
	$f_{kk1} = f_{-k1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$	0.345 N/mm ²	Table NA.6	
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$			
Max local stress @	$X = 7.4$ m, $Y = 1.25$ m < f_k / γ_{mc}	0.22 N/mm ²	OK	
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k + 0.75(W_x)$			
Max axial buckling force @	$X = 5.3$ m, $Y = 1.25$ m averaged over width Of 1 m	19.05 kN/m		
Moments from Lateral Load	$M_{w_x, top} = 0.000$ kN.m, $M_{w_x, mid} = 0.119$ kN.m			
Capacity reduction factor top, Φ	$e_x = 17.0$ mm, $h_{ef} = 2080$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm	0.568		
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.120$ mm, $h_{ef} = 2.080$	0.540		
Wind Post Stiffening	Wind post Is assumed To act As stiffener, influencing h_{ef}			
$F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$	$0.540 \times 5.73 \times 100 / 2.6$	118.9 kN/m		
F_d / F_r	$19.1 / 118.9$	0.160	OK	
$M_{ri} = f_{kk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m		
$M_{ri} = f_{kk1} \cdot Z_b / \gamma_{mf}$	$0.345 \times 1667 / 2.3$	0.25 kN.m/m		
Design For Lateral Loads				
Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²		
Wind Post Data	Base pinned, Top pinned, Major axis bending			
Leaf Continuity at Wind Posts	Inner leaf continuous, outer leaf continuous			
Wind posts at 8.5m	WP U1, $M_{el} = 1.98$ kN.m			
Wind posts at 2.6m	buttres wall, $M_{el} = 2$ kN.m			
Yield Line Analysis	Load Factor, λ_p	1.096		
$U_t = 1 / \lambda_p$	$1 / 1.096$	0.912	OK	
Wind Post Design	Full restrained moment capacity implicitly checked in yield line analysis. The yield line analysis considers the combined bending of the post and wall. Wind post service deflection not checked.			

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /110

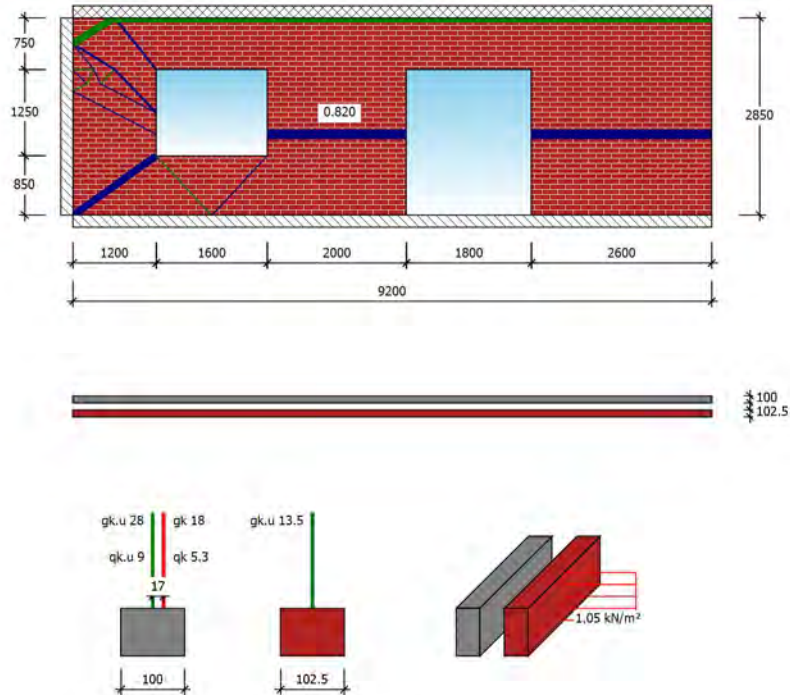
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall M GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.474$ m (Eqn. 5.6), $L=9.200$ m, $L_{ef}=9.200$ m

Bottom Simple, Top Cont., Left Simple, Right Free

 $W_x=1.05$ kN/m²opening at $X=4.8$, $Y=0$ - Two way spanningopening at $X=1.2$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=19.4 < \lambda_{lim}=27.1$, $1/t_{ef}=72.1$, $H/t_{ef}=22.3$. Hence $H/t_{ef} \leq 30$ (F.2) 0.745 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.157$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=4.206$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.52 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k) + 0.75(W_x)$

Moments from Lateral Load

 $X=4.288$ m, $Y=1.425$ m averaged over width Of 1.025 m

42.8 kN/m

Capacity reduction factor top, Φ $M_{w, top}=0.349$ kN.m, $M_{w, mid}=0.196$ kN.m

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.303$ mm, $e_{ef}=2.494$

0.624

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.624 \times 4.5 \times 102.5/2.6$

110.8 kN/m

Fd/Fr

42.8/110.8

0.386

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /111

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 10.4 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 10.4 \cdot 1.38$ 14.35 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 7.34 N/mm² Table NA.4

Loads from above

Dead Load = 28.0 kN/m, Live Load = 9.0 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.833 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.467 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 1.224 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 4.211 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 1.91 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 7.1 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

152.17 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.527 \text{ kN.m}, M_{wx, mid} = 0.297 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 6.6 \text{ mm}, h_{ef} = 2494 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.758

Capacity reduction factor mid, Φ_m $e_{hm} = 0.303 \text{ mm}, h_{ef} = 2.494$

0.550

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.550 \times 7.34 \times 100 / 2.6$

155.2 kN/m

 F_d / F_r $152.2 / 155.2$

0.981

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.833 \times 1667 / 2.3$

0.604 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $1.224 \times 1667 / 2.3$

0.887 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.219

 $U_t = 1 / \lambda_p$ $1 / 1.219$

0.820

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

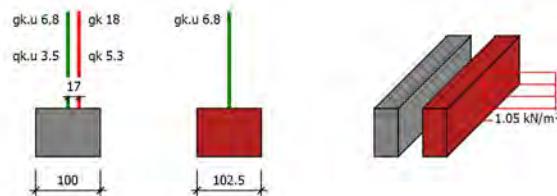
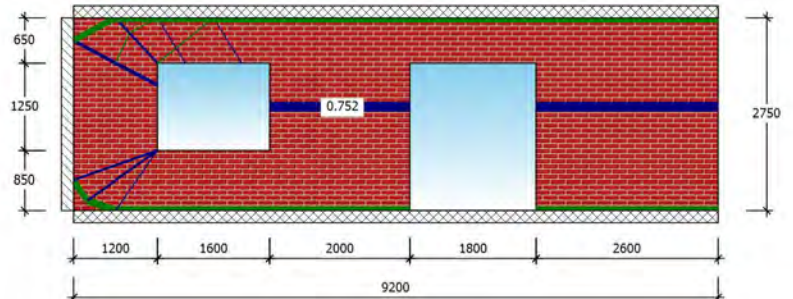
Sheet : /112

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall M 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=2.051$ m (Eqn. 5.6), $L=9.200$ m, $L_{ef}=9.200$ m

Bottom Cont., Top Cont., Left Simple, Right Free

 $W_x=1.05$ kN/m²opening at $X=4.8$, $Y=0$ - Two way spanningopening at $X=1.2$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=16.1 < \lambda_{lim}=27.1$, $l/t_{ef}=72.1$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 30$ (F.2) 0.718 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=4.177$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.3 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=4.288$ m, $Y=1.375$ m averaged over width Of 1.025 m

25.23 kN/m

Moments from Lateral Load

 $M_{w,x,top}=0.000$ kN.m, $M_{w,x,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

 F_d/F_r $25.2/127.9$

0.197

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /113

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 6.8 kN/m, Live Load = 3.5 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.255 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.836 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 4.182 \text{ m}, Y = 1.375 \text{ m} < f_k / \gamma_{mc}$ 1.07 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 7.1 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 1 m

86.02 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.290 \text{ kN.m}, M_{wx, mid} = 0.145 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 11.7 \text{ mm}, h_{ef} = 2063 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.674

Capacity reduction factor mid, Φ_m $e_{hm} = 0.144 \text{ mm}, h_{ef} = 2.063$

0.600

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.600 \times 5.73 \times 100 / 2.6$

132.1 kN/m

 F_d / F_r $86.0 / 132.1$

0.651

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.836 \times 1667 / 2.3$

0.606 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.331

 $U_t = 1 / \lambda_p$ $1 / 1.331$

0.752

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

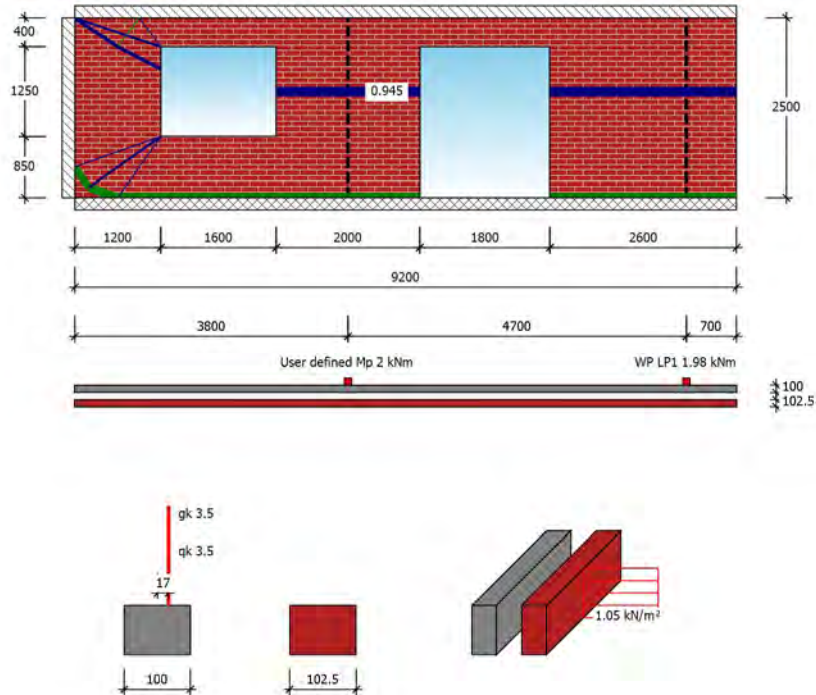
Sheet : /114

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall M 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Wind Post L reduction

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.798$ m (Eqn. 5.8), $L=9.200$ m, $L_{ef}=9.200$ mWind post assumed to act as stiffener, $L=4.700$ m, $L_{ef}=4.700$ m

Bottom Cont., Top Simple, Left Simple, Right Free

 $W_x=1.05$ kN/m²opening at $X=4.8$, $Y=0$ - Two way spanningopening at $X=1.2$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=14.1 < \lambda_{lim}=27$, $L_{wp}/t_{ef}=36.8$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 53.2$ (F.2)

0.522

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$

12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$

4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)

1.1 N/mm² Table NA.6

Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.022$ N/mm² $f_{kk1}=f_{-k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$

0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=4.105$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$

0.07 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=7.113$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.97 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1907$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.907$

0.747

Wind Post Stiffening

Wind post Is assumed To act As stiffener, influencing h_{ef} $F_r=\Phi \cdot f_k \cdot tk/\gamma_{mc}$ $0.747 \times 4.5 \times 102.5/2.6$

132.6 kN/m

 F_d/F_r

7.0/132.6

0.053

OK

Barter Hill Partnerships Ltd 15 Meridian Way, Meridian Business Park Norwich, GB NR7 0TA 01279430888		Cloud 3b89b	Job Ref : 10056 Sheet : /115 Made by : VM Date : 02 September 2024 / Ver. 2023.19.22 Checked : Approved :	
Mro= $f_{kk2} \cdot Z_p / \gamma_{mf}$	1.1x1751/2.3		0.837 kN.m/m	
Mro= $f_{kk1} \cdot Z_b / \gamma_{mf}$	0.451x1751/2.3		0.343 kN.m/m	
Inner-Leaf Design				
Partial Safety Factor ($\gamma_{mc} / \gamma_{mf}$)	Construction Class I, Unit Manufacture II	2.6/2.3	Table NA.1	
Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m ³			
	Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm ²			
	Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$	10.07 N/mm ²		
Mortar Material	M4, $f_m = 4$ N/mm ²			
Compressive Strength (f_k)	$k = 0.75, \alpha = 0.7, \beta = 0.3$	5.73 N/mm ²	Table NA.4	
Loads @ this level	Dead Load=3.5 kN/m, Live Load=3.5 kN/m, $e_x = 17$ mm			
Section Properties	Area=1000 cm ² /m, $Z_p = 1667$ cm ³ /m			
Flexural Strength f_{kk2} (Perpendicular)		0.734 N/mm ²	Table NA.6	
Flexural Strength f_{kk1} (Parallel)	$f_{kk1} = 0.25, g_d = 0.041$ N/mm ²			
	$f_{kk1} = f_{k1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$	0.345 N/mm ²	Table NA.6	
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$			
Max local stress @	$X = 4.11$ m, $Y = 1.25$ m < f_k / γ_{mc}	0.24 N/mm ²	OK	
Critical axial buckling Case	$1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$			
Max axial buckling force @	$X = 7.1$ m, $Y = 1.25$ m averaged over width Of 1 m	20.04 kN/m		
Moments from Lateral Load	$M_{wx, top} = 0.000$ kN.m, $M_{wx, mid} = 0.000$ kN.m			
Capacity reduction factor top, Φ	$e_x = 17.0$ mm, $h_{ef} = 1907$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm	0.575		
Capacity reduction factor mid, Φ_m	$e_{hm} = 0.000$ mm, $h_{ef} = 1.907$	0.581		
Wind Post Stiffening	Wind post Is assumed To act As stiffener, influencing h_{ef}			
$F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$	$0.575 \times 5.73 \times 100 / 2.6$	126.7 kN/m		
F_d / F_r	$20.0 / 126.7$	0.158	OK	
$M_{ri} = f_{kk2} \cdot Z_p / \gamma_{mf}$	$0.734 \times 1667 / 2.3$	0.532 kN.m/m		
$M_{ri} = f_{kk1} \cdot Z_b / \gamma_{mf}$	$0.345 \times 1667 / 2.3$	0.25 kN.m/m		
Design For Lateral Loads				
Design Lateral Load W_d	1.5 W_x	1.575 kN/m ²		
Wind Post Data	Base pinned, Top pinned, Major axis bending			
Leaf Continuity at Wind Posts	Inner leaf continuous, outer leaf continuous			
Wind posts at 8.5m	WP LP1, $M_{el} = 1.98$ kN.m			
Wind posts at 3.8m	, $M_{el} = 2$ kN.m			
Yield Line Analysis	Load Factor, λ_p	1.058		
$U_t = 1 / \lambda_p$	$1 / 1.058$	0.945	OK	
Wind Post Design	Full restrained moment capacity implicitly checked in yield line analysis. The yield line analysis considers the combined bending of the post and wall. Wind post service deflection not checked.			

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /116

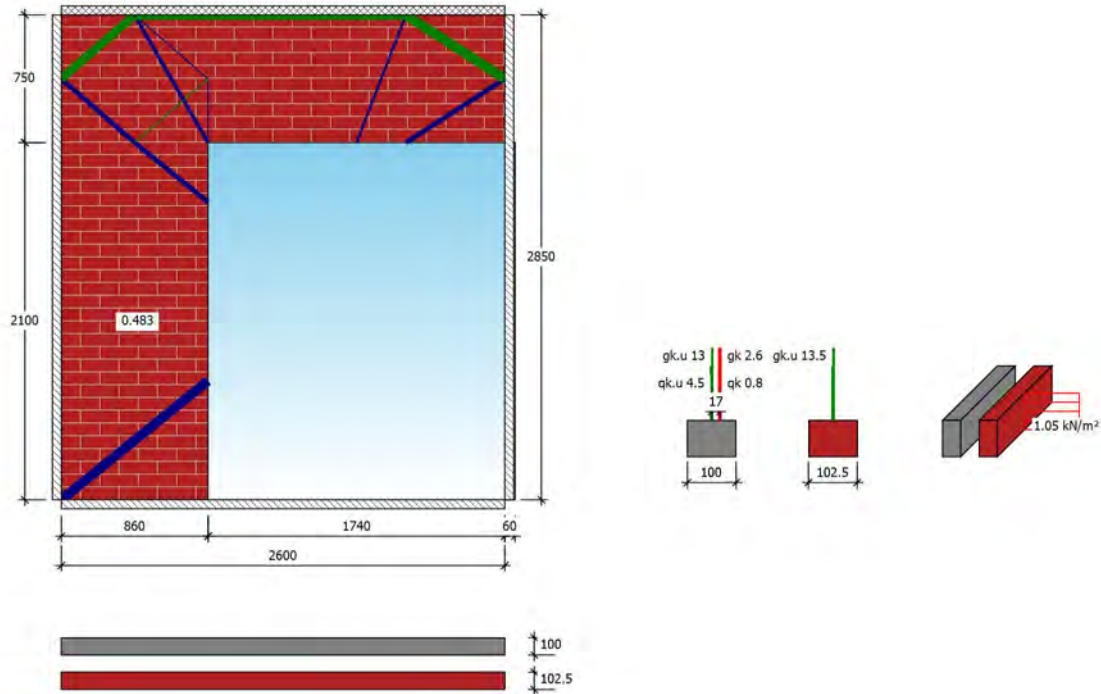
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall N GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.299$ m (Eqn. 5.8), $L=2.600$ m, $L_{ef}=2.600$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=10.2 \leq \lambda_{lim}=27$, $L/t_{ef}=20.4$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.377 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.157$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0.766$ m, $Y=1.425$ m $< f_k \cdot 0.96$ (small area red.) γ_{mc} 0.56 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max axial buckling force @

 $X=0.43$ m, $Y=1.425$ m averaged over width Of 0.86 m

49.52 kN/m

Moments from Lateral Load

 $M_{wx, top}=0.000$ kN.m, $M_{wx, mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1299$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.299$

0.836

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.836 \times 4.34 \times 102.5/2.6$

143.0 kN/m

Fd/Fr

49.5/143.0

0.346

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /117

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m³Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm²Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4$ N/mm²

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=13.0 kN/m, Live Load=4.5 kN/m

Loads @ this level

Dead Load=2.6 kN/m, Live Load=0.75 kN/m, $e_x = 17$ mm

Section Properties

Area=1000 cm²/m, $Z_p = 1667$ cm³/mFlexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.163$ N/mm² $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.625 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.271$ m, $Y = 1.425$ m < $f_k \cdot 0.96$ (small area red.) γ_{mc} 0.74 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.43$ m, $Y = 1.425$ m averaged over width Of 0.86 m

62.89 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000$ kN.m, $M_{wx, mid} = 0.000$ kN.mCapacity reduction factor top, Φ $e_x = 2.7$ mm, $h_{ef} = 1299$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm

0.888

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000$ mm, $h_{ef} = 1.299$

0.836

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.836 \times 5.49 \times 100 / 2.6$

176.3 kN/m

Fd/Fr

 $62.9 / 176.3$

0.357

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.625 \times 1667 / 2.3$

0.453 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

2.069

 $U_t = 1 / \lambda_p$ $1 / 2.069$

0.483

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /118

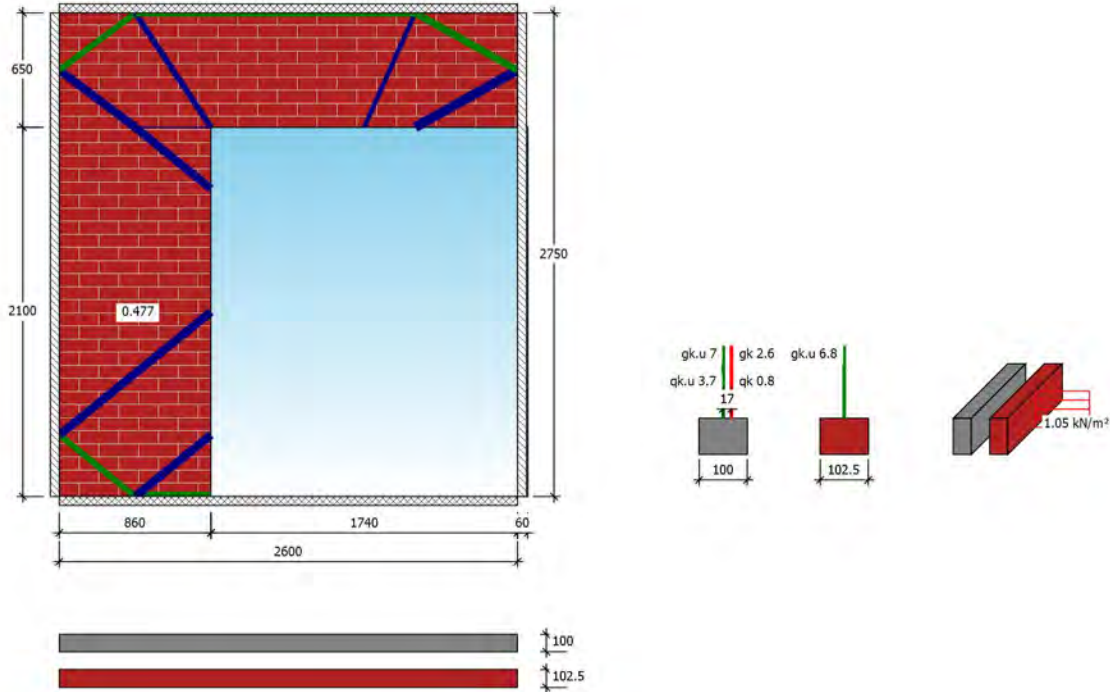
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall N 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.266$ m (Eqn. 5.8), $L=2.600$ m, $L_{ef}=2.600$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.9 < \lambda_{lim}=27$, $L/t_{ef}=20.4$, $H/t_{ef}=21.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.367 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.09$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0.237$ m, $Y=1.375$ m $< f_k \cdot 0.96$ (small area red.) γ_{mc} 0.31 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max axial buckling force @

 $X=0.43$ m, $Y=1.375$ m averaged over width Of 0.86 m

28.58 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1266$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.266$

0.839

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.839 \times 4.34 \times 102.5/2.6$

143.7 kN/m

Fd/Fr

28.6/143.7

0.199

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /119

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 7.0 kN/m, Live Load = 3.7 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.75 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.103 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.486 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.242 \text{ m}, Y = 1.375 \text{ m} < f_k \cdot 0.96 (\text{small area red.}) / \gamma_{mc}$ 0.5 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.43 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 0.86 m

43.08 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 4.0 \text{ mm}, h_{ef} = 1266 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.864

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.266$

0.839

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.839 \times 5.49 \times 100 / 2.6$

177.1 kN/m

Fd/Fr

 $43.1 / 177.1$

0.243

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.486 \times 1667 / 2.3$

0.352 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

2.099

 $U_t = 1 / \lambda_p$ $1 / 2.099$

0.477

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /120

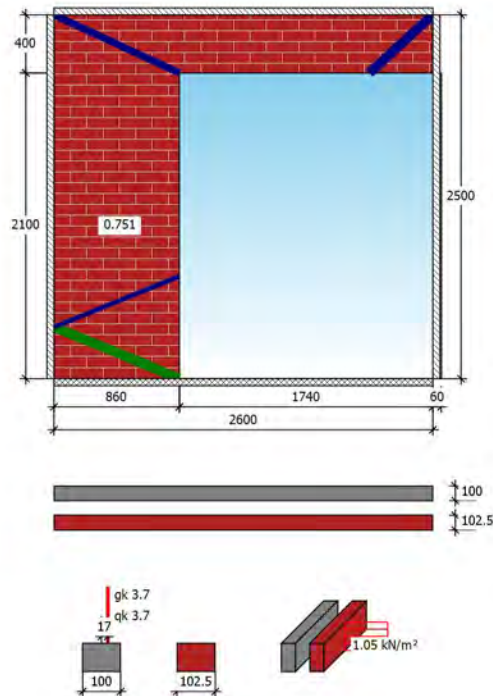
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall N 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.281$ m (Eqn. 5.8), $L=2.600$ m, $L_{ef}=2.600$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=10 \leq \lambda_{lim}=27$, $L/t_{ef}=20.4$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.372 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.165$ m, $Y=1.25$ m < $f_k \cdot 0.96$ (small area red.) γ_{mc} 0.07 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=0.43$ m, $Y=1.25$ m averaged over width Of 0.86 m

7.21 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1281$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.281$

0.838

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.838 \times 4.34 \times 102.5/2.6$

143.4 kN/m

Fd/Fr

7.2/143.4

0.050

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751/2.3$

0.343 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /121

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 3.7 kN/m, Live Load = 3.7 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.043 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$ 0.349 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X = 0.17 \text{ m}, Y = 1.25 \text{ m} < f_k \cdot 0.96 (\text{small area red.}) / \gamma_{mc}$ 0.26 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$

Moments from Lateral Load

 $X = 0.43 \text{ m}, Y = 1.25 \text{ m}$ averaged over width Of 0.86 m

23.48 kN/m

Capacity reduction factor top, Φ $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor mid, Φ_m $e_x = 17.0 \text{ mm}, h_{ef} = 1281 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.603

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.281$

0.706

Fd/Fr

 $0.603 \times 5.49 \times 100 / 2.6$

127.2 kN/m

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$

23.5/127.2

0.185

OK

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $0.349 \times 1667 / 2.3$

0.253 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.332

 $U_t = 1 / \lambda_p$

1 / 1.332

0.751

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

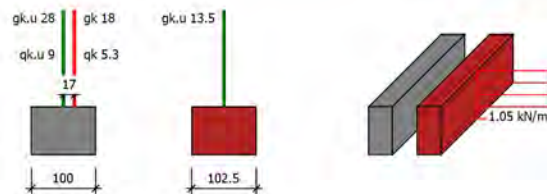
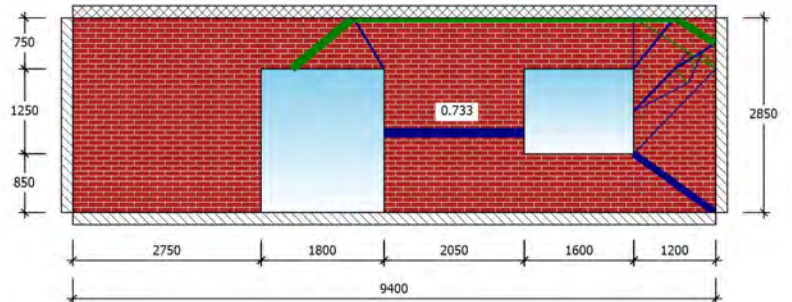
Sheet : /122

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall P GF****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.330$ m (Eqn. 5.8), $L=9.400$ m, $L_{ef}=9.400$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=2.75$, $Y=0$ - Two way spanningopening at $X=6.6$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=18.3 < \lambda_{lim}=27$, $1/t_{ef}=73.7$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 41.6$ (F.1) 0.676 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$

12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$

4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)

1.1 N/mm² Table NA.6

Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.157$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$

0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=2.156$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$

0.52 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=5.063$ m, $Y=1.425$ m averaged over width Of 1.025 m

42.8 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.312$ kN.m, $M_{wx,mid}=0.175$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2494$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.892

Capacity reduction factor mid, Φ_m $e_{hm}=0.271$ mm, $h_{ef}=2,494$

0.625

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.625 \times 4.5 \times 102.5/2.6$

110.9 kN/m

Fd/Fr

42.8/110.9

0.386

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /123

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 10.4 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 10.4 \cdot 1.38$ 14.35 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 7.34 N/mm² Table NA.4

Loads from above

Dead Load = 28.0 kN/m, Live Load = 9.0 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.833 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.467 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 1.224 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 2.161 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 1.91 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 5.05 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

152.17 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.472 \text{ kN.m}, M_{wx, mid} = 0.265 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 6.6 \text{ mm}, h_{ef} = 2494 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.758

Capacity reduction factor mid, Φ_m $e_{hm} = 0.271 \text{ mm}, h_{ef} = 2.494$

0.551

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.551 \times 7.34 \times 100 / 2.6$

155.4 kN/m

 F_d / F_r

152.2 / 155.4

0.979

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.833 \times 1667 / 2.3$

0.604 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $1.224 \times 1667 / 2.3$

0.887 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.364

 $U_t = 1 / \lambda_p$

1 / 1.364

0.733

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

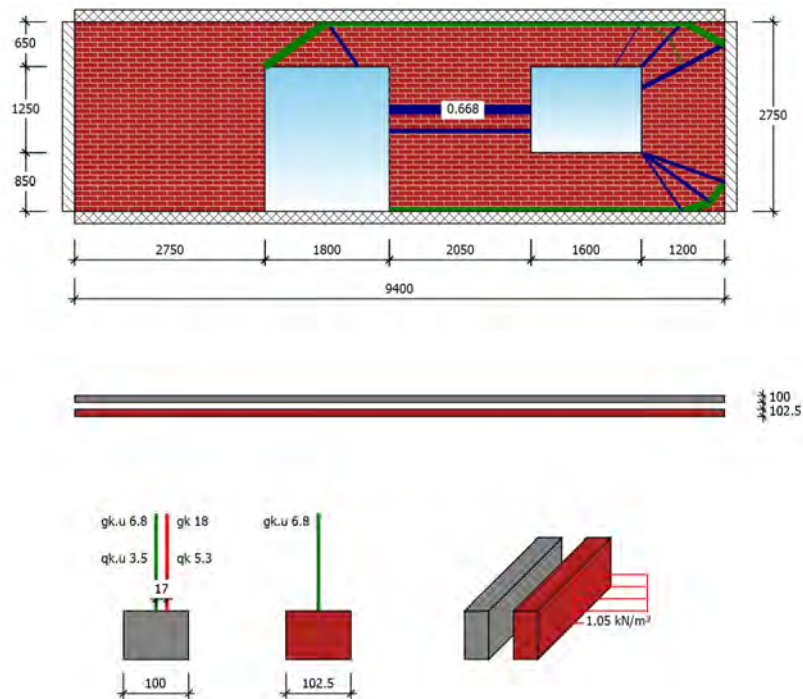
Sheet : /124

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

**Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall
Design to BS EN 1996-1-1:2005+A1:2012****Wall P 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.968$ m (Eqn. 5.8), $L=9.400$ m, $L_{ef}=9.400$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=2.75$, $Y=0$ - Two way spanningopening at $X=6.6$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15.4 < \lambda_{lim}=27.1$, $l/t_{ef}=73.7$, $H/t_{ef}=21.6$. Hence $H/t_{ef} \leq 41.6$ (F.1) 0.571 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.09$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=2.127$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.3 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=5.063$ m, $Y=1.375$ m averaged over width Of 1.025 m

25.23 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2063$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.063$

0.720

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.720 \times 4.5 \times 102.5/2.6$

127.9 kN/m

 F_d/F_r $25.2/127.9$

0.197

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /125

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 6.8 kN/m, Live Load = 3.5 kN/m

Loads @ this level

Dead Load = 18.0 kN/m, Live Load = 5.3 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.255 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.836 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 2.132 \text{ m}, Y = 1.375 \text{ m} < f_k / \gamma_{mc}$ 1.07 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 5.05 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 1 m

86.02 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.258 \text{ kN.m}, M_{wx, mid} = 0.129 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 11.7 \text{ mm}, h_{ef} = 2063 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.674

Capacity reduction factor mid, Φ_m $e_{hm} = 0.128 \text{ mm}, h_{ef} = 2.063$

0.600

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.600 \times 5.73 \times 100 / 2.6$

132.2 kN/m

 F_d / F_r $86.0 / 132.2$

0.651

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.836 \times 1667 / 2.3$

0.606 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.497

 $U_t = 1 / \lambda_p$ $1 / 1.497$

0.668

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

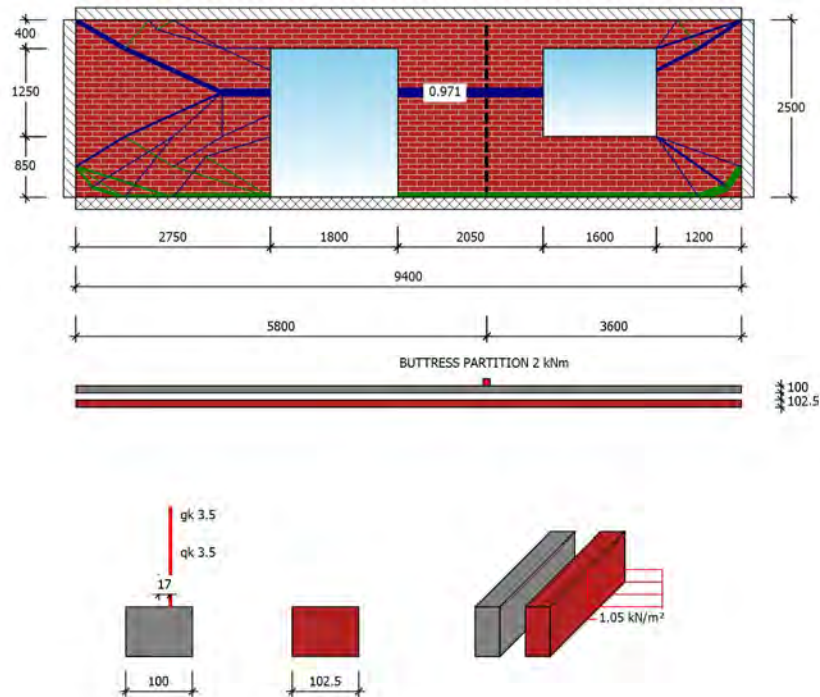
Sheet : /126

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall P 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Wind Post L reduction

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.915$ m (Eqn. 5.8), $L=9.400$ m, $L_{ef}=9.400$ mWind post assumed to act as stiffener, $L=5.800$ m, $L_{ef}=5.800$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=2.75$, $Y=0$ - Two way spanningopening at $X=6.6$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=15 < \lambda_{lim}=27$, $L_{wp}/t_{ef}=45.5$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 48.6$ (F.1) 0.556 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=2.055$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.07 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=2.238$ m, $Y=1.25$ m averaged over width Of 1.025 m

6.97 kN/m

Moments from Lateral Load

 $M_{w,x,top}=0.000$ kN.m, $M_{w,x,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=2044$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.044$

0.724

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.724 \times 4.5 \times 102.5/2.6$

128.4 kN/m

 F_d/F_r $7.0/128.4$

0.054

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751/2.3$

0.343 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /127

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 3.5 kN/m, Live Load = 3.5 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.041 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$ 0.345 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ 0.24 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k + 0.75(W_x)$

20.04 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.127 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 17.0 \text{ mm}, h_{ef} = 2044 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.569

Capacity reduction factor mid, Φ_m $e_{hm} = 0.128 \text{ mm}, h_{ef} = 2.044$

0.548

 $F_r = \Phi \cdot f_{kt} / \gamma_{mc}$ $0.548 \times 5.73 \times 100 / 2.6$

120.6 kN/m

Fd/Fr

20.0/120.6

0.166

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.345 \times 1667 / 2.3$

0.25 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Wind Post Data

Base pinned, Top pinned, Major axis bending

Leaf Continuity at Wind Posts

Inner leaf continuous, outer leaf continuous

Wind posts at 5.8m

BUTTRESS PARTITION, $M_{el} 2 \text{ kN.m}$

Yield Line Analysis

Load Factor λ_p

1.030

 $U_t = 1 / \lambda_p$

1 / 1.030

0.971

OK

Node Density Caution

Consider increasing the node density as the solution is close to failure

Warning

Yield Line Design Caution

For walls with openings a 5% design reserve is recommended to account for the possibility that most critical yield line pattern may not have been achieved.

Full restrained moment capacity implicitly checked in yield line analysis.

The yield line analysis considers the combined bending of the post and wall.

Wind Post Design

Wind post service deflection not checked.

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /128

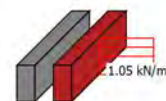
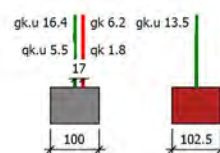
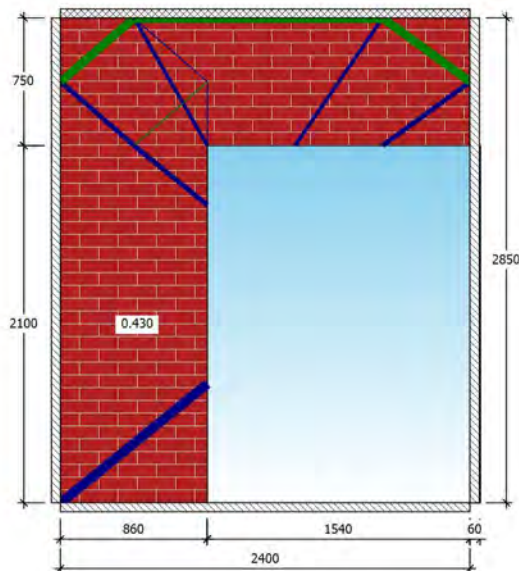
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall W GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.200$ m (Eqn. 5.9), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.4 \leq \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.348 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.157$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0.266$ m, $Y=1.425$ m $< f_k \cdot 0.96$ (small area red.) γ_{mc} 0.52 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max axial buckling force @

 $X=0.43$ m, $Y=1.425$ m averaged over width Of 0.86 m

47.09 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1200$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.200$

0.847

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.847 \times 4.34 \times 102.5/2.6$

145.0 kN/m

Fd/Fr

47.1/145.0

0.325

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /129

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m³Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm²Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4$ N/mm²Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 16.4 kN/m, Live Load = 5.5 kN/m

Loads @ this level

Dead Load = 6.2 kN/m, Live Load = 1.8 kN/m, $e_x = 17$ mm

Section Properties

Area = 1000 cm²/m, $Z_p = 1667$ cm³/mFlexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.233$ N/mm² $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.786 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.271$ m, $Y = 1.425$ m < $f_k \cdot 0.96$ (small area red.) / γ_{mc} 0.98 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 0.43$ m, $Y = 1.425$ m averaged over width Of 0.86 m

84.25 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.195$ kN.m, $M_{wx, mid} = 0.109$ kN.mCapacity reduction factor top, Φ $e_x = 4.5$ mm, $h_{ef} = 1200$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm

0.856

Capacity reduction factor mid, Φ_m $e_{hm} = 0.143$ mm, $h_{ef} = 1.200$

0.845

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.845 \times 5.49 \times 100 / 2.6$

178.4 kN/m

 F_d / F_r $84.2 / 178.4$

0.472

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.786 \times 1667 / 2.3$

0.569 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

2.326

 $U_t = 1 / \lambda_p$ $1 / 2.326$

0.430

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

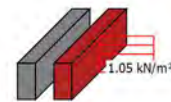
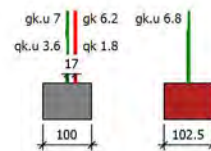
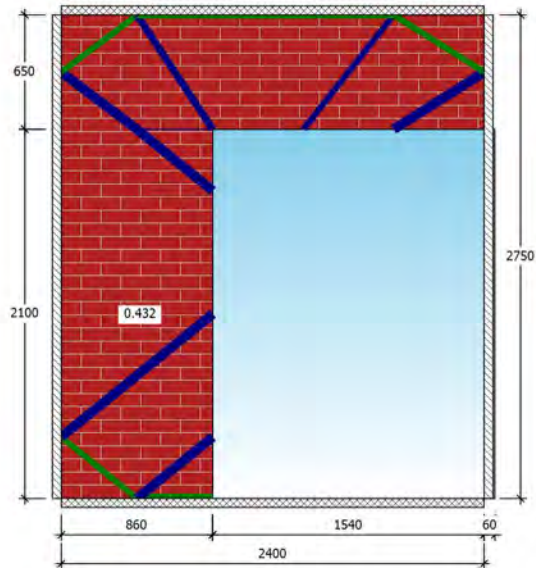
Sheet : /130

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall W 1F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.186$ m (Eqn. 5.8), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.3 < \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=21.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.344 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.09$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0.237$ m, $Y=1.375$ m $< f_k \cdot 0.96$ (small area red.) γ_{mc} 0.3 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max axial buckling force @

 $X=0.43$ m, $Y=1.375$ m averaged over width Of 0.86 m

27.29 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1186$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.186$

0.848

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.848 \times 4.34 \times 102.5/2.6$

145.2 kN/m

 F_d/F_r

27.3/145.2

0.188

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /131

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 7.0 kN/m, Live Load = 3.6 kN/m

Loads @ this level

Dead Load = 6.2 kN/m, Live Load = 1.8 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.139 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.569 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.242 \text{ m}, Y = 1.375 \text{ m} < f_k \cdot 0.96 (\text{small area red.}) / \gamma_{mc}$ 0.61 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.43 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 0.86 m

53.05 kN/m

Moments from Lateral Load

 $M_{wx, \text{top}} = 0.000 \text{ kN.m}, M_{wx, \text{mid}} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 7.2 \text{ mm}, h_{ef} = 1186 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.803

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.186$

0.823

 $F_r = \Phi \cdot f_{k,tk} / \gamma_{mc}$ $0.803 \times 5.49 \times 100 / 2.6$

169.4 kN/m

Fd/Fr

 $53.1 / 169.4$

0.313

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.569 \times 1667 / 2.3$

0.412 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

2.317

 $U_t = 1 / \lambda_p$ $1 / 2.317$

0.432

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

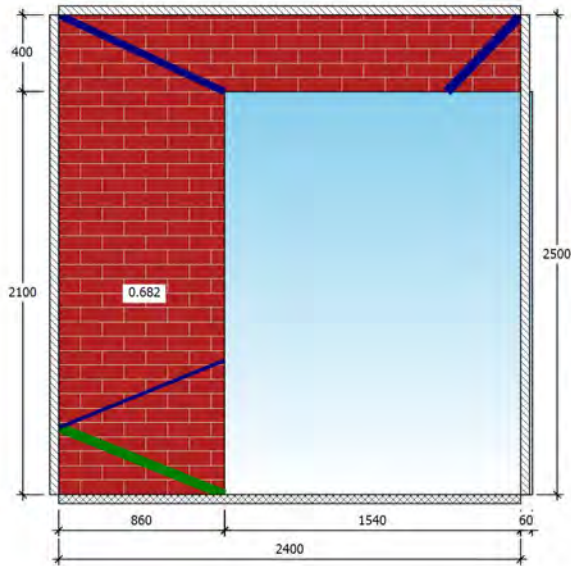
Sheet : /132

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall W 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.195$ m (Eqn. 5.8), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.4 < \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=19.6$, Hence $H/t_{ef} < 80$ (F.1) 0.347 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.165$ m, $Y=1.25$ m $< f_k \cdot 0.96$ (small area red.) γ_{mc} 0.07 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=0.43$ m, $Y=1.25$ m averaged over width Of 0.86 m

7.1 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1195$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.195$

0.847

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.847 \times 4.34 \times 102.5 / 2.6$

145.1 kN/m

 F_d/F_r $7.1 / 145.1$

0.049

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751 / 2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751 / 2.3$

0.343 kN.m/m

Software produced by www.MasterSeries.com © Civil and Structural Computer Services Limited.

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /134

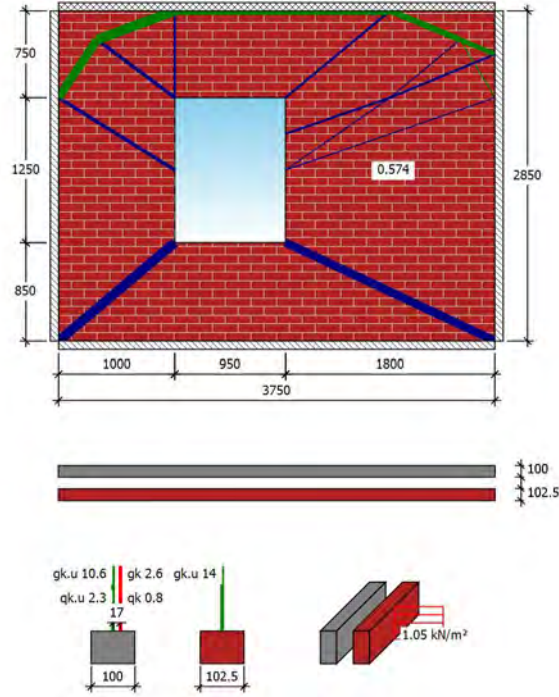
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall Q GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.729$ m (Eqn. 5.8), $L=3.750$ m, $L_{ef}=3.750$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=13.6 \leq \lambda_{lim}=27$, $L/t_{ef}=29.4$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.502 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=14.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $gd=0.162$ N/mm² $f_{kk1}=f_{k1}+\min(gd, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.772 N/mm² Table NA.6 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Critical axial compressive Case

Max local stress @

 $X=0.406$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.39 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=2.463$ m, $Y=1.425$ m averaged over width Of 1.025 m

35.47 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.055$

0.722

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.722 \times 4.5 \times 102.5/2.6$

128.1 kN/m

Fd/Fr

35.5/128.1

0.277

OK

Mro= $f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

Mro= $f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.772 \times 1751/2.3$

0.588 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /135

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 10.6 kN/m, Live Load = 2.3 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.8 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.139 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.57 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.05q_k + 1.05q_{ku}$ $X = 0.411 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 0.38 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.05q_k + 1.05q_{ku} + 0.75(W_x)$ $X = 2.45 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

33.21 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.226 \text{ kN.m}, M_{wx, mid} = 0.127 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 3.5 \text{ mm}, h_{ef} = 2055 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.838

Capacity reduction factor mid, Φ_m $e_{hm} = 0.166 \text{ mm}, h_{ef} = 2.055$

0.689

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.689 \times 5.73 \times 100 / 2.6$

151.9 kN/m

Fd/Fr

 $33.2 / 151.9$

0.219

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.57 \times 1667 / 2.3$

0.413 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.741

 $U_t = 1 / \lambda_p$ $1 / 1.741$

0.574

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /136

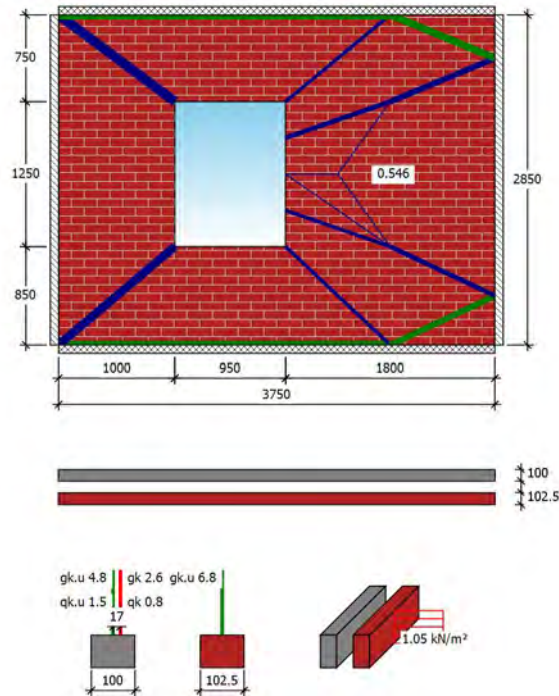
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall Q 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.613$ m (Eqn. 5.8), $L=3.750$ m, $L_{ef}=3.750$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=12.6 \leq \lambda_{lim}=27$, $L/t_{ef}=29.4$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.468 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $gd=0.091$ N/mm² $f_{kk1}=f_{-k1}+\min(gd, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.609 N/mm² Table NA.6 $1.35(\gamma_{tk}.h+g_k u)$

Critical axial compressive Case

Max local stress @

 $X=0.406$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.23 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk}.h+g_k u)$

Moments from Lateral Load

 $X=2.463$ m, $Y=1.425$ m averaged over width Of 1.025 m

21.15 kN/m

Capacity reduction factor top, Φ $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.m

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.848$

0.757

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.757 \times 4.5 \times 102.5/2.6$

134.4 kN/m

Fd/Fr

21.1/134.4

0.157

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.609 \times 1751/2.3$

0.464 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /137

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 4.8 kN/m, Live Load = 1.5 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.8 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.081 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.436 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.411 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 0.24 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku} + 0.75(W_x)$ $X = 2.45 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

20.7 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.154 \text{ kN.m}, M_{wx, mid} = 0.077 \text{ kN.m}$ Capacity reduction factor top, Φ

0.799

Capacity reduction factor mid, Φ_m

0.711

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.711 \times 5.73 \times 100 / 2.6$

156.5 kN/m

Fd/Fr

20.7/156.5

0.132

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.436 \times 1667 / 2.3$

0.316 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.832

 $U_t = 1/\lambda_p$

1 / 1.832

0.546

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /138

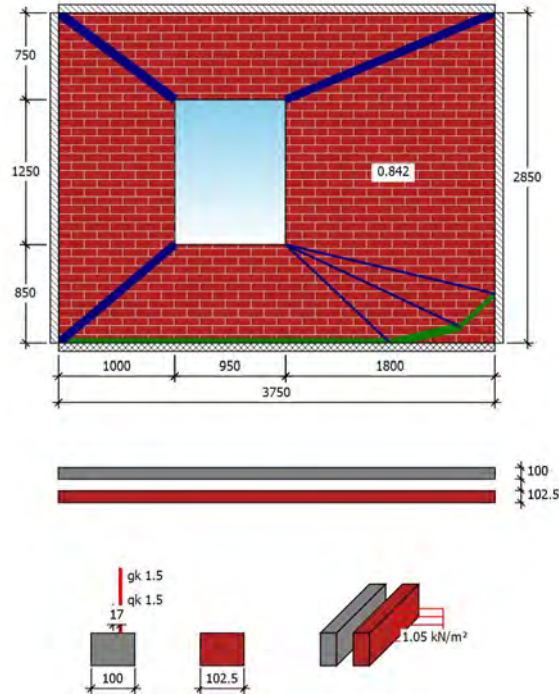
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall Q 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.729$ m (Eqn. 5.8), $L=3.750$ m, $L_{ef}=3.750$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=1$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=13.6 \leq \lambda_{lim}=27$, $L/t_{ef}=29.4$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.502 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.025$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.458 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.406$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.08 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $X=2.463$ m, $Y=1.425$ m averaged over width Of 1.025 m

7.81 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $e_{ef}=2.055$

0.722

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.722 \times 4.5 \times 102.5/2.6$

128.1 kN/m

Fd/Fr

7.8/128.1

0.061

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.458 \times 1751/2.3$

0.349 kN.m/m

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Job Ref : 10056

Sheet : /139

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 1.5 kN/m, Live Load = 1.5 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.022 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.301 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X = 0.411 \text{ m}, Y = 1.425 \text{ m} < f_k / \gamma_{mc}$ 0.09 N/mm²

OK

Critical axial buckling Case

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k + 0.75(W_x)$

Max axial buckling force @

 $X = 2.45 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 1 m

8.05 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.106 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 17.0 \text{ mm}, h_{ef} = 2055 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.569

Capacity reduction factor mid, Φ_m $e_{hm} = 0.139 \text{ mm}, h_{ef} = 2.055$

0.545

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.545 \times 5.73 \times 100 / 2.6$

120.0 kN/m

Fd/Fr

8.1/120.0

0.067

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.301 \times 1667 / 2.3$

0.218 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.188

 $U_t = 1 / \lambda_p$

1 / 1.188

0.842

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /140

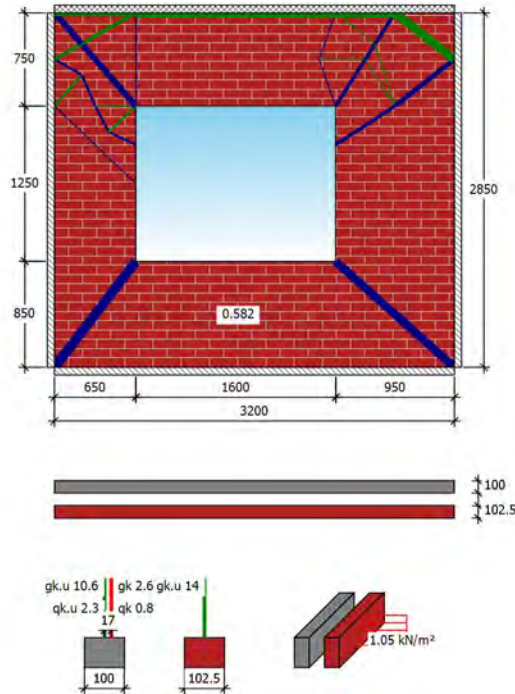
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall R GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.552$ m (Eqn. 5.8), $L=3.200$ m, $L_{ef}=3.200$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.65$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=12.2 \leq \lambda_{lim}=27$, $L/t_{ef}=25.1$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.450 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=14.0 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $gd=0.162$ N/mm² $f_{kk1}=f_{-k1}+\min(gd, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.772 N/mm² Table NA.6 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Critical axial compressive Case

Max local stress @

 $X=0.056$ m, $Y=1.425$ m < $f_k \cdot 0.9$ (small area red.) γ_{mc} 0.52 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Moments from Lateral Load

 $X=0.325$ m, $Y=1.425$ m averaged over width Of 0.65 m

51.38 kN/m

Capacity reduction factor top, Φ $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.m

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=0.975$

0.869

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.869 \times 4.05 \times 102.5/2.6$

138.8 kN/m

Fd/Fr

51.4/138.8

0.370

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.772 \times 1751/2.3$

0.588 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /141

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4 \text{ N/mm}^2$

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 10.6 kN/m, Live Load = 2.3 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.8 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.139 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.57 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.05q_k + 1.05q_{ku}$ $X = 0.061 \text{ m}, Y = 1.425 \text{ m} < f_k \cdot 0.9 (\text{small area red.}) / \gamma_{mc}$ 0.51 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.05q_k + 1.05q_{ku}$ $X = 0.325 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 0.65 m

49.51 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 3.5 \text{ mm}, h_{ef} = 975 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.886

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 0.975$

0.869

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.869 \times 5.13 \times 100 / 2.6$

171.3 kN/m

Fd/Fr

49.5/171.3

0.289

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.57 \times 1667 / 2.3$

0.413 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.719

 $U_t = 1 / \lambda_p$

1 / 1.719

0.582

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /142

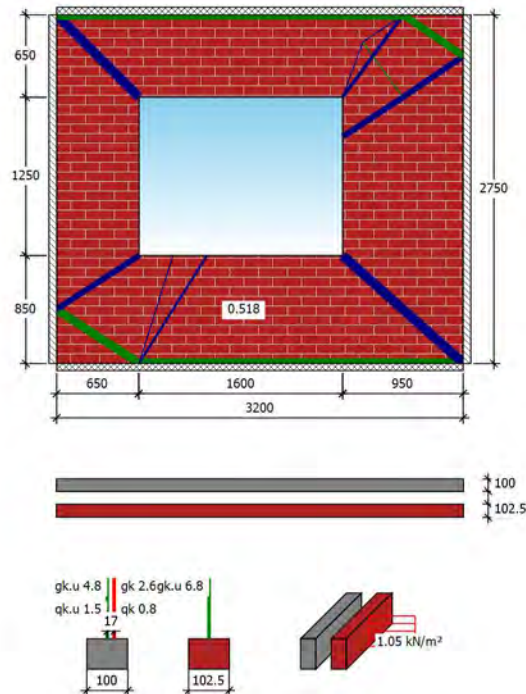
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall R 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.457$ m (Eqn. 5.8), $L=3.200$ m, $L_{ef}=3.200$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.65$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=11.4 \leq \lambda_{lim}=27$, $L/t_{ef}=25.1$, $H/t_{ef}=21.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.423 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.09$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.607 N/mm² Table NA.6

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0.027$ m, $Y=1.375$ m < $f_k \cdot 0.9$ (small area red.) γ_{mc} 0.29 N/mm² OK

Critical axial buckling Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max axial buckling force @

 $X=0.325$ m, $Y=1.375$ m averaged over width Of 0.65 m

29 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=975$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=0.975$

0.869

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.869 \times 4.05 \times 102.5/2.6$

138.8 kN/m

Fd/Fr

29.0/138.8

0.209

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /143

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91$ kN/m³Compressive strength (equiv. air dried) $f_b = 7.3$ N/mm²Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m = 4$ N/mm²

Mortar Material

Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 4.8 kN/m, Live Load = 1.5 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.8 kN/m, $e_x = 17$ mm

Section Properties

Area = 1000 cm²/m, $Z_p = 1667$ cm³/mFlexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.081$ N/mm² $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.436 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.032$ m, $Y = 1.375$ m < $f_k \cdot 0.9$ (small area red.) γ_{mc} 0.31 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.325$ m, $Y = 1.375$ m averaged over width Of 0.65 m

30.51 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000$ kN.m, $M_{wx, mid} = 0.000$ kN.mCapacity reduction factor top, Φ $e_x = 6.0$ mm, $h_{ef} = 975$ mm, $t_{ef} = 127.6$ mm, $t = 100.0$ mm

0.838

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000$ mm, $h_{ef} = 0.975$

0.866

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.838 \times 5.13 \times 100 / 2.6$

165.2 kN/m

Fd/Fr

 $30.5 / 165.2$

0.185

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.436 \times 1667 / 2.3$

0.316 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

1.932

 $U_t = 1 / \lambda_p$ $1 / 1.932$

0.518

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /144

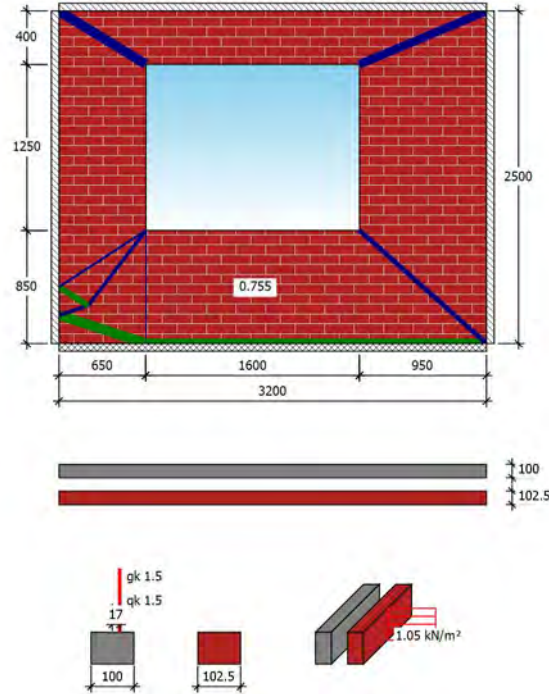
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall R 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.491$ m (Eqn. 5.8), $L=3.200$ m, $L_{ef}=3.200$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.65$, $Y=0.85$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=11.7 < \lambda_{lim}=27$, $L/t_{ef}=25.1$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.433 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.022$ N/mm² $f_{kk1}=f_{kk1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0$ m, $Y=1.05$ m < $f_k \cdot 0.9$ (small area red.) γ_{mc} 0.07 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=0.325$ m, $Y=1.25$ m averaged over width of 0.65 m

7.31 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=975$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=0.975$

0.869

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.869 \times 4.05 \times 102.5/2.6$

138.8 kN/m

Fd/Fr

7.3/138.8

0.053

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751/2.3$

0.343 kN.m/m

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Job Ref : 10056

Sheet : /145

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 1.5 kN/m, Live Load = 1.5 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.021 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$ 0.299 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X = 0 \text{ m}, Y = 1.05 \text{ m} < f_k \cdot 0.9 \text{ (small area red.)} / \gamma_{mc}$ 0.11 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$

Moments from Lateral Load

 $X = 0.325 \text{ m}, Y = 1.25 \text{ m}$ averaged over width Of 0.65 m

11.04 kN/m

Capacity reduction factor top, Φ $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor mid, Φ_m $e_x = 17.0 \text{ mm}, h_{ef} = 975 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.617

 $F_r = \Phi \cdot f_{kt} / \gamma_{mc}$ $e_{hm} = 0.000 \text{ mm}, h_{ef} = 0.975$

0.753

Fd/Fr

0.617 x 5.13 x 100 / 2.6

121.6 kN/m

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$

11.0 / 121.6

0.091

OK

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$

0.734 x 1667 / 2.3

0.532 kN.m/m

0.299 x 1667 / 2.3

0.216 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.325

 $U_t = 1 / \lambda_p$

1 / 1.325

0.755

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

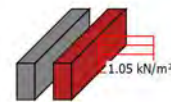
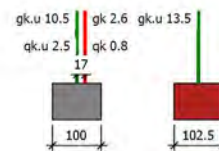
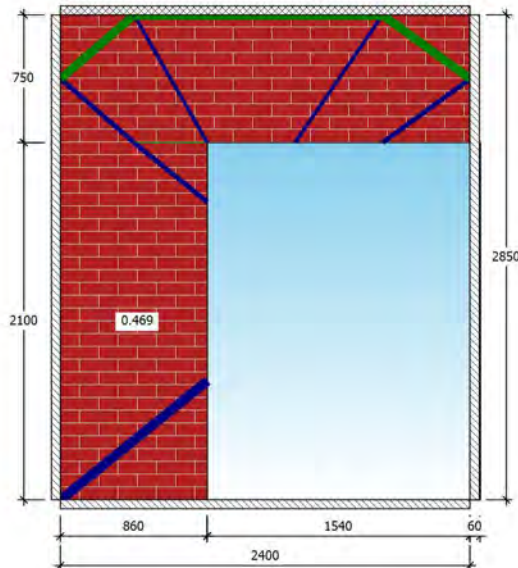
Sheet : /146

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall U GF****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.200$ m (Eqn. 5.9), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.4 \leq \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=22.3$, Hence $H/t_{ef} \leq 80$ (F.1) 0.348 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group 1, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Loads from above

Dead Load=13.5 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.157$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.761 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=0.266$ m, $Y=1.425$ m $< f_k \cdot 0.96$ (small area red.) γ_{mc} 0.52 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $1.35(\gamma_{tk} \cdot h + g_{ku})$ $X=0.43$ m, $Y=1.425$ m averaged over width Of 0.86 m

47.09 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1200$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.200$

0.847

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.847 \times 4.34 \times 102.5/2.6$

145.0 kN/m

 F_d/F_r $47.1/145.0$

0.325

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.761 \times 1751/2.3$

0.579 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /147

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 10.5 kN/m, Live Load = 2.5 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.75 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.138 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.567 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.271 \text{ m}, Y = 1.425 \text{ m} < f_k \cdot 0.96 (\text{small area red.}) / \gamma_{mc}$ 0.54 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.43 \text{ m}, Y = 1.425 \text{ m}$ averaged over width Of 0.86 m

46.7 kN/m

Moments from Lateral Load

 $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ

0.877

Capacity reduction factor mid, Φ_m

0.847

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.847 \times 5.49 \times 100 / 2.6$

178.7 kN/m

Fd/Fr

46.7/178.7

0.261

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.567 \times 1667 / 2.3$

0.411 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

2.134

 $U_t = 1/\lambda_p$

1 / 2.134

0.469

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /148

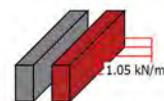
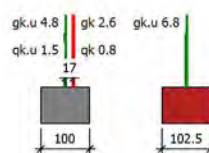
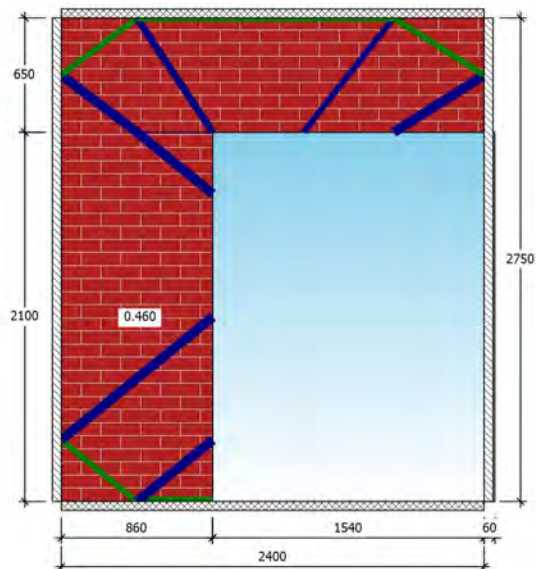
Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall Design to BS EN 1996-1-1:2005+A1:2012 Wall U 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.186$ m (Eqn. 5.8), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.3 < \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=21.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.344 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$

12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$

4.5 N/mm² Table NA.4

Loads from above

Dead Load=6.75 kN/m

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{kk2} (Perpendicular)

1.1 N/mm² Table NA.6

Flexural Strength f_{kk1} (Parallel) $f_{kk1}=0.4$, $g_d=0.09$ N/mm² $f_{kk1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$

0.607 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.237$ m, $Y=1.375$ m $< f_k \cdot 0.96$ (small area red.) γ_{mc}

0.3 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=0.43$ m, $Y=1.375$ m averaged over width Of 0.86 m

27.29 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=1186$ mm, $t_{ef}=127.6$ mm, $t=102.5$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.186$

0.848

 $F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$ $0.848 \times 4.34 \times 102.5/2.6$

145.2 kN/m

 F_d/F_r $27.3/145.2$

0.188

OK

 $M_{ro}=f_{kk2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751/2.3$

0.837 kN.m/m

 $M_{ro}=f_{kk1} \cdot Z_b/\gamma_{mf}$ $0.607 \times 1751/2.3$

0.462 kN.m/m

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /149

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load = 4.8 kN/m, Live Load = 1.5 kN/m

Loads @ this level

Dead Load = 2.6 kN/m, Live Load = 0.75 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.081 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) \gamma_{mf}$ 0.436 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.242 \text{ m}, Y = 1.375 \text{ m} < f_k \cdot 0.96 (\text{small area red.}) / \gamma_{mc}$ 0.32 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X = 0.43 \text{ m}, Y = 1.375 \text{ m}$ averaged over width Of 0.86 m

28.26 kN/m

Moments from Lateral Load

 $M_{wx, \text{top}} = 0.000 \text{ kN.m}, M_{wx, \text{mid}} = 0.000 \text{ kN.m}$ Capacity reduction factor top, Φ $e_x = 5.9 \text{ mm}, h_{ef} = 1186 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.829

Capacity reduction factor mid, Φ_m $e_{hm} = 0.000 \text{ mm}, h_{ef} = 1.186$

0.836

 $F_r = \Phi \cdot f_{k,tk} / \gamma_{mc}$ $0.829 \times 5.49 \times 100 / 2.6$

174.9 kN/m

Fd/Fr

28.3/174.9

0.162

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.436 \times 1667 / 2.3$

0.316 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor λ_p

2.174

 $U_t = 1/\lambda_p$

1 / 2.174

0.460

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

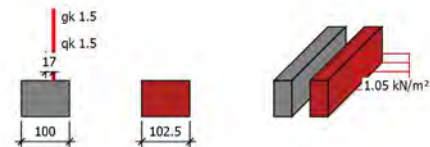
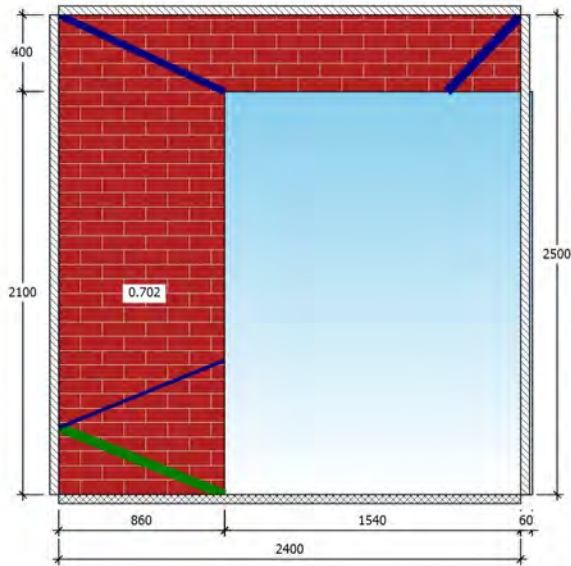
Sheet : /150

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Two Way Spanning, Vertically and Laterally Loaded, Cavity Wall**Design to BS EN 1996-1-1:2005+A1:2012****Wall U 2F****Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Lateral Loads

Opening load span direction

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=1.195$ m (Eqn. 5.8), $L=2.400$ m, $L_{ef}=2.400$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $W_x=1.05$ kN/m²opening at $X=0.86$, $Y=0$ - Two way spanning $t_1=100$, $t_2=102.5$, $t_{ef}=127.6$ $\lambda=9.4 \leq \lambda_{lim}=27$, $L/t_{ef}=18.8$, $H/t_{ef}=19.6$, Hence $H/t_{ef} \leq 80$ (F.1) 0.347 OK**Outer-Leaf Design**Partial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Clay water absorption 7% to 12%, Group I, $\gamma=17.66$ kN/m³Compressive strength (equiv. air dried) $f_b=15$ N/mm²Normalised mean compressive strength $f_b=15 \cdot 0.85$ 12.75 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.5$, $\alpha=0.7$, $\beta=0.3$ 4.5 N/mm² Table NA.4

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/mFlexural Strength f_{k2} (Perpendicular)1.1 N/mm² Table NA.6Flexural Strength f_{k1} (Parallel) $f_{k1}=0.4$, $g_d=0.022$ N/mm² $f_{k1}=f_{k1}+\min(g_d, 0.15 \cdot f_k/\gamma_{mc})/\gamma_{mf}$ 0.451 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X=0.165$ m, $Y=1.25$ m < $f_k \cdot 0.96$ (small area red.) γ_{mc} 0.07 N/mm² OK

Critical axial buckling Case

Max axial buckling force @

 $X=0.43$ m, $Y=1.25$ m averaged over width Of 0.86 m

7.1 kN/m

Moments from Lateral Load

 $M_{wx,top}=0.000$ kN.m, $M_{wx,mid}=0.000$ kN.mCapacity reduction factor top, Φ

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $e_{hf}=1.195$

0.847

 $F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$ $0.847 \times 4.34 \times 102.5 / 2.6$

145.1 kN/m

 F_d/F_r $7.1 / 145.1$

0.049

OK

 $M_{ro}=f_{k2} \cdot Z_p/\gamma_{mf}$ $1.1 \times 1751 / 2.3$

0.837 kN.m/m

 $M_{ro}=f_{k1} \cdot Z_b/\gamma_{mf}$ $0.451 \times 1751 / 2.3$

0.343 kN.m/m

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Job Ref : 10056

Sheet : /151

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

Checked :

Approved :

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma = 4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b = 7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b = 7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m = 4 \text{ N/mm}^2$ Compressive Strength (f_k) $k = 0.75, \alpha = 0.7, \beta = 0.3$ 5.73 N/mm² Table NA.4

Loads @ this level

Dead Load = 1.5 kN/m, Live Load = 1.5 kN/m, $e_x = 17 \text{ mm}$

Section Properties

Area = 1000 cm²/m, $Z_p = 1667 \text{ cm}^3/\text{m}$ Flexural Strength f_{xk2} (Perpendicular)0.734 N/mm² Table NA.6Flexural Strength f_{xk1} (Parallel) $f_{xk1} = 0.25, g_d = 0.021 \text{ N/mm}^2$ $f_{xk1} = f_{xk1} + \min(g_d, 0.15 \cdot f_k / \gamma_{mc}) / \gamma_{mf}$ 0.299 N/mm² Table NA.6

Critical axial compressive Case

Max local stress @

 $X = 0.17 \text{ m}, Y = 1.25 \text{ m} < f_k \cdot 0.96 (\text{small area red.}) / \gamma_{mc}$ 0.11 N/mm²

OK

Critical axial buckling Case

Max axial buckling force @

 $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$

Moments from Lateral Load

 $X = 0.43 \text{ m}, Y = 1.25 \text{ m}$ averaged over width Of 0.86 m

10.08 kN/m

Capacity reduction factor top, Φ $M_{wx, top} = 0.000 \text{ kN.m}, M_{wx, mid} = 0.000 \text{ kN.m}$ Capacity reduction factor mid, Φ_m $e_x = 17.0 \text{ mm}, h_{ef} = 1195 \text{ mm}, t_{ef} = 127.6 \text{ mm}, t = 100.0 \text{ mm}$

0.607

 $F_r = \Phi \cdot f_{k, tk} / \gamma_{mc}$ $0.607 \times 5.49 \times 100 / 2.6$

128.1 kN/m

Fd/Fr

10.1/128.1

0.079

OK

 $M_{ri} = f_{xk2} \cdot Z_p / \gamma_{mf}$ $0.734 \times 1667 / 2.3$

0.532 kN.m/m

 $M_{ri} = f_{xk1} \cdot Z_b / \gamma_{mf}$ $0.299 \times 1667 / 2.3$

0.216 kN.m/m

Design For Lateral LoadsDesign Lateral Load W_d 1.5 W_x 1.575 kN/m²

Yield Line Analysis

Load Factor, λ_p

1.425

 $U_t = 1 / \lambda_p$

1 / 1.425

0.702

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /152

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

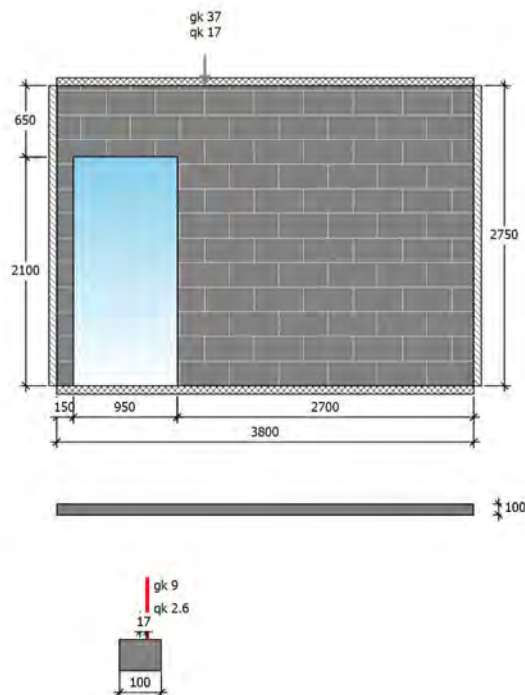
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AJ 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.593$ m (Eqn. 5.8), $L=3.800$ m, $L_{ef}=3.800$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t=100$, $t_{ef}=100$ $\lambda=15.9 \leq \lambda_{lim}=27$

0.590

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4Dead Load=9.0 kN/m, Live Load=2.6 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ $X=0$ m, $Y=1.05$ m $< f_k \cdot 0.75$ (small area red.) / γ_{mc} 0.75 N/mm²

OK

 $X=0.075$ m, $Y=1.268$ m averaged over width Of 0.15 m

75.45 kN/m

 $e_x=13.9$ mm, $h_{ef}=825$ mm, $t_{ef}=100.0$ mm, $t=100.0$ mm

0.685

 $e_{hm}=0.000$ mm, $h_{ef}=0.825$

0.784

 $0.685 \times 4.27 \times 100 / 2.6$

112.4 kN/m

 $75.5 / 112.4$

0.671

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

gk 37 kN, qk 17 kN, Bearing Length 200 mm width 100 mm

Length 440 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 37 + 1.5 \cdot 17) \cdot 1000 / (440 \cdot 100)$ 1.63 N/mm²No Bearing enhancement, $1.00 \cdot f_k / \gamma_{mc}$ 2.2 N/mm²

OK

Point Load at 1.35m

Spreader details

Bearing Stress

Local Bearing Capacity

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /153

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

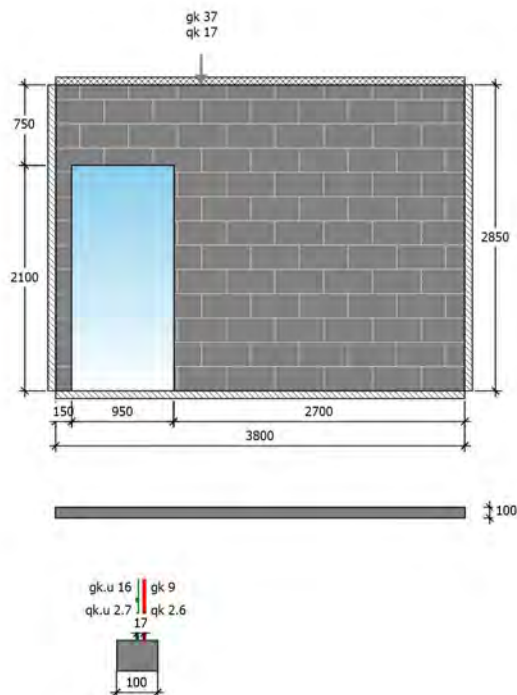
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AJ GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.743$ m (Eqn. 5.8), $L=3.800$ m, $L_{ef}=3.800$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t=100$, $t_{ef}=100$ $\lambda=17.4 \leq \lambda_{lim}=27$

0.646

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=17.5$ N/mm²Normalised mean compressive strength $f_b=17.5 \cdot 1.38$ 24.15 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 10.56 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, Φ Capacity reduction factor mid, Φ_m $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ F_d/F_r

Point load design method

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X=0$ m, $Y=1.05$ m < $f_k \cdot 0.75$ (small area red.) / γ_{mc} 2.55 N/mm²

OK

 $X=0.075$ m, $Y=1.318$ m averaged over width Of 0.15 m

255.15 kN/m

 $ex=3.9$ mm, $h_{ef}=855$ mm, $t_{ef}=100.0$ mm, $t=100.0$ mm

0.884

 $e_{hm}=0.000$ mm, $e_{ef}=0.855$

0.858

 $0.858 \times 7.87 \times 100 / 2.6$

259.7 kN/m

255.1/259.7

0.983

OK

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

gk 37 kN, qk 17 kN, Bearing Length 200 mm width 100 mm

Length 2500 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 37 + 1.5 \cdot 17) \cdot 1000 / (2500 \cdot 100)$ 0.29 N/mm²Bearing enhancement eq 6.11, $1.08 \cdot f_k / \gamma_{mc}$ 4.41 N/mm²

OK

Point Load at 1.35m

Spreader details

Bearing Stress

Local Bearing Capacity

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /154

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

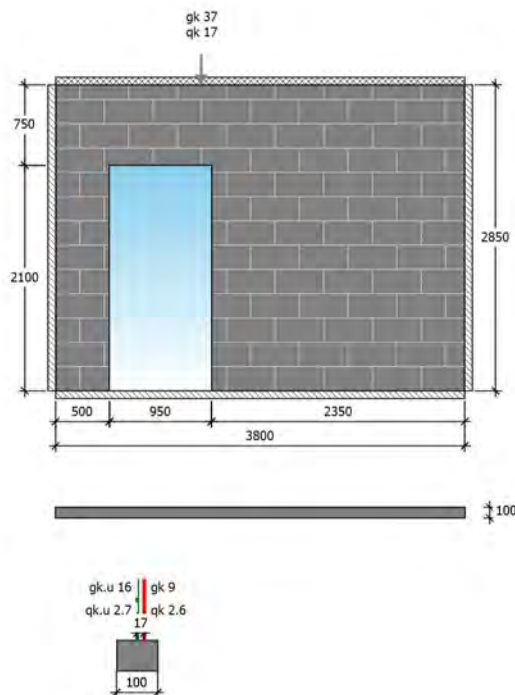
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AJ GF for block strength

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.743$ m (Eqn. 5.8), $L=3.800$ m, $L_{ef}=3.800$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t=100$, $t_{ef}=100$ $\lambda=17.4 < \lambda_{lim}=27$

0.646

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, Φ Capacity reduction factor mid, Φ_m $F_r=\Phi \cdot f_k \cdot tk / \gamma_{mc}$ F_d/F_r

Point load design method

Dead Load=16.0 kN/m, Live Load=2.7 kN/m

Dead Load=9.0 kN/m, Live Load=2.6 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X=0$ m, $Y=1.05$ m $< f_k \cdot 0.85$ (small area red.) / γ_{mc} 1.27 N/mm²

OK

 $X=0.25$ m, $Y=1.318$ m averaged over width of 0.5 m

126.72 kN/m

 $e_x=4.0$ mm, $h_{ef}=855$ mm, $t_{ef}=100.0$ mm, $t=100.0$ mm

0.881

 $e_{hm}=0.000$ mm, $h_{ef}=0.855$

0.858

 $0.858 \times 4.87 \times 100 / 2.6$

160.7 kN/m

126.7/160.7

0.789

OK

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 1.35m

gk 37 kN, qk 17 kN, Bearing Length 200 mm width 100 mm

Spreader details

Length 2500 mm, Depth 215 mm, Thickness 100 mm

Bearing Stress

 $(1.25 \cdot 37 + 1.5 \cdot 17) \cdot 1000 / (2500 \cdot 100)$ 0.29 N/mm²

Local Bearing Capacity

Bearing enhancement eq 6.11, $1.08 \cdot f_k / \gamma_{mc}$ 2.39 N/mm²

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /155

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

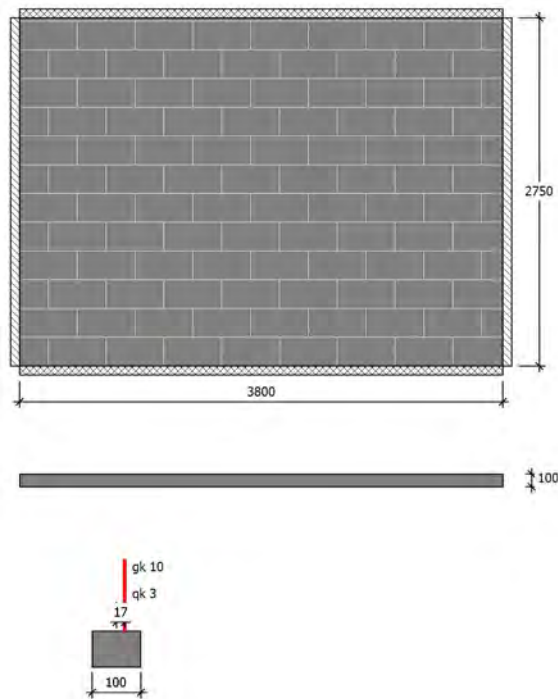
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AH 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.593$ m (Eqn. 5.8), $L=3.800$ m, $L_{ef}=3.800$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t=100$, $t_{ef}=100$ $\lambda=15.9 < \lambda_{lim}=27$

0.590

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads @ this level

Dead Load=10.0 kN/m, Live Load=3.0 kN/m, $e_x=17$ mm

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.25(\gamma_{tk}h+g_k)+1.5q_k$

Max local stress @

 $X=0$ m, $Y=1.375$ m $< f_k/\gamma_{mc}$ 0.19 N/mm²

OK

Max axial buckling force @

 $X=3.3$ m, $Y=1.375$ m averaged over width of 1 m

18.69 kN/m

Capacity reduction factor top, Φ $e_x=17.0$ mm, $h_{ef}=1593$ mm, $t_{ef}=100.0$ mm, $t=100.0$ mm

0.589

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.593$

0.574

 $F_r=\Phi_k f_k/\gamma_{mc}$ $0.574 \times 5.73 \times 100/2.6$

126.4 kN/m

Fd/Fr

18.7/126.4

0.148

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /156

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

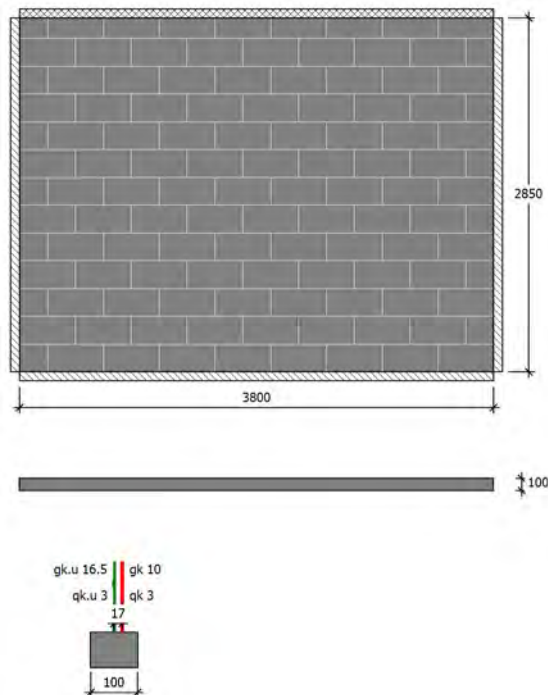
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Single-leaf Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AH GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Single-leaf Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=1.743$ m (Eqn. 5.8), $L=3.800$ m, $L_{ef}=3.800$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t=100$, $t_{ef}=100$ $\lambda=17.4 < \lambda_{lim}=27$

0.646

OK

Wall DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Dead Load=16.5 kN/m, Live Load=3.0 kN/m

Loads @ this level

Dead Load=10.0 kN/m, Live Load=3.0 kN/m, $e_x=17$ mm

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.35(\gamma_{tk}h + g_k + g_{ku}) + 1.05q_k + 1.05q_{ku}$

Max local stress @

 $X=0$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.44 N/mm²

OK

Max axial buckling force @

 $X=3.3$ m, $Y=1.425$ m averaged over width Of 1 m

43.87 kN/m

Capacity reduction factor top, Φ $e_x=6.9$ mm, $h_{ef}=1743$ mm, $t_{ef}=100.0$ mm, $t=100.0$ mm

0.785

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=1.743$

0.641

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.641 \times 5.73 \times 100 / 2.6$

141.2 kN/m

Fd/Fr

43.9/141.2

0.311

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /157

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

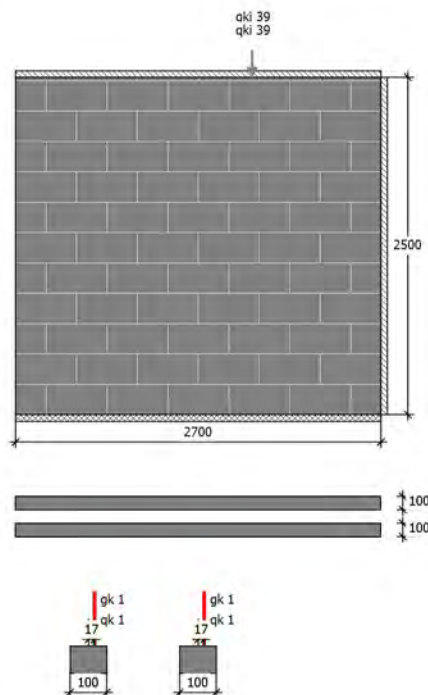
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall Y 2F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.500$ m, $h_{ef}=2.039$ m (Eqn. 5.6), $l=2.700$ m, $l_{ef}=2.700$ m

Bottom Cont., Top Simple, Left Free, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=16.2 < \lambda_{lim}=27$

0.599

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4Dead Load=1.0 kN/m, Live Load=1.0 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m $1.25(\gamma_{tk} \cdot h + g_k) + 1.5q_k$ $X=0$ m, $Y=1.25$ m $< f_k/\gamma_{mc}$ 0.04 N/mm²

OK

 $X=1.6$ m, $Y=1.25$ m averaged over width of 1 m

4.28 kN/m

 $e_x=17.0$ mm, $h_{ef}=2039$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.569

 $e_{hm}=0.000$ mm, $h_{ef}=2.039$

0.547

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$

120.4 kN/m

 F_d/F_r

0.036

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4Dead Load=1.0 kN/m, Live Load=1.0 kN/m, $e_x=17$ mmArea=1000 cm²/m, $Z_p=1667$ cm³/m

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /158****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Critical axial compressive Case	$1.25(\gamma_{tk}.h+g_k)+1.5q_k$		
Max local stress @	$X=0.871\text{ m}, Y=1.143\text{ m} < f_k/\gamma_{mc}$	0.65 N/mm ²	OK
Max axial buckling force @	$X=1.6\text{ m}, Y=1.143\text{ m}$ averaged over width Of 1 m	65.25kN/m	
Capacity reduction factor top. Φ	$e_x=0.7\text{ mm}, h_{ef}=2039\text{ mm}, t_{ef}=126.0\text{ mm}, t=100.0\text{ mm}$	0.895	
Capacity reduction factor mid. Φ_m	$e_{hm} = 0.000\text{ mm}, h_{ef} = 2.039$	0.720	
$F_r = \Phi \cdot f_{k,tk}/\gamma_{mc}$	$0.720 \times 5.73 \times 100 / 2.6$	158.6 kN/m	
Fd/Fr	65.2/158.6	0.411	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 1.75m	gk 39 kN, qk 39 kN, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	$(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000 / (440 \cdot 100)$	2.44 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.41 \cdot f_k/\gamma_{mc}$	3.11 N/mm ²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /159

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

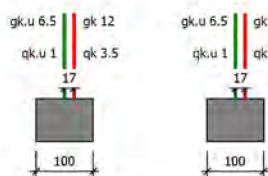
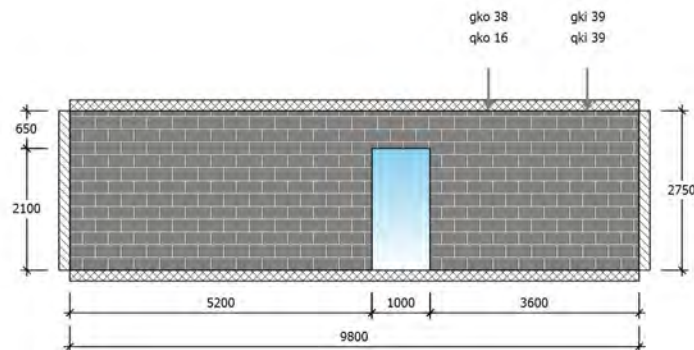
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall Y 1F

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.750$ m, $h_{ef}=1.975$ m (Eqn. 5.8), $L=9.800$ m, $L_{ef}=9.800$ m

Bottom Cont., Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=15.7 < \lambda_{lim}=27$

0.581

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, Φ Capacity reduction factor mid, Φ_m $F_r=\Phi \cdot f_k \cdot tk / \gamma_{mc}$ F_d/F_r

Point load design method

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X=6.249$ m, $Y=1.268$ m $< f_k/\gamma_{mc}$ 0.91 N/mm²

OK

 $X=6.7$ m, $Y=1.268$ m averaged over width of 1 m

82.45 kN/m

 $ex=6.4$ mm, $h_{ef}=1990$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.783

 $e_{hm}=0.000$ mm, $h_{ef}=1.990$

0.672

 $0.672 \times 5.73 \times 100 / 2.6$

148.0 kN/m

 $82.4 / 148.0$

0.557

OK

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

 $g_k=38$ kN, $q_k=16$ kN, Bearing Length 200 mm width 100 mm

Length 440 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 38 + 1.5 \cdot 16) \cdot 1000 / (440 \cdot 100)$ 1.63 N/mm²Bearing enhancement eq 6.11, $1.50 \cdot f_k / \gamma_{mc}$ 3.3 N/mm²

OK

Point Load at 7.2m

Spreader details

Bearing Stress

Local Bearing Capacity

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /160****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$		
	Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$		
	Normalised mean compressive strength $f_b=7.3 \cdot 1.38$	10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$		
Compressive Strength (f_k)	$k=0.75, \alpha=0.7, \beta=0.3$	5.73 N/mm ²	Table NA.4
Loads from above	Dead Load=6.5 kN/m, Live Load=1.0 kN/m		
Loads @ this level	Dead Load=12.0 kN/m, Live Load=3.5 kN/m, $e_x=17 \text{ mm}$		
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$		
Critical axial compressive Case	$1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$		
Max local stress @	$X=7.949 \text{ m}, Y=1.268 \text{ m} < f_k/\gamma_{mc}$	0.89 N/mm ²	OK
Max axial buckling force @	$X=9.3 \text{ m}, Y=1.268 \text{ m}$ averaged over width Of 1 m	89.48kN/m	
Capacity reduction factor top, Φ	$e_x=3.9 \text{ mm}, h_{ef}=1990 \text{ mm}, t_{ef}=126.0 \text{ mm}, t=100.0 \text{ mm}$	0.833	
Capacity reduction factor mid, Φ_m	$e_{hm}=0.000 \text{ mm}, h_{ef}=1.990$	0.699	
$F_r=\Phi \cdot f_k \cdot t_k/\gamma_{mc}$	$0.699 \times 5.73 \times 100/2.6$	153.9 kN/m	
F_d/F_r	$89.5/153.9$	0.581	OK
Point load design method	Design based on axial load take down for wall compression design.		
	No design for bending due to point loads.		
Point Load at 8.9m	$g_k 39 \text{ kN}, q_k 39 \text{ kN}$, Bearing Length 200 mm width 100 mm		
Spreader details	Length 440 mm, Depth 215 mm, Thicknesss 100 mm		
Bearing Stress	$(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000/(440 \cdot 100)$	2.44 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.38 \cdot f_k/\gamma_{mc}$	3.05 N/mm ²	OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /161

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

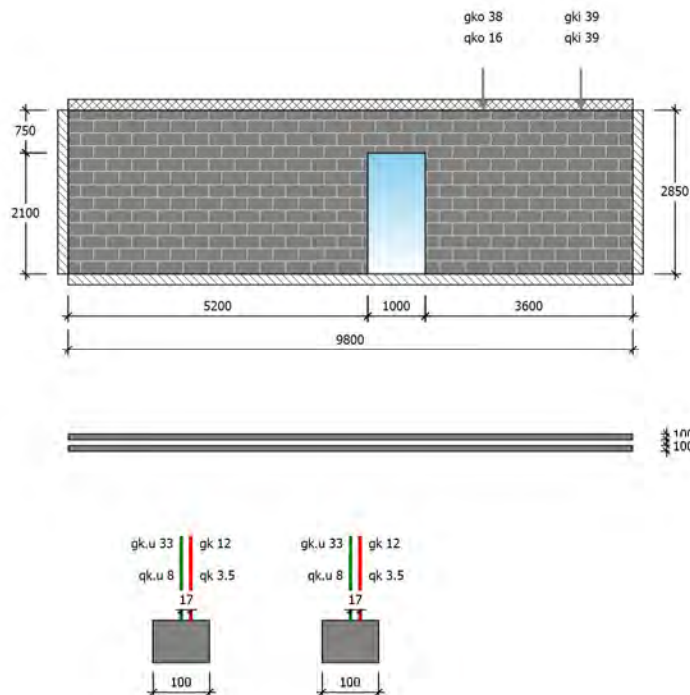
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall Y GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.342$ m (Eqn. 5.8), $L=9.800$ m, $L_{ef}=9.800$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=18.6 < \lambda_{lim}=27$

0.688

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=10.4$ N/mm²Normalised mean compressive strength $f_b=10.4 \cdot 1.38$ 14.35 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 7.34 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Loads @ this level

Section Properties

Critical axial compressive Case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, Φ Capacity reduction factor mid, Φ_m $F_r=\Phi \cdot f_k \cdot tk / \gamma_{mc}$ F_d/F_r

Point load design method

 $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$ $X=6.2$ m, $Y=1.318$ m $< f_k/\gamma_{mc}$ 1.63 N/mm²

OK

 $X=6.7$ m, $Y=1.318$ m averaged over width Of 1 m

140.95 kN/m

 $ex=3.7$ mm, $h_{ef}=2368$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.820

 $ehm=0.000$ mm, $h_{ef}=2.368$

0.612

 $0.612 \times 7.34 \times 100 / 2.6$

172.7 kN/m

141.0/172.7

0.816

OK

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

gk 38 kN, qk 16 kN, Bearing Length 200 mm width 100 mm

Length 2500 mm, Depth 215 mm, Thickness 100 mm

 $(1.25 \cdot 38 + 1.5 \cdot 16) \cdot 1000 / (2500 \cdot 100)$ 0.29 N/mm²No Bearing enhancement, $1.00 \cdot f_k / \gamma_{mc}$ 2.82 N/mm²

OK

Point Load at 7.2m

Spreader details

Bearing Stress

Local Bearing Capacity

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Barter Hill Partnerships Ltd

Cloud 3b89b

15 Meridian Way, Meridian Business Park**Norwich, GB****NR7 0TA****01279430888****Job Ref : 10056****Sheet : /162****Made by : VM****Date : 02 September 2024 / Ver. 2023.19.22****Checked :****Approved :**

Unit Material	Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91 \text{ kN/m}^3$ Compressive strength (equiv. air dried) $f_b=7.3 \text{ N/mm}^2$ Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm ²	
Mortar Material	M4, $f_m=4 \text{ N/mm}^2$ $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm ² Table NA.4	
Compressive Strength (f_k)		
Loads from above	Dead Load=33.0 kN/m, Live Load=8.0 kN/m	
Loads @ this level	Dead Load=12.0 kN/m, Live Load=3.5 kN/m, $e_x=17 \text{ mm}$	
Section Properties	Area=1000 cm ² /m, $Z_p=1667 \text{ cm}^3/\text{m}$ $1.25(\gamma_{tk} \cdot h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$	
Critical axial compressive Case	$X=6.735 \text{ m}$, $Y=1.05 \text{ m} < f_k/\gamma_{mc}$ 1.54 N/mm ² OK	
Max local stress @	$X=6.7 \text{ m}$, $Y=1.318 \text{ m}$ averaged over width Of 1 m123.67kN/m	
Max axial buckling force @	$e_x=4.2 \text{ mm}$, $h_{ef}=2368 \text{ mm}$, $t_{ef}=126.0 \text{ mm}$, $t=100.0 \text{ mm}$ 0.810	
Capacity reduction factor top, Φ	$e_{hm}=0.000 \text{ mm}$, $h_{ef}=2.368$ 0.606	
Capacity reduction factor mid, Φ_m	$0.606 \times 5.73 \times 100/2.6$ 133.6 kN/m	
$F_r=\Phi \cdot f_{k,tk}/\gamma_{mc}$	123.7/133.60.926	OK
Fd/Fr		
Point load design method	Design based on axial load take down for wall compression design. No design for bending due to point loads.	
Point Load at 8.9m	$g_k 39 \text{ kN}$, $q_k 39 \text{ kN}$, Bearing Length 200 mm width 100 mm	
Spreader details	Length 2500 mm, Depth 215 mm, Thicknesss 100 mm	
Bearing Stress	$(1.25 \cdot 39 + 1.5 \cdot 39) \cdot 1000/(2150 \cdot 100)$ 0.5 N/mm ²	
Local Bearing Capacity	Bearing enhancement eq 6.11, $1.01 \cdot f_k/\gamma_{mc}$ 2.21 N/mm ² OK	

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /163

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

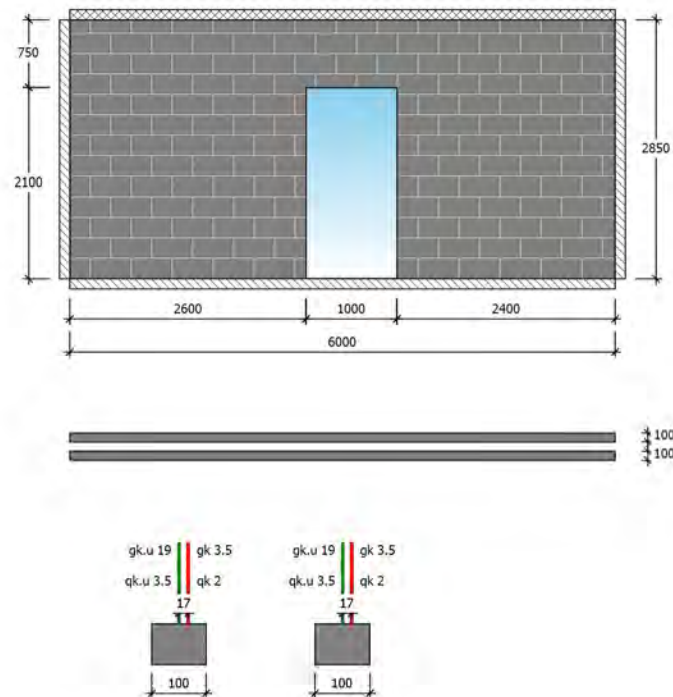
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Wall AC GF

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=2.850$ m, $h_{ef}=2.126$ m (Eqn. 5.8), $L=6.000$ m, $L_{ef}=6.000$ m

Bottom Simple, Top Cont., Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=16.9 < \lambda_{lim}=27$

0.625

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=10.4$ N/mm²Normalised mean compressive strength $f_b=10.4 \cdot 1.38$ 14.35 N/mm²M4, $f_m=4$ N/mm² $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 7.34 N/mm² Table NA.4

Mortar Material

Compressive Strength (f_k)

Loads from above

Dead Load=19.0 kN/m, Live Load=3.5 kN/m

Loads @ this level

Dead Load=3.5 kN/m, Live Load=2.0 kN/m, $e_x=17$ mm

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.25(\gamma_{tk}h + g_k + g_{ku}) + 1.5q_k + 1.5q_{ku}$

Max local stress @

 $X=2.011$ m, $Y=1.425$ m $< f_k/\gamma_{mc}$ 0.65 N/mm²

OK

Max axial buckling force @

 $X=2.1$ m, $Y=1.425$ m averaged over width Of 1 m

56.54 kN/m

Capacity reduction factor top, Φ $e_x=3.5$ mm, $h_{ef}=2262$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.830

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=2.262$

0.640

 $F_r = \Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.640 \times 7.34 \times 100 / 2.6$

180.7 kN/m

Fd/Fr

56.5/180.7

0.313

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=4.91$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=19.0 kN/m, Live Load=3.5 kN/m

Job Ref : 10056
Sheet : /164
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

$$\text{Fd}/\text{Fr}$$

56.5/141.0

0.401

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /165

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

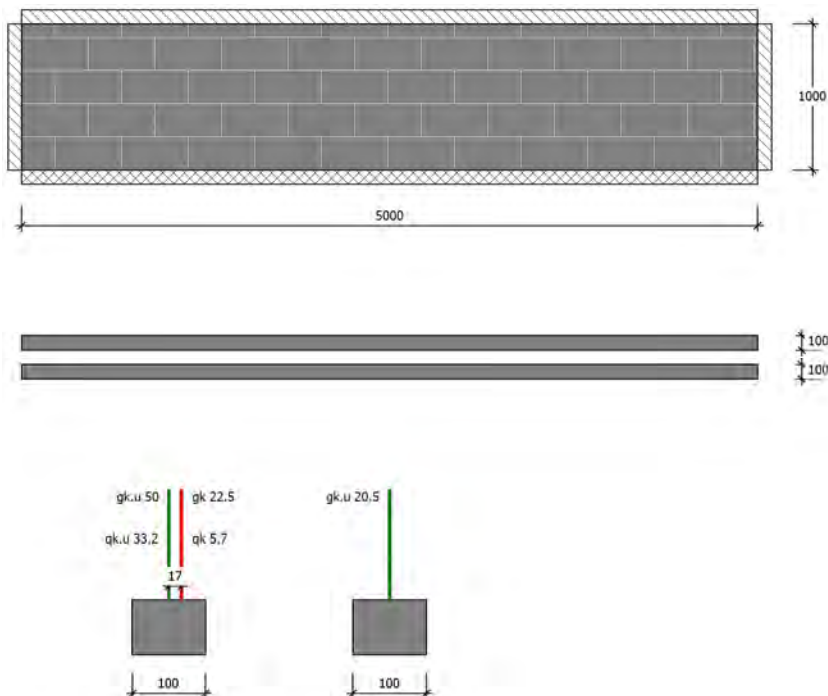
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Subwall 7N

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=1.000$ m, $h_{ef}=0.733$ m (Eqn. 5.8), $L=5.000$ m, $L_{ef}=5.000$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=5.8 \leq \lambda_{lim}=27$

0.216

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=20.5 kN/m

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0$ m, $Y=0.5$ m $< f_k/\gamma_{mc}$ 0.3 N/mm²

OK

Max axial buckling force @

 $X=4.5$ m, $Y=0.5$ m averaged over width Of 1 m

29.66 kN/m

Capacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=733$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=0.733$

0.885

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.885 \times 5.73 \times 100 / 2.6$

195.0 kN/m

Fd/Fr

29.7/195.0

0.152

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Unit Material

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=7.3$ N/mm²Normalised mean compressive strength $f_b=7.3 \cdot 1.38$ 10.07 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 5.73 N/mm² Table NA.4

Loads from above

Dead Load=50.0 kN/m, Live Load=33.2 kN/m

Loads @ this level

Dead Load=22.5 kN/m, Live Load=5.7 kN/m, $e_x=17$ mm

Job Ref : 10056
Sheet : /166
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

 F_d/F_r

150.8/194.7

0.775

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /167

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

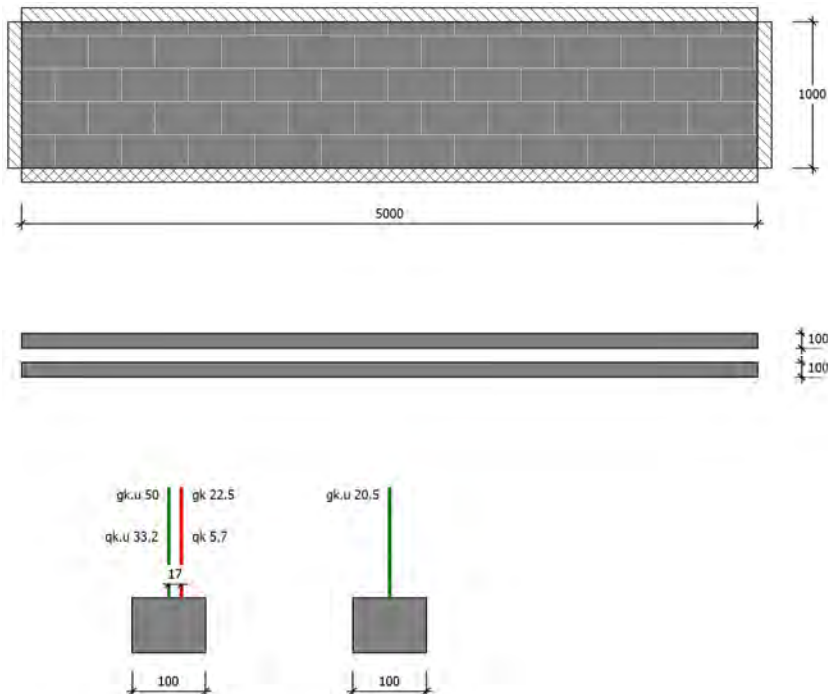
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Subwall 10N

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=1.000$ m, $h_{ef}=0.733$ m (Eqn. 5.8), $L=5.000$ m, $L_{ef}=5.000$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=5.8 \leq \lambda_{lim}=27$

0.216

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=10.4$ N/mm²Normalised mean compressive strength $f_b=10.4 \cdot 1.38$ 14.35 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 7.34 N/mm² Table NA.4

Loads from above

Dead Load=20.5 kN/m

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0$ m, $Y=0.5$ m $< f_k/\gamma_{mc}$ 0.3 N/mm²

OK

Max axial buckling force @

 $X=4.5$ m, $Y=0.5$ m averaged over width Of 1 m

29.66 kN/m

Capacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=733$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=0.733$

0.885

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.885 \times 7.34 \times 100 / 2.6$

249.9 kN/m

Fd/Fr

29.7/249.9

0.119

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class I, Unit Manufacture II

2.6/2.3 Table NA.1

Unit Material

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=10.4$ N/mm²Normalised mean compressive strength $f_b=10.4 \cdot 1.38$ 14.35 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 7.34 N/mm² Table NA.4

Loads from above

Dead Load=50.0 kN/m, Live Load=33.2 kN/m

Loads @ this level

Dead Load=22.5 kN/m, Live Load=5.7 kN/m, $e_x=17$ mm

Job Ref : 10056
Sheet : /168
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

 F_d/F_r

150.8/249.5

0.605

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /169

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

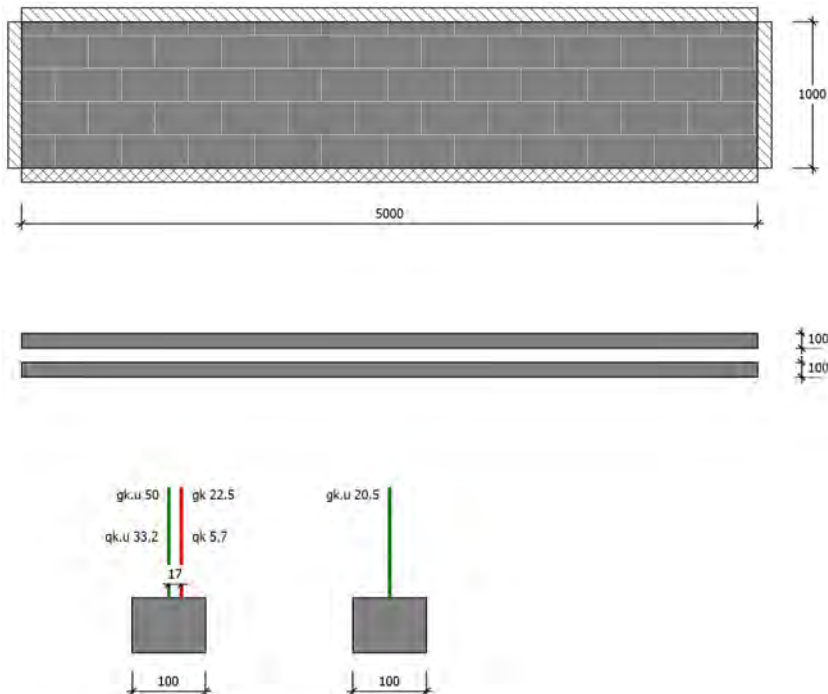
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Subwall 17N

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=1.000$ m, $h_{ef}=0.733$ m (Eqn. 5.8), $L=5.000$ m, $L_{ef}=5.000$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=5.8 \leq \lambda_{lim}=27$

0.216

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=17.5$ N/mm²Normalised mean compressive strength $f_b=17.5 \cdot 1.38$ 24.15 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 10.56 N/mm² Table NA.4

Loads from above

Dead Load=20.5 kN/m

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0$ m, $Y=0.5$ m $< f_k/\gamma_{mc}$ 0.3 N/mm²

OK

Max axial buckling force @

 $X=4.5$ m, $Y=0.5$ m averaged over width Of 1 m

29.66 kN/m

Capacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=733$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=0.733$

0.885

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.885 \times 10.56 \times 100 / 2.6$

359.7 kN/m

Fd/Fr

29.7/359.7

0.082

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Unit Material

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=17.5$ N/mm²Normalised mean compressive strength $f_b=17.5 \cdot 1.38$ 24.15 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 10.56 N/mm² Table NA.4

Loads from above

Dead Load=50.0 kN/m, Live Load=33.2 kN/m

Loads @ this level

Dead Load=22.5 kN/m, Live Load=5.7 kN/m, $e_x=17$ mm

Job Ref : 10056
Sheet : /170
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

 F_d/F_r

150.8/359.1

0.420

OK

Barter Hill Partnerships Ltd

15 Meridian Way, Meridian Business Park

Norwich, GB

NR7 0TA

01279430888

Cloud 3b89b

Job Ref : 10056

Sheet : /171

Made by : VM

Date : 02 September 2024 / Ver. 2023.19.22

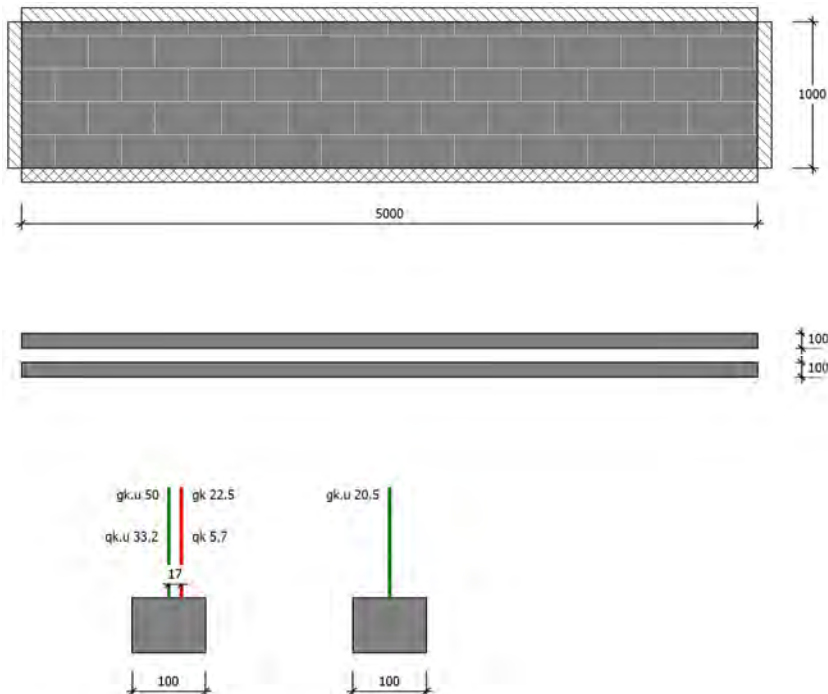
Checked :

Approved :

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS EN 1996-1-1:2005+A1:2012

Subwall 22N

**Summary of Design Data**

EuroCode National Annex

Wall Dimensions

Support Conditions

Cavity Wall (mm)

Limiting Dimensions

Using UK values A1 2012

 $h=1.000$ m, $h_{ef}=0.733$ m (Eqn. 5.8), $L=5.000$ m, $L_{ef}=5.000$ m

Bottom Cont., Top Simple, Left Simple, Right Simple

 $t_1=100$, $t_2=100$, $t_{ef}=126$ $\lambda=5.8 \leq \lambda_{lim}=27$

0.216

OK

Outer-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Unit Material

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=22.5$ N/mm²Normalised mean compressive strength $f_b=22.5 \cdot 1.38$ 31.05 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 12.59 N/mm² Table NA.4

Loads from above

Dead Load=20.5 kN/m

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive Case

 $1.35(\gamma_{tk} \cdot h + g_{ku})$

Max local stress @

 $X=0$ m, $Y=0.5$ m $< f_k/\gamma_{mc}$ 0.3 N/mm²

OK

Max axial buckling force @

 $X=4.5$ m, $Y=0.5$ m averaged over width Of 1 m

29.66 kN/m

Capacity reduction factor top, Φ $e_x=0.0$ mm, $h_{ef}=733$ mm, $t_{ef}=126.0$ mm, $t=100.0$ mm

0.900

Capacity reduction factor mid, Φ_m $e_{hm}=0.000$ mm, $h_{ef}=0.733$

0.885

 $F_r=\Phi \cdot f_k \cdot t_k / \gamma_{mc}$ $0.885 \times 12.59 \times 100 / 2.6$

428.9 kN/m

Fd/Fr

29.7/428.9

0.069

OK

Inner-Leaf DesignPartial Safety Factor (γ_{mc}/γ_{mf})

Construction Class 1, Unit Manufacture II

2.6/2.3 Table NA.1

Unit Material

Autoclaved Aerated Concrete Blocks, Group 1, $\gamma=14.72$ kN/m³Compressive strength (equiv. air dried) $f_b=22.5$ N/mm²Normalised mean compressive strength $f_b=22.5 \cdot 1.38$ 31.05 N/mm²

Mortar Material

M4, $f_m=4$ N/mm²Compressive Strength (f_k) $k=0.75$, $\alpha=0.7$, $\beta=0.3$ 12.59 N/mm² Table NA.4

Loads from above

Dead Load=50.0 kN/m, Live Load=33.2 kN/m

Loads @ this level

Dead Load=22.5 kN/m, Live Load=5.7 kN/m, $e_x=17$ mm

Job Ref : 10056
Sheet : /172
Made by : VM
Date : 02 September 2024 / Ver. 2023.19.22
Checked :
Approved :

01279430888

 F_d/F_r

150.8/428.2

0.352

OK



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B1

Sheet no./rev.
1

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

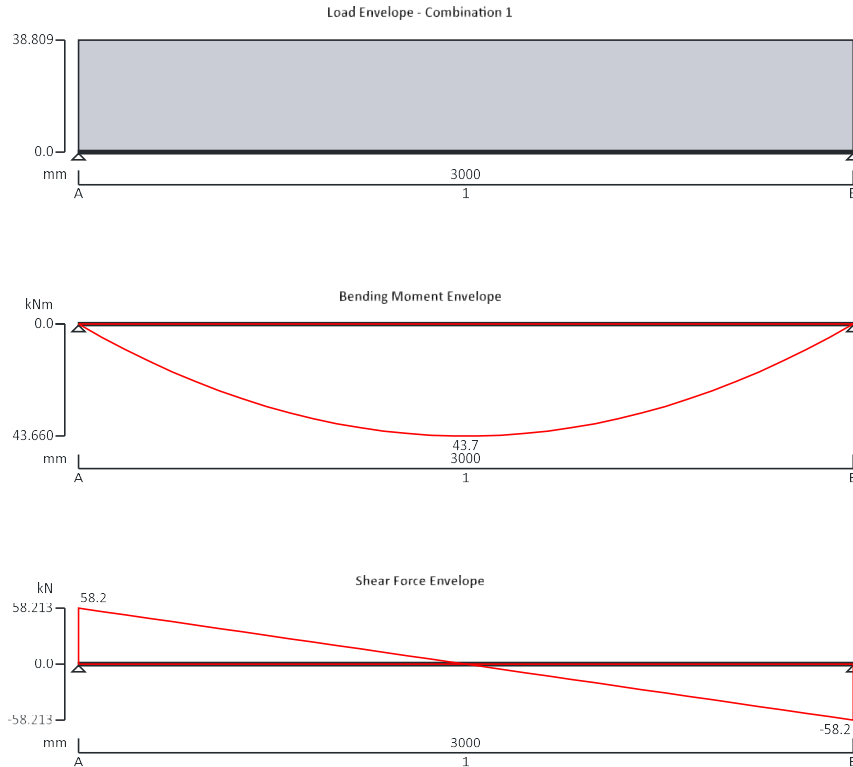
Ref.	Calculations	Output
------	--------------	--------

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Permanent self weight of beam $\times 1$
	Permanent full UDL 17.3 kN/m
	Variable full UDL 10.1 kN/m

Load combinations

Load combination 1	Support A	Permanent $\times 1.35$
		Variable $\times 1.50$
	Support B	Permanent $\times 1.35$
		Variable $\times 1.50$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B1

Sheet no./rev.
2

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

Output

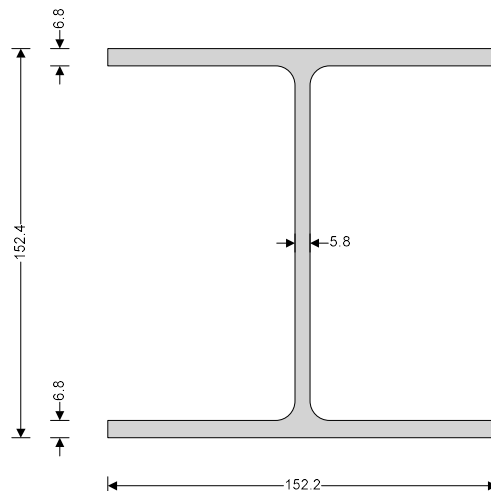
Variable $\times 1.50$

Analysis results

Maximum moment	$M_{\max} = 43.7 \text{ kNm}$	$M_{\min} = 0 \text{ kNm}$
Maximum shear	$V_{\max} = 58.2 \text{ kN}$	$V_{\min} = -58.2 \text{ kN}$
Deflection	$\delta_{\max} = 11.1 \text{ mm}$	$\delta_{\min} = 0 \text{ mm}$
Maximum reaction at support A	$R_{A_{\max}} = 58.2 \text{ kN}$	$R_{A_{\min}} = 58.2 \text{ kN}$
Unfactored permanent load reaction at support A	$R_{A_{\text{Permanent}}} = 26.3 \text{ kN}$	
Unfactored variable load reaction at support A	$R_{A_{\text{Variable}}} = 15.2 \text{ kN}$	
Maximum reaction at support B	$R_{B_{\max}} = 58.2 \text{ kN}$	$R_{B_{\min}} = 58.2 \text{ kN}$
Unfactored permanent load reaction at support B	$R_{B_{\text{Permanent}}} = 26.3 \text{ kN}$	
Unfactored variable load reaction at support B	$R_{B_{\text{Variable}}} = 15.2 \text{ kN}$	

Section details

Section type	UC 152x152x23 (British Steel Section Range 2022 (BS4-1))
Steel grade	S355
EN 10025-2:2004 - Hot rolled products of structural steels	
Nominal thickness of element	$t = \max(t_f, t_w) = 6.8 \text{ mm}$
Nominal yield strength	$f_y = 355 \text{ N/mm}^2$
Nominal ultimate tensile strength	$f_u = 470 \text{ N/mm}^2$
Modulus of elasticity	$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections	$\gamma_{M0} = 1.00$
Resistance of members to instability	$\gamma_{M1} = 1.00$
Resistance of tensile members to fracture	$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis	$K_y = 1.000$
Effective length factor in minor axis	$K_z = 1.000$
Effective length factor for torsion	$K_{LT,A} = 1.400 + 2 \times h$
	$K_{LT,B} = 1.000$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B1

Sheet no./rev.
3

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.	Calculations	Output
------	--------------	--------

Classification of cross sections - Section 5.5

$$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = \mathbf{0.81}$$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section $c = d = \mathbf{123.6 \text{ mm}}$
 $c / t_w = 26.2 \times \varepsilon \leq 72 \times \varepsilon$ Class 1

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section $c = (b - t_w - 2 \times r) / 2 = \mathbf{65.6 \text{ mm}}$
 $c / t_f = 11.9 \times \varepsilon \leq 14 \times \varepsilon$ Class 3

Section is class 3

Check shear - Section 6.2.6

Height of web $h_w = h - 2 \times t_f = \mathbf{138.8 \text{ mm}}$

Shear area factor $\eta = \mathbf{1.000}$
 $h_w / t_w < 72 \times \varepsilon / \eta$

Shear buckling resistance can be ignored

Design shear force $V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = \mathbf{58.2 \text{ kN}}$

Shear area - cl 6.2.6(3) $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = \mathbf{997 \text{ mm}^2}$

Design shear resistance - cl 6.2.6(2) $V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = \mathbf{204.4 \text{ kN}}$

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment $M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = \mathbf{43.7 \text{ kNm}}$

Design bending resistance moment - eq 6.14 $M_{c,Rd} = M_{el,Rd} = W_{el,y} \times f_y / \gamma_{M0} = \mathbf{58.2 \text{ kNm}}$

PASS - Design bending resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = \mathbf{12 \text{ mm}}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = \mathbf{11.101 \text{ mm}}$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project				Job Ref.	
Redevelopment of East Court, East Grinstead, RH19 3LT				10056	
Part of Structure				Sheet no./rev.	
B2				1	
Calc. by	Date	Chk'd by	Date	Rev'd by	Date
VM	29/08/2024		29/08/2024		

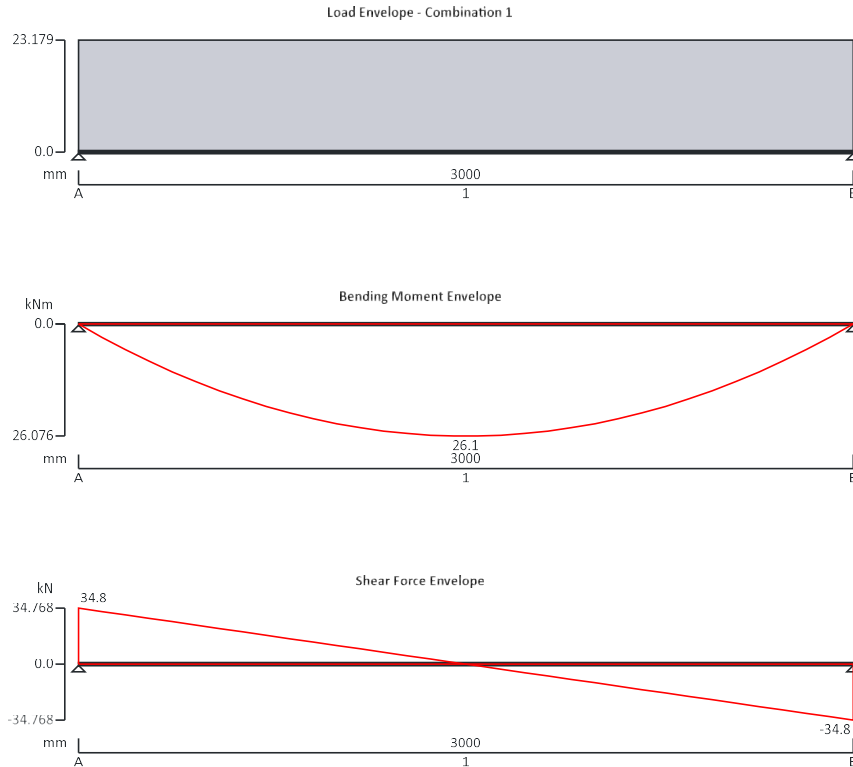
Ref.	Calculations	Output
------	--------------	--------

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Permanent self weight of beam $\times 1$
	Permanent full UDL 12.5 kN/m
	Variable full UDL 4 kN/m

Load combinations

Load combination 1	Support A	Permanent $\times 1.35$
		Variable $\times 1.50$
	Support B	Permanent $\times 1.35$
		Variable $\times 1.50$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B2

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Variable $\times 1.50$

Analysis results

Maximum moment

$M_{\max} = 26.1 \text{ kNm}$

$M_{\min} = 0 \text{ kNm}$

Maximum shear

$V_{\max} = 34.8 \text{ kN}$

$V_{\min} = -34.8 \text{ kN}$

Deflection

$\delta_{\max} = 6.7 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_{\max}} = 34.8 \text{ kN}$

$R_{A_{\min}} = 34.8 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_{\text{Permanent}}} = 19.1 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_{\text{Variable}}} = 6 \text{ kN}$

Maximum reaction at support B

$R_{B_{\max}} = 34.8 \text{ kN}$

$R_{B_{\min}} = 34.8 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_{\text{Permanent}}} = 19.1 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_{\text{Variable}}} = 6 \text{ kN}$

Section details

Section type

UC 152x152x23 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 6.8 \text{ mm}$

Nominal yield strength

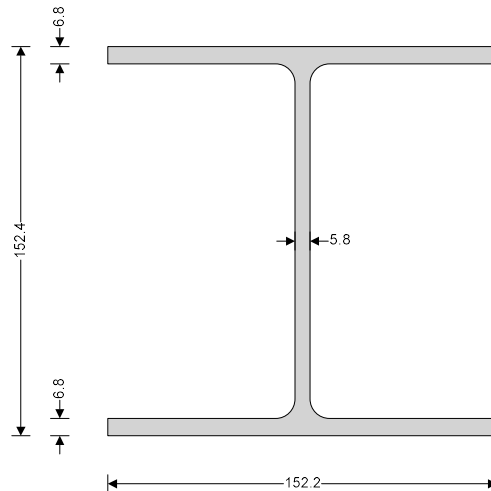
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis

$K_y = 1.000$

Effective length factor in minor axis

$K_z = 1.000$

Effective length factor for torsion

$K_{LT,A} = 1.400 + 2 \times h$

$K_{LT,B} = 1.000$



Harlow – 01279 430888
Norwich – 01603 300360

Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
Part of Structure B2				Sheet no./rev. 3	
Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024	Rev'd by	Date

Ref.	Calculations	Output
------	--------------	--------

Classification of cross sections - Section 5.5

$$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = \mathbf{0.81}$$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section

$$c = d = \mathbf{123.6 \text{ mm}}$$

$$c / t_w = 26.2 \times \varepsilon \leq 72 \times \varepsilon \quad \text{Class 1}$$

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section

$$c = (b - t_w - 2 \times r) / 2 = \mathbf{65.6 \text{ mm}}$$

$$c / t_f = 11.9 \times \varepsilon \leq 14 \times \varepsilon \quad \text{Class 3}$$

Section is class 3

Check shear - Section 6.2.6

Height of web

$$h_w = h - 2 \times t_f = \mathbf{138.8 \text{ mm}}$$

Shear area factor

$$\eta = \mathbf{1.000}$$

$$h_w / t_w < 72 \times \varepsilon / \eta$$

Shear buckling resistance can be ignored

Design shear force

$$V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = \mathbf{34.8 \text{ kN}}$$

Shear area - cl 6.2.6(3)

$$A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = \mathbf{997 \text{ mm}^2}$$

Design shear resistance - cl 6.2.6(2)

$$V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = \mathbf{204.4 \text{ kN}}$$

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment

$$M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = \mathbf{26.1 \text{ kNm}}$$

Design bending resistance moment - eq 6.14

$$M_{c,Rd} = M_{el,Rd} = W_{el,y} \times f_y / \gamma_{M0} = \mathbf{58.2 \text{ kNm}}$$

PASS - Design bending resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection

$$\delta_{lim} = L_{s1} / 250 = \mathbf{12 \text{ mm}}$$

Maximum deflection span 1

$$\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = \mathbf{6.721 \text{ mm}}$$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B3

Sheet no./rev.
1

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

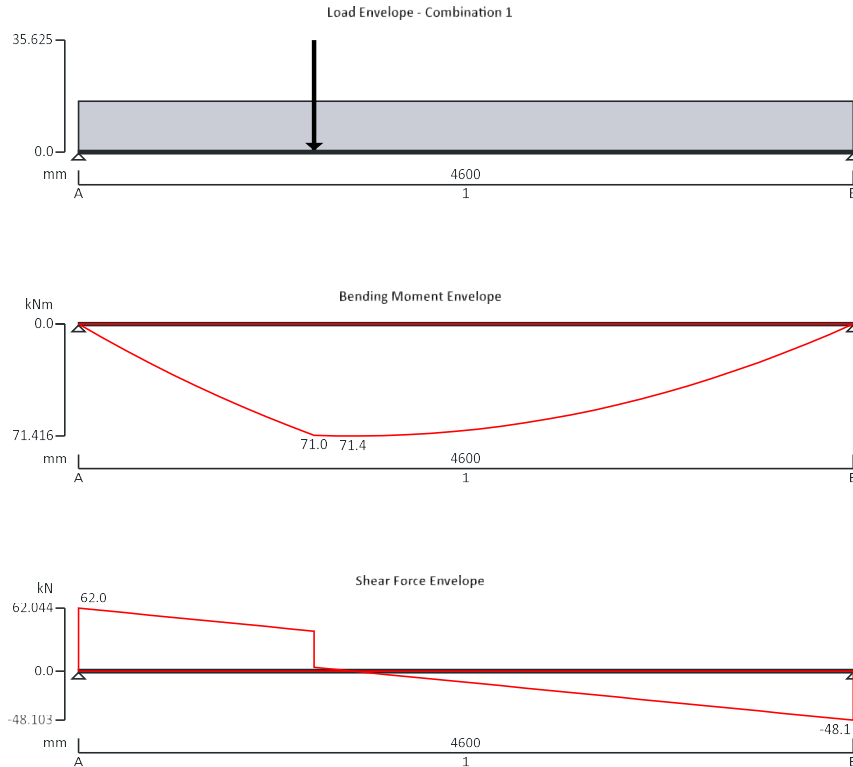
Output

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Permanent full UDL 7.1 kN/m

Variable full UDL 4 kN/m

Permanent point load 12.5 kN at 1400 mm

Variable point load 12.5 kN at 1400 mm

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$

Permanent $\times 1.35$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B3

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Analysis results

Maximum moment

$M_{\max} = 71.4 \text{ kNm}$

Variable $\times 1.50$

Permanent $\times 1.35$

Variable $\times 1.50$

Maximum shear

$V_{\max} = 62 \text{ kN}$

$M_{\min} = 0 \text{ kNm}$

$V_{\min} = -48.1 \text{ kN}$

Deflection

$\delta_{\max} = 11.2 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_{\max}} = 62 \text{ kN}$

$R_{A_{\min}} = 62 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_{\text{Permanent}}} = 26.1 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_{\text{Variable}}} = 17.9 \text{ kN}$

Maximum reaction at support B

$R_{B_{\max}} = 48.1 \text{ kN}$

$R_{B_{\min}} = 48.1 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_{\text{Permanent}}} = 21.2 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_{\text{Variable}}} = 13 \text{ kN}$

Section details

Section type

UC 203x203x46 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_r, t_w) = 11.0 \text{ mm}$

Nominal yield strength

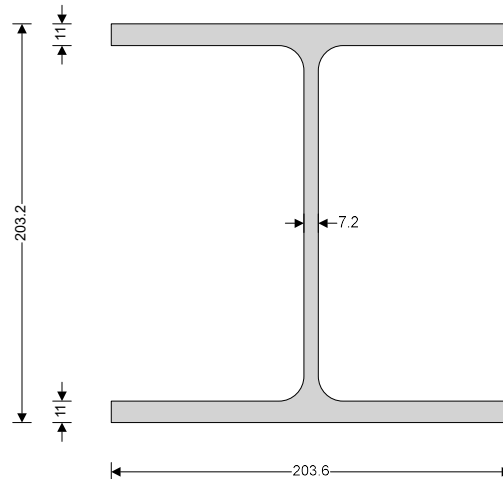
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis

$K_y = 1.000$

Effective length factor in minor axis

$K_z = 1.000$

Effective length factor for torsion

$K_{LTA} = 1.400 + 2 \times h$

 Harlow – 01279 430888 Norwich – 01603 300360	Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
	Part of Structure B3				Sheet no./rev. 3	
	Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024	Rev'd by	Date
	Ref.				Calculations	
Output						
K _{LT,B} = 1.000						
Classification of cross sections - Section 5.5						
ε = √[235 N/mm ² / f _y] = 0.81						
Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)						
Width of section c = d = 155.8 mm						
c / t _w = 26.6 × ε <= 72 × ε Class 1						
Outstand flanges - Table 5.2 (sheet 2 of 3)						
Width of section c = (b - t _w - 2 × r) / 2 = 85.5 mm						
c / t _f = 9.6 × ε <= 10 × ε Class 2						
Section is class 2						
Check shear - Section 6.2.6						
Height of web h _w = h - 2 × t _f = 181.2 mm						
Shear area factor η = 1.000						
h _w / t _w < 72 × ε / η						
Shear buckling resistance can be ignored						
Design shear force V _{Ed} = max(abs(V _{max}), abs(V _{min})) = 62 kN						
Shear area - cl 6.2.6(3) A _v = max(A - 2 × b × t _f + (t _w + 2 × r) × t _f , η × h _w × t _w) = 1802 mm ²						
Design shear resistance - cl 6.2.6(2) V _{c,Rd} = V _{pl,Rd} = A _v × (f _y / √[3]) / γ _{M0} = 369.3 kN						
PASS - Design shear resistance exceeds design shear force						
Check bending moment major (y-y) axis - Section 6.2.5						
Design bending moment M _{Ed} = max(abs(M _{s1_max}), abs(M _{s1_min})) = 71.4 kNm						
Design bending resistance moment - eq 6.13 M _{c,Rd} = M _{pl,Rd} = W _{pl,y} × f _y / γ _{M0} = 178.1 kNm						
PASS - Design bending resistance moment exceeds design bending moment						
Check vertical deflection - Section 7.2.1						
Consider deflection due to permanent and variable loads						
Limiting deflection δ _{lim} = L _{s1} / 250 = 18.4 mm						
Maximum deflection span 1 δ = max(abs(δ _{max}), abs(δ _{min})) = 11.182 mm						
PASS - Maximum deflection does not exceed deflection limit						



Harlow – 01279 430888
Norwich – 01603 300360

Project				Job Ref.	
Redevelopment of East Court, East Grinstead, RH19 3LT				10056	
Part of Structure				Sheet no./rev.	
B4				1	
Calc. by	Date	Chk'd by	Date	Rev'd by	Date
VM	29/08/2024		29/08/2024		

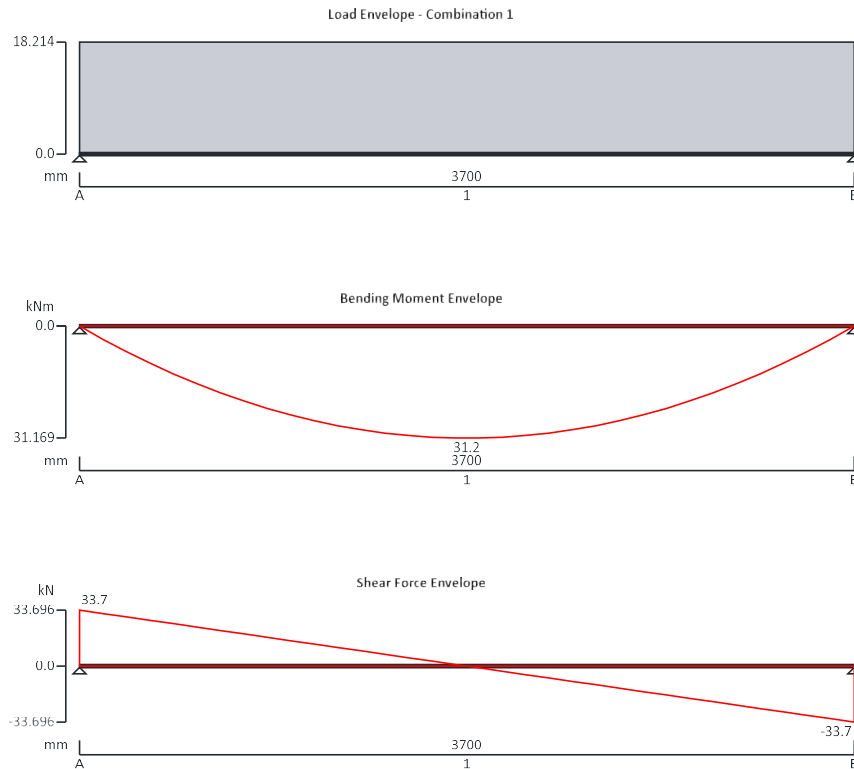
Ref.	Calculations	Output
------	--------------	--------

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Permanent self weight of beam $\times 1$
	Permanent full UDL 8.6 kN/m
	Variable full UDL 4.2 kN/m

Load combinations

Load combination 1	Support A	Permanent $\times 1.35$
		Variable $\times 1.50$
	Support B	Permanent $\times 1.35$
		Variable $\times 1.50$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B4

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Variable $\times 1.50$

Analysis results

Maximum moment

$M_{\max} = 31.2 \text{ kNm}$

$M_{\min} = 0 \text{ kNm}$

Maximum shear

$V_{\max} = 33.7 \text{ kN}$

$V_{\min} = -33.7 \text{ kN}$

Deflection

$\delta_{\max} = 12.1 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_{\max}} = 33.7 \text{ kN}$

$R_{A_{\min}} = 33.7 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_{\text{Permanent}}} = 16.3 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_{\text{Variable}}} = 7.8 \text{ kN}$

Maximum reaction at support B

$R_{B_{\max}} = 33.7 \text{ kN}$

$R_{B_{\min}} = 33.7 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_{\text{Permanent}}} = 16.3 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_{\text{Variable}}} = 7.8 \text{ kN}$

Section details

Section type

UC 152x152x23 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 6.8 \text{ mm}$

Nominal yield strength

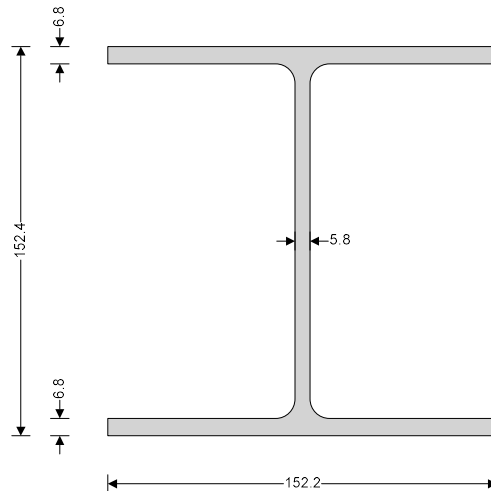
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis

$K_y = 1.000$

Effective length factor in minor axis

$K_z = 1.000$

Effective length factor for torsion

$K_{LT,A} = 1.400 + 2 \times h$

$K_{LT,B} = 1.000$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B4

Sheet no./rev.
3

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.	Calculations	Output
------	--------------	--------

Classification of cross sections - Section 5.5

$$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.81$$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section $c = d = 123.6 \text{ mm}$
 $c / t_w = 26.2 \times \varepsilon \leq 72 \times \varepsilon$ Class 1

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section $c = (b - t_w - 2 \times r) / 2 = 65.6 \text{ mm}$
 $c / t_f = 11.9 \times \varepsilon \leq 14 \times \varepsilon$ Class 3

Section is class 3

Check shear - Section 6.2.6

Height of web $h_w = h - 2 \times t_f = 138.8 \text{ mm}$

Shear area factor $\eta = 1.000$

$$h_w / t_w < 72 \times \varepsilon / \eta$$

Shear buckling resistance can be ignored

Design shear force $V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 33.7 \text{ kN}$

Shear area - cl 6.2.6(3) $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 997 \text{ mm}^2$

Design shear resistance - cl 6.2.6(2) $V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 204.4 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment $M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 31.2 \text{ kNm}$

Design bending resistance moment - eq 6.14 $M_{c,Rd} = M_{el,Rd} = W_{el,y} \times f_y / \gamma_{M0} = 58.2 \text{ kNm}$

PASS - Design bending resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = 14.8 \text{ mm}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = 12.111 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit



Harlow - 01279 430888
Norwich - 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B5

Sheet no./rev.
1

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

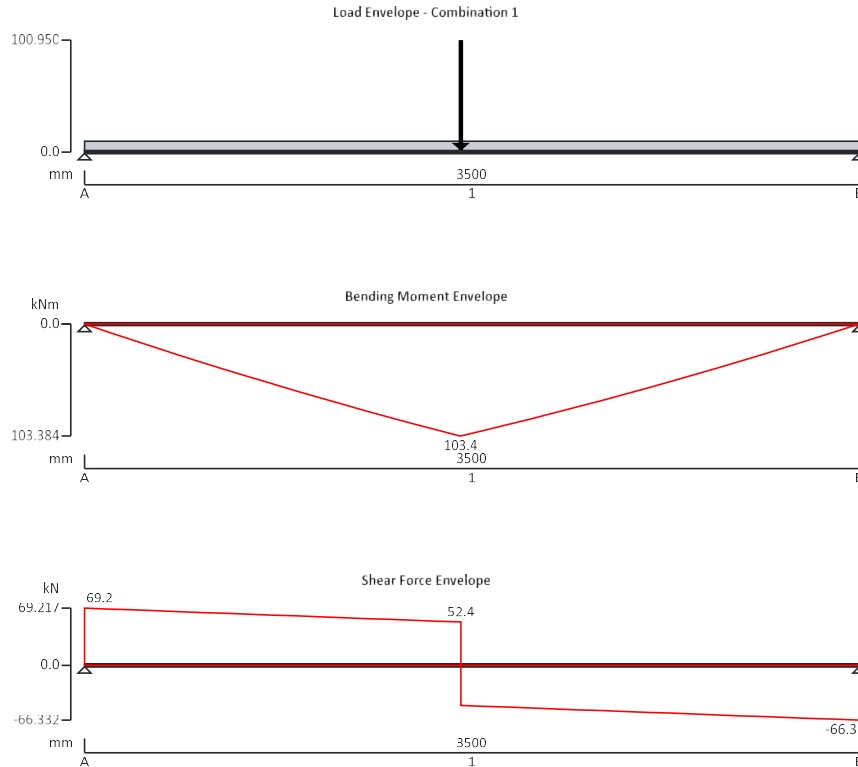
Output

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Permanent full UDL 5.2 kN/m

Variable full UDL 1.5 kN/m

b4 - Permanent point load 16 kN at 1700 mm

b4 - Variable point load 7.7 kN at 1700 mm

b14 - Permanent point load 28 kN at 1700 mm

b14 - Variable point load 20 kN at 1700 mm

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B5

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Analysis results

Maximum moment

$M_{\max} = 103.4 \text{ kNm}$

$M_{\min} = 0 \text{ kNm}$

Maximum shear

$V_{\max} = 69.2 \text{ kN}$

$V_{\min} = -66.3 \text{ kN}$

Deflection

$\delta_{\max} = 8.1 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_{\max}} = 69.2 \text{ kN}$

$R_{A_{\min}} = 69.2 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_{\text{Permanent}}} = 32.5 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_{\text{Variable}}} = 16.9 \text{ kN}$

Maximum reaction at support B

$R_{B_{\max}} = 66.3 \text{ kN}$

$R_{B_{\min}} = 66.3 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_{\text{Permanent}}} = 31.3 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_{\text{Variable}}} = 16.1 \text{ kN}$

Section details

Section type

UC 203x203x46 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 11.0 \text{ mm}$

Nominal yield strength

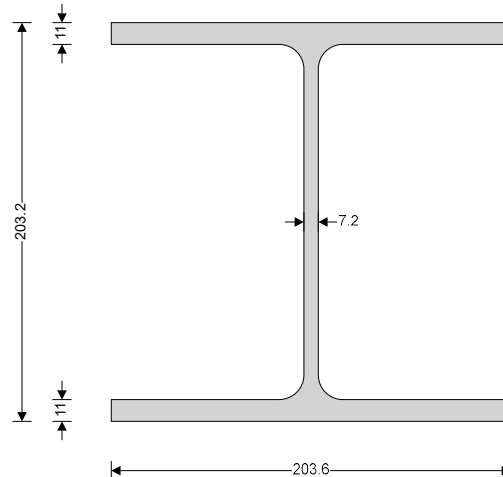
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis

$K_y = 1.000$

Effective length factor in minor axis

$K_z = 1.000$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B5

Sheet no./rev.
3

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.	Calculations	Output
------	--------------	--------

Effective length factor for torsion

$$K_{LT,A} = 1.400 + 2 \times h$$

$$K_{LT,B} = 1.000$$

Classification of cross sections - Section 5.5

$$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.81$$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section

$$c = d = 155.8 \text{ mm}$$

$$c / t_w = 26.6 \times \varepsilon \leq 72 \times \varepsilon \quad \text{Class 1}$$

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section

$$c = (b - t_w - 2 \times r) / 2 = 85.5 \text{ mm}$$

$$c / t_f = 9.6 \times \varepsilon \leq 10 \times \varepsilon \quad \text{Class 2}$$

Section is class 2

Check shear - Section 6.2.6

Height of web

$$h_w = h - 2 \times t_f = 181.2 \text{ mm}$$

Shear area factor

$$\eta = 1.000$$

$$h_w / t_w < 72 \times \varepsilon / \eta$$

Shear buckling resistance can be ignored

Design shear force

$$V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 69.2 \text{ kN}$$

Shear area - cl 6.2.6(3)

$$A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 1802 \text{ mm}^2$$

Design shear resistance - cl 6.2.6(2)

$$V_{c,Rd} = V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 369.3 \text{ kN}$$

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment

$$M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 103.4 \text{ kNm}$$

Design bending resistance moment - eq 6.13

$$M_{c,Rd} = M_{pl,Rd} = W_{pl,y} \times f_y / \gamma_{M0} = 178.1 \text{ kNm}$$

PASS - Design bending resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection

$$\delta_{lim} = L_{s1} / 250 = 14 \text{ mm}$$

Maximum deflection span 1

$$\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = 8.062 \text{ mm}$$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B6

Sheet no./rev.
1

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

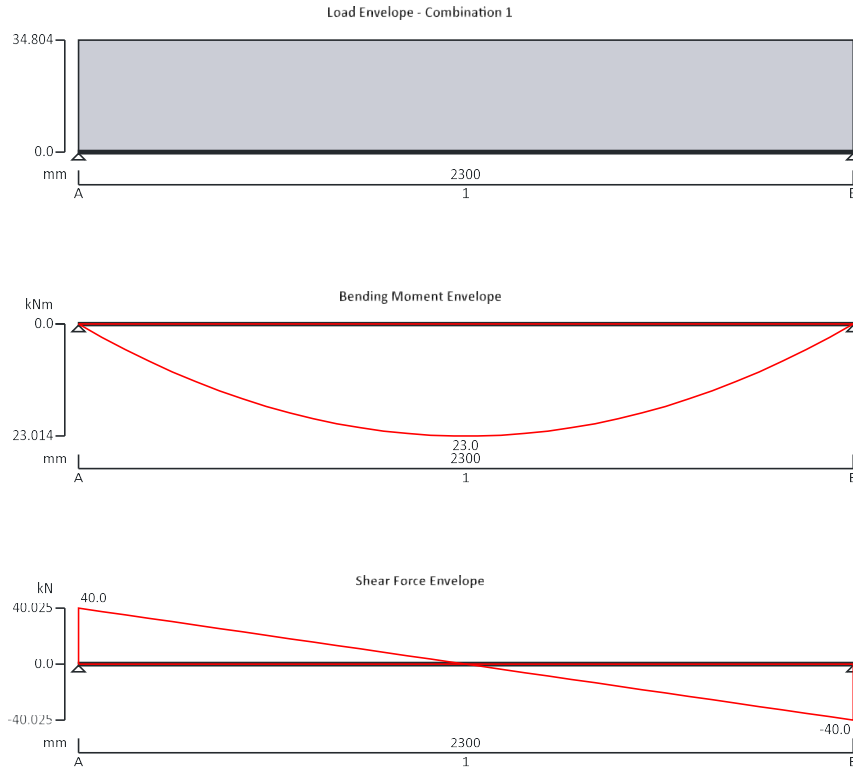
Ref.	Calculations	Output
------	--------------	--------

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Permanent self weight of beam $\times 1$
	Permanent full UDL 20 kN/m
	Variable full UDL 5 kN/m

Load combinations

Load combination 1	Support A	Permanent $\times 1.35$
		Variable $\times 1.50$
	Support B	Permanent $\times 1.35$
		Variable $\times 1.50$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B6

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Variable $\times 1.50$

Analysis results

Maximum moment

$M_{\max} = 23 \text{ kNm}$

$M_{\min} = 0 \text{ kNm}$

Maximum shear

$V_{\max} = 40 \text{ kN}$

$V_{\min} = -40 \text{ kN}$

Deflection

$\delta_{\max} = 3.5 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_{\max}} = 40 \text{ kN}$

$R_{A_{\min}} = 40 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_{\text{Permanent}}} = 23.3 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_{\text{Variable}}} = 5.8 \text{ kN}$

Maximum reaction at support B

$R_{B_{\max}} = 40 \text{ kN}$

$R_{B_{\min}} = 40 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_{\text{Permanent}}} = 23.3 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_{\text{Variable}}} = 5.8 \text{ kN}$

Section details

Section type

UC 152x152x23 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 6.8 \text{ mm}$

Nominal yield strength

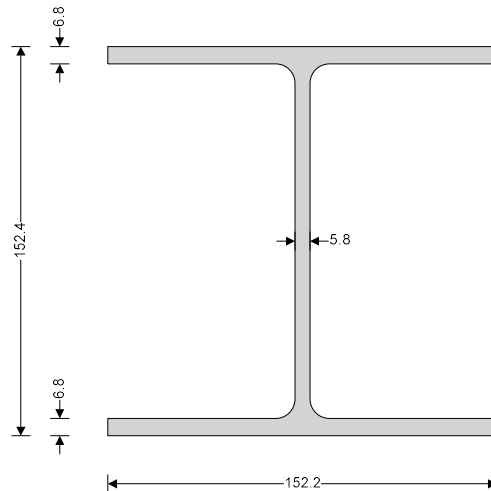
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis

$K_y = 1.000$

Effective length factor in minor axis

$K_z = 1.000$

Effective length factor for torsion

$K_{LT,A} = 1.400 + 2 \times h$

$K_{LT,B} = 1.000$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B6

Sheet no./rev.
3

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.	Calculations	Output
------	--------------	--------

Classification of cross sections - Section 5.5

$$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.81$$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section $c = d = 123.6 \text{ mm}$
 $c / t_w = 26.2 \times \varepsilon \leq 72 \times \varepsilon$ Class 1

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section $c = (b - t_w - 2 \times r) / 2 = 65.6 \text{ mm}$
 $c / t_f = 11.9 \times \varepsilon \leq 14 \times \varepsilon$ Class 3

Section is class 3

Check shear - Section 6.2.6

Height of web $h_w = h - 2 \times t_f = 138.8 \text{ mm}$

Shear area factor $\eta = 1.000$

$$h_w / t_w < 72 \times \varepsilon / \eta$$

Shear buckling resistance can be ignored

Design shear force $V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 40 \text{ kN}$

Shear area - cl 6.2.6(3) $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 997 \text{ mm}^2$

Design shear resistance - cl 6.2.6(2) $V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 204.4 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment $M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 23 \text{ kNm}$

Design bending resistance moment - eq 6.14 $M_{c,Rd} = M_{el,Rd} = W_{el,y} \times f_y / \gamma_{M0} = 58.2 \text{ kNm}$

PASS - Design bending resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = 9.2 \text{ mm}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = 3.502 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B7

Sheet no./rev.
1

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

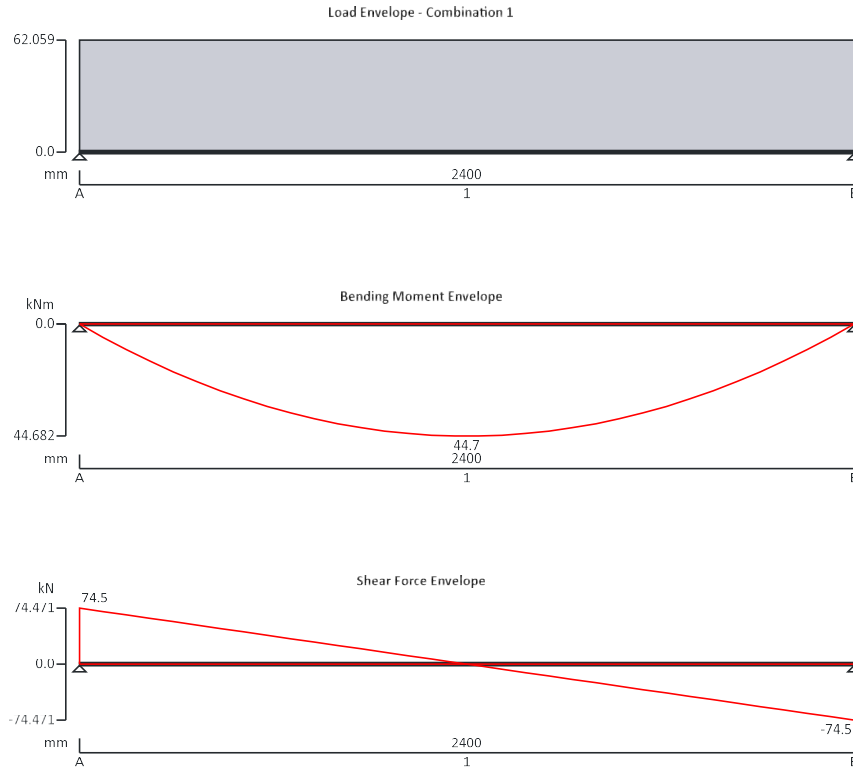
Output

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Permanent full UDL 31.3 kN/m

Variable full UDL 13 kN/m

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$

Permanent $\times 1.35$

Variable $\times 1.50$

Support B

Permanent $\times 1.35$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B7

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Variable $\times 1.50$

Analysis results

Maximum moment

$M_{\max} = 44.7 \text{ kNm}$

$M_{\min} = 0 \text{ kNm}$

Maximum shear

$V_{\max} = 74.5 \text{ kN}$

$V_{\min} = -74.5 \text{ kN}$

Deflection

$\delta_{\max} = 7.3 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_{\max}} = 74.5 \text{ kN}$

$R_{A_{\min}} = 74.5 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_{\text{Permanent}}} = 37.8 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_{\text{Variable}}} = 15.6 \text{ kN}$

Maximum reaction at support B

$R_{B_{\max}} = 74.5 \text{ kN}$

$R_{B_{\min}} = 74.5 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_{\text{Permanent}}} = 37.8 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_{\text{Variable}}} = 15.6 \text{ kN}$

Section details

Section type

UC 152x152x23 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 6.8 \text{ mm}$

Nominal yield strength

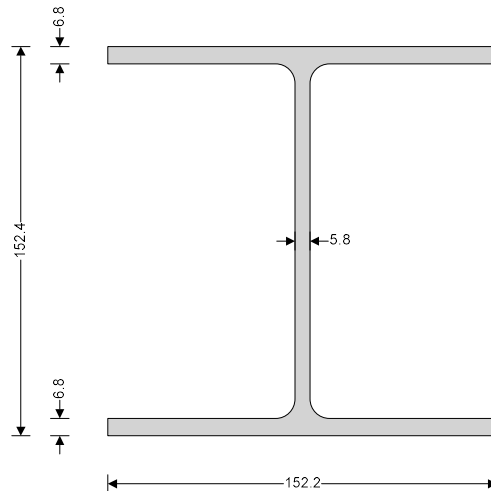
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis

$K_y = 1.000$

Effective length factor in minor axis

$K_z = 1.000$

Effective length factor for torsion

$K_{LT,A} = 1.400 + 2 \times h$

$K_{LT,B} = 1.000$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B7

Sheet no./rev.
3

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.	Calculations	Output
------	--------------	--------

Classification of cross sections - Section 5.5

$$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.81$$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section $c = d = 123.6 \text{ mm}$
 $c / t_w = 26.2 \times \varepsilon \leq 72 \times \varepsilon$ Class 1

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section $c = (b - t_w - 2 \times r) / 2 = 65.6 \text{ mm}$
 $c / t_f = 11.9 \times \varepsilon \leq 14 \times \varepsilon$ Class 3

Section is class 3

Check shear - Section 6.2.6

Height of web $h_w = h - 2 \times t_f = 138.8 \text{ mm}$

Shear area factor $\eta = 1.000$

$$h_w / t_w < 72 \times \varepsilon / \eta$$

Shear buckling resistance can be ignored

Design shear force $V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 74.5 \text{ kN}$

Shear area - cl 6.2.6(3) $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 997 \text{ mm}^2$

Design shear resistance - cl 6.2.6(2) $V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 204.4 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment $M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 44.7 \text{ kNm}$

Design bending resistance moment - eq 6.14 $M_{c,Rd} = M_{el,Rd} = W_{el,y} \times f_y / \gamma_{M0} = 58.2 \text{ kNm}$

PASS - Design bending resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = 9.6 \text{ mm}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = 7.329 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

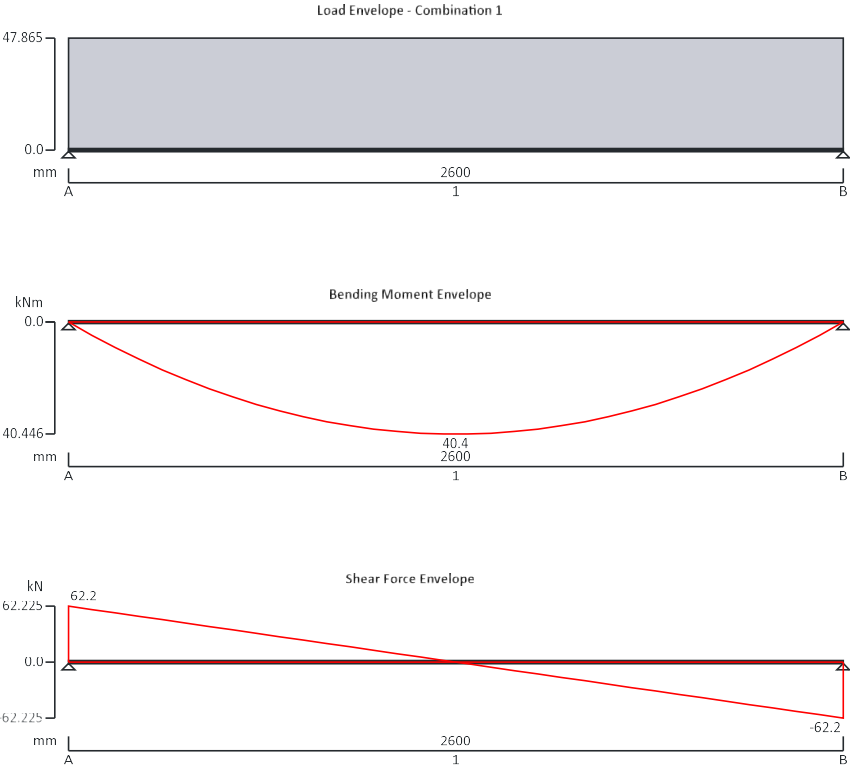
Project				Job Ref.	
Redevelopment of East Court, East Grinstead, RH19 3LT				10056	
Part of Structure				Sheet no./rev.	
B8				1	
Calc. by	Date	Chk'd by	Date	Rev'd by	Date
VM	29/08/2024		29/08/2024		
Ref.				Calculations	
				Output	

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Permanent self weight of beam × 1
	Permanent full UDL 25 kN/m
	Variable full UDL 9 kN/m

Load combinations

Load combination 1	Support A	Permanent × 1.35
		Variable × 1.50
	Support B	Permanent × 1.35
		Variable × 1.50



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B8

Sheet no./rev.
2

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

Output

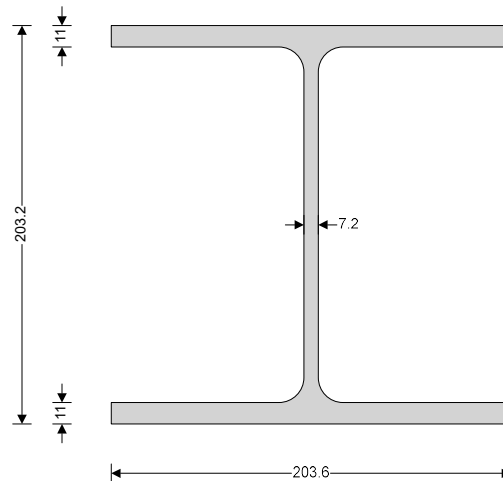
Variable $\times 1.50$

Analysis results

Maximum moment	$M_{\max} = 40.4 \text{ kNm}$	$M_{\min} = 0 \text{ kNm}$
Maximum shear	$V_{\max} = 62.2 \text{ kN}$	$V_{\min} = -62.2 \text{ kN}$
Deflection	$\delta_{\max} = 2.1 \text{ mm}$	$\delta_{\min} = 0 \text{ mm}$
Maximum reaction at support A	$R_{A_{\max}} = 62.2 \text{ kN}$	$R_{A_{\min}} = 62.2 \text{ kN}$
Unfactored permanent load reaction at support A	$R_{A_{\text{Permanent}}} = 33.1 \text{ kN}$	
Unfactored variable load reaction at support A	$R_{A_{\text{Variable}}} = 11.7 \text{ kN}$	
Maximum reaction at support B	$R_{B_{\max}} = 62.2 \text{ kN}$	$R_{B_{\min}} = 62.2 \text{ kN}$
Unfactored permanent load reaction at support B	$R_{B_{\text{Permanent}}} = 33.1 \text{ kN}$	
Unfactored variable load reaction at support B	$R_{B_{\text{Variable}}} = 11.7 \text{ kN}$	

Section details

Section type	UC 203x203x46 (British Steel Section Range 2022 (BS4-1))
Steel grade	S355
EN 10025-2:2004 - Hot rolled products of structural steels	
Nominal thickness of element	$t = \max(t_f, t_w) = 11.0 \text{ mm}$
Nominal yield strength	$f_y = 355 \text{ N/mm}^2$
Nominal ultimate tensile strength	$f_u = 470 \text{ N/mm}^2$
Modulus of elasticity	$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections	$\gamma_{M0} = 1.00$
Resistance of members to instability	$\gamma_{M1} = 1.00$
Resistance of tensile members to fracture	$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis	$K_y = 1.000$
Effective length factor in minor axis	$K_z = 1.000$
Effective length factor for torsion	$K_{LT,A} = 1.400 + 2 \times h$
	$K_{LT,B} = 1.000$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B8

Sheet no./rev.
3

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.	Calculations	Output
------	--------------	--------

Classification of cross sections - Section 5.5

$$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = \mathbf{0.81}$$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section $c = d = \mathbf{155.8 \text{ mm}}$
 $c / t_w = 26.6 \times \varepsilon \leq 72 \times \varepsilon$ Class 1

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section $c = (b - t_w - 2 \times r) / 2 = \mathbf{85.5 \text{ mm}}$
 $c / t_f = 9.6 \times \varepsilon \leq 10 \times \varepsilon$ Class 2

Section is class 2

Check shear - Section 6.2.6

Height of web $h_w = h - 2 \times t_f = \mathbf{181.2 \text{ mm}}$

Shear area factor $\eta = \mathbf{1.000}$
 $h_w / t_w < 72 \times \varepsilon / \eta$

Shear buckling resistance can be ignored

Design shear force $V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = \mathbf{62.2 \text{ kN}}$

Shear area - cl 6.2.6(3) $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = \mathbf{1802 \text{ mm}^2}$

Design shear resistance - cl 6.2.6(2) $V_{c,Rd} = V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = \mathbf{369.3 \text{ kN}}$

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment $M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = \mathbf{40.4 \text{ kNm}}$

Design bending resistance moment - eq 6.13 $M_{c,Rd} = M_{pl,Rd} = W_{pl,y} \times f_y / \gamma_{M0} = \mathbf{178.1 \text{ kNm}}$

PASS - Design bending resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = \mathbf{10.4 \text{ mm}}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = \mathbf{2.12 \text{ mm}}$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B9

Sheet no./rev.
1

Calc. by VM	Date 30/08/2024	Chk'd by	Date 30/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

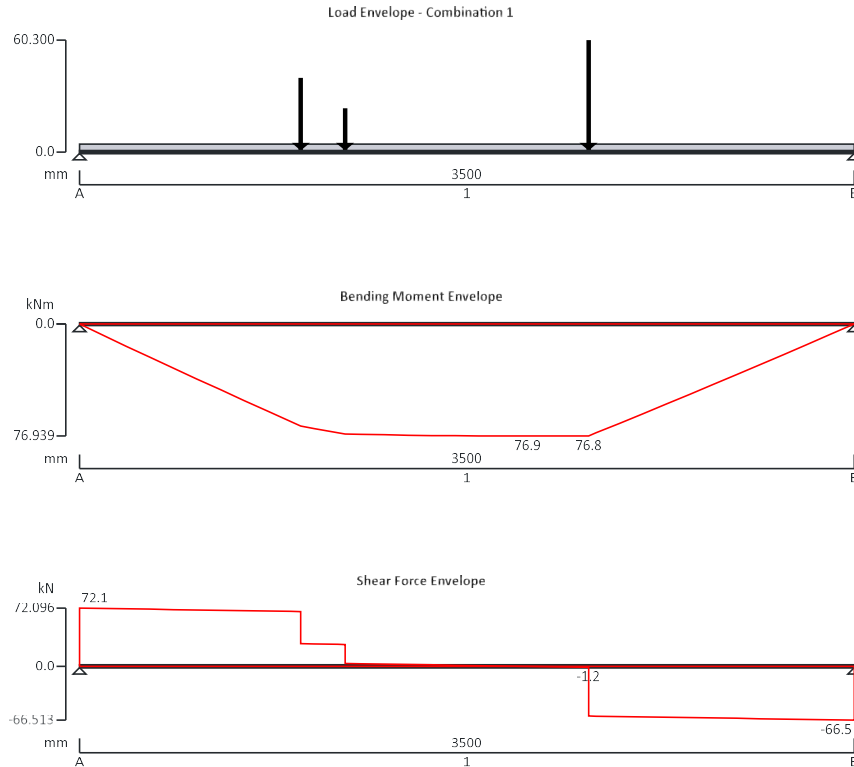
Output

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Permanent full UDL 1 kN/m

Variable full UDL 1.5 kN/m

Permanent point load 32 kN at 2300 mm

Variable point load 11.4 kN at 2300 mm

Permanent point load 14 kN at 1000 mm

Variable point load 14 kN at 1000 mm

Permanent point load 2.3 kN at 1200 mm

Variable point load 2.3 kN at 1200 mm

Permanent point load 6 kN at 1200 mm



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B9

Sheet no./rev.

2

Calc. by

VM

Date

30/08/2024

Chk'd by

Date

30/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Variable point load 6 kN at 1200 mm

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$

Permanent $\times 1.35$

Variable $\times 1.50$

Support B

Permanent $\times 1.35$

Variable $\times 1.50$

Analysis results

Maximum moment

$M_{\max} = 76.9$ kNm

$M_{\min} = 0$ kNm

Maximum moment span 1 segment 1

$M_{s1_seg1_max} = 76.8$ kNm

$M_{s1_seg1_min} = 0$ kNm

Maximum moment span 1 segment 2

$M_{s1_seg2_max} = 76.9$ kNm

$M_{s1_seg2_min} = 0$ kNm

Maximum shear

$V_{\max} = 72.1$ kN

$V_{\min} = -66.5$ kN

Maximum shear span 1 segment 1

$V_{s1_seg1_max} = 72.1$ kN

$V_{s1_seg1_min} = 0$ kN

Maximum shear span 1 segment 2

$V_{s1_seg2_max} = 1.2$ kN

$V_{s1_seg2_min} = -66.5$ kN

Deflection segment 3

$\delta_{\max} = 7.4$ mm

$\delta_{\min} = 0$ mm

Maximum reaction at support A

$R_{A_max} = 72.1$ kN

$R_{A_min} = 72.1$ kN

Unfactored permanent load reaction at support A

$R_{A_Permanent} = 29$ kN

Unfactored variable load reaction at support A

$R_{A_Variable} = 22$ kN

Maximum reaction at support B

$R_{B_max} = 66.5$ kN

$R_{B_min} = 66.5$ kN

Unfactored permanent load reaction at support B

$R_{B_Permanent} = 30.4$ kN

Unfactored variable load reaction at support B

$R_{B_Variable} = 17$ kN

Section details

Section type

UC 203x203x46 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 11.0$ mm

Nominal yield strength

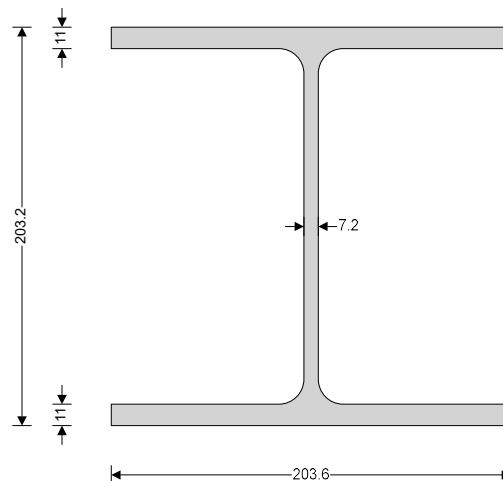
$f_y = 355$ N/mm²

Nominal ultimate tensile strength

$f_u = 470$ N/mm²

Modulus of elasticity

$E = 210000$ N/mm²



 Harlow – 01279 430888 Norwich – 01603 300360		Project			Job Ref.	
		Redevelopment of East Court, East Grinstead, RH19 3LT			10056	
		Part of Structure			Sheet no./rev.	
		B9			3	
		Calc. by	Date	Chk'd by	Date	Rev'd by
		VM	30/08/2024		30/08/2024	Date
Ref.	Calculations					Output
Partial factors - Section 6.1						
Resistance of cross-sections			$\gamma_{M0} = 1.00$			
Resistance of members to instability			$\gamma_{M1} = 1.00$			
Resistance of tensile members to fracture			$\gamma_{M2} = 1.10$			
Lateral restraint						
			Span 1 has lateral restraint at supports plus midspan			
Effective length factors						
Effective length factor in major axis			$K_y = 1.000$			
Effective length factor in minor axis			$K_z = 1.000$			
Effective length factor for torsion			$K_{LT,A} = 1.400 + 2 \times h$			
			$K_{LT,B} = 1.000$			
Classification of cross sections - Section 5.5						
			$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.81$			
Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)						
Width of section			$c = d = 155.8 \text{ mm}$			
			$c / t_w = 26.6 \times \varepsilon \leq 72 \times \varepsilon$		Class 1	
Outstand flanges - Table 5.2 (sheet 2 of 3)						
Width of section			$c = (b - t_w - 2 \times r) / 2 = 85.5 \text{ mm}$			
			$c / t_f = 9.6 \times \varepsilon \leq 10 \times \varepsilon$		Class 2	
			Section is class 2			
Check shear - Section 6.2.6						
Height of web			$h_w = h - 2 \times t_f = 181.2 \text{ mm}$			
Shear area factor			$\eta = 1.000$			
			$h_w / t_w < 72 \times \varepsilon / \eta$			
			Shear buckling resistance can be ignored			
Design shear force			$V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 72.1 \text{ kN}$			
Shear area - cl 6.2.6(3)			$A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 1802 \text{ mm}^2$			
Design shear resistance - cl 6.2.6(2)			$V_{c,Rd} = V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 369.3 \text{ kN}$			
			PASS - Design shear resistance exceeds design shear force			
Check bending moment at span 1 segment 1 major (y-y) axis - Section 6.2.5						
Design bending moment			$M_{Ed} = \max(\text{abs}(M_{s1_seg1_max}), \text{abs}(M_{s1_seg1_min})) = 76.8 \text{ kNm}$			
Design bending resistance moment - eq 6.13			$M_{c,Rd} = M_{pl,Rd} = W_{pl,y} \times f_y / \gamma_{M0} = 178.1 \text{ kNm}$			
Slenderness ratio for lateral torsional buckling						
Correction factor - Table 6.6			$k_c = 1$			
			$C_1 = 1 / k_c^2 = 1$			
Destabilised load condition factor			$D = 1.2$			
Curvature factor			$g = \sqrt{[1 - (I_z / I_y)]} = 0.815$			
Poissons ratio			$\nu = 0.3$			
Shear modulus			$G = E / [2 \times (1 + \nu)] = 80769 \text{ N/mm}^2$			
Unrestrained length			$L = (1.4 \times L_{s1_seg1} + 2 \times h + 1.2 \times L_{s1_seg1}) / 2 = 2478 \text{ mm}$			
Elastic critical buckling moment			$M_{cr} = C_1 \times \pi^2 \times E \times I_z / (L^2 \times g) \times \sqrt{[I_w / I_z + L^2 \times G \times I_t / (\pi^2 \times E \times I_z)]} = 727 \text{ kNm}$			
Slenderness ratio for lateral torsional buckling			$\bar{\lambda}_{LT} = D \times \sqrt{(W_{pl,y} \times f_y / M_{cr})} = 0.594$			
Limiting slenderness ratio			$\bar{\lambda}_{LT,0} = 0.4$			



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B9

Sheet no./rev.
4

Calc. by	Date	Chk'd by	Date
VM	30/08/2024		30/08/2024

Rev'd by	Date

Ref.	Calculations	Output
------	--------------	--------

$\bar{\lambda}_{LT} > \bar{\lambda}_{LT,0}$ - Lateral torsional buckling cannot be ignored

Design resistance for buckling - Section 6.3.2.1

Buckling curve - Table 6.5	b
Imperfection factor - Table 6.3	$\alpha_{LT} = 0.34$
Correction factor for rolled sections	$\beta = 0.75$
LTB reduction determination factor	$\phi_{LT} = 0.5 \times [1 + \alpha_{LT} \times (\bar{\lambda}_{LT} - \bar{\lambda}_{LT,0}) + \beta \times \bar{\lambda}_{LT}^2] = 0.665$
LTB reduction factor - eq 6.57	$\chi_{LT} = \min(1 / [\phi_{LT} + \sqrt{(\phi_{LT}^2 - \beta \times \bar{\lambda}_{LT}^2)}], 1, 1 / \bar{\lambda}_{LT}^2) = 0.920$
Modification factor	$f = \min(1 - 0.5 \times (1 - k_c) \times [1 - 2 \times (\bar{\lambda}_{LT} - 0.8)^2], 1) = 1.000$
Modified LTB reduction factor - eq 6.58	$\chi_{LT,mod} = \min(\chi_{LT} / f, 1) = 0.920$
Design buckling resistance moment - eq 6.55	$M_{b,Rd} = \chi_{LT,mod} \times W_{ply} \times f_y / \gamma_{M1} = 163.8 \text{ kNm}$

PASS - Design buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection	$\delta_{lim} = L_{s1} / 250 = 14 \text{ mm}$
Maximum deflection span 1	$\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = 7.384 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B11

Sheet no./rev.
1

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

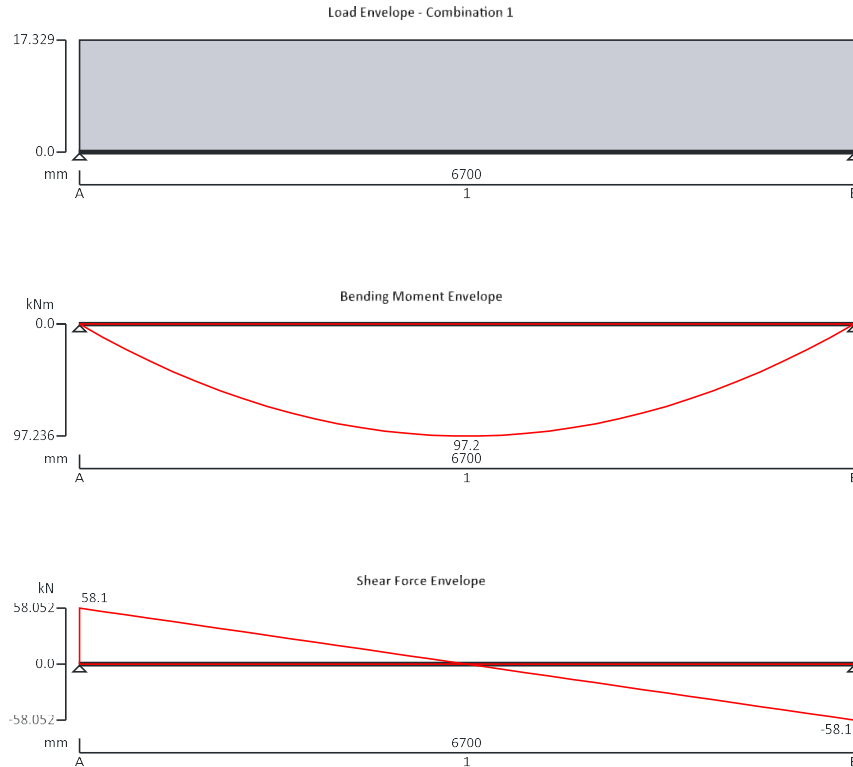
Output

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Permanent full UDL 5.8 kN/m

Variable full UDL 5.8 kN/m

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$

Permanent $\times 1.35$

Variable $\times 1.50$

Support B

Permanent $\times 1.35$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B11

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Variable $\times 1.50$

Analysis results

Maximum moment

$M_{\max} = 97.2 \text{ kNm}$

$M_{\min} = 0 \text{ kNm}$

Maximum shear

$V_{\max} = 58.1 \text{ kN}$

$V_{\min} = -58.1 \text{ kN}$

Deflection

$\delta_{\max} = 24.7 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_{\max}} = 58.1 \text{ kN}$

$R_{A_{\min}} = 58.1 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_{\text{Permanent}}} = 21.4 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_{\text{Variable}}} = 19.4 \text{ kN}$

Maximum reaction at support B

$R_{B_{\max}} = 58.1 \text{ kN}$

$R_{B_{\min}} = 58.1 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_{\text{Permanent}}} = 21.4 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_{\text{Variable}}} = 19.4 \text{ kN}$

Section details

Section type

UC 203x203x60 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 14.2 \text{ mm}$

Nominal yield strength

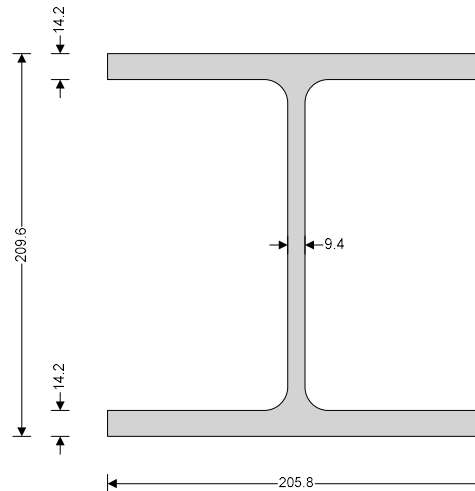
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis

$K_y = 1.000$

Effective length factor in minor axis

$K_z = 1.000$

Effective length factor for torsion

$K_{LT,A} = 1.400 + 2 \times h$

$K_{LT,B} = 1.000$

barter hill

Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B11

Sheet no./rev.

3

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Classification of cross sections - Section 5.5

$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = \mathbf{0.81}$

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section

$c = d = \mathbf{155.8 \text{ mm}}$
 $c / t_w = 20.4 \times \varepsilon \leq 72 \times \varepsilon$ Class 1

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section

$c = (b - t_w - 2 \times r) / 2 = \mathbf{85.5 \text{ mm}}$
 $c / t_f = 7.4 \times \varepsilon \leq 9 \times \varepsilon$ Class 1

Section is class 1

Check shear - Section 6.2.6

Height of web

$h_w = h - 2 \times t_f = \mathbf{181.2 \text{ mm}}$

Shear area factor

$\eta = \mathbf{1.000}$
 $h_w / t_w < 72 \times \varepsilon / \eta$

Shear buckling resistance can be ignored

Design shear force

$V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = \mathbf{58.1 \text{ kN}}$

Shear area - cl 6.2.6(3)

$A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = \mathbf{2336 \text{ mm}^2}$

Design shear resistance - cl 6.2.6(2)

$V_{c,Rd} = V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = \mathbf{478.8 \text{ kN}}$
PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment

$M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = \mathbf{97.2 \text{ kNm}}$

Design bending resistance moment - eq 6.13

$M_{c,Rd} = M_{pl,Rd} = W_{pl,y} \times f_y / \gamma_{M0} = \mathbf{234.4 \text{ kNm}}$

Slenderness ratio for lateral torsional buckling

Correction factor - Table 6.6

$k_c = \mathbf{1}$
 $C_1 = 1 / k_c^2 = \mathbf{1}$

Destabilised load condition factor

$D = \mathbf{1.2}$

Curvature factor

$g = \sqrt{[1 - (I_z / I_y)]} = \mathbf{0.815}$

Poissons ratio

$v = \mathbf{0.3}$

Shear modulus

$G = E / [2 \times (1 + v)] = \mathbf{80769 \text{ N/mm}^2}$

Unrestrained length

$L = (1.4 \times L_{s1} + 2 \times h + 1.2 \times L_{s1}) / 2 = \mathbf{8920 \text{ mm}}$

Elastic critical buckling moment

$M_{cr} = C_1 \times \pi^2 \times E \times I_z / (L^2 \times g) \times \sqrt{[I_w / I_z + L^2 \times G \times I_t / (\pi^2 \times E \times I_z)]} = \mathbf{190.3 \text{ kNm}}$

Slenderness ratio for lateral torsional buckling

$\bar{\lambda}_{LT} = D \times \sqrt{(W_{pl,y} \times f_y / M_{cr})} = \mathbf{1.332}$

Limiting slenderness ratio

$\bar{\lambda}_{LT,0} = \mathbf{0.4}$
 $\bar{\lambda}_{LT} > \bar{\lambda}_{LT,0}$ - Lateral torsional buckling cannot be ignored

Design resistance for buckling - Section 6.3.2.1

Buckling curve - Table 6.5

b

Imperfection factor - Table 6.3

$\alpha_{LT} = \mathbf{0.34}$

Correction factor for rolled sections

$\beta = \mathbf{0.75}$

LTB reduction determination factor

$\phi_{LT} = 0.5 \times [1 + \alpha_{LT} \times (\bar{\lambda}_{LT} - \bar{\lambda}_{LT,0}) + \beta \times \bar{\lambda}_{LT}^2] = \mathbf{1.324}$

LTB reduction factor - eq 6.57

$\chi_{LT} = \min(1 / [\phi_{LT} + \sqrt{(\phi_{LT}^2 - \beta \times \bar{\lambda}_{LT}^2)}], 1, 1 / \bar{\lambda}_{LT}^2) = \mathbf{0.507}$

Modification factor

$f = \min(1 - 0.5 \times (1 - k_c) \times [1 - 2 \times (\bar{\lambda}_{LT} - 0.8)^2], 1) = \mathbf{1.000}$

Modified LTB reduction factor - eq 6.58

$\chi_{LT,mod} = \min(\chi_{LT} / f, 1) = \mathbf{0.507}$

Design buckling resistance moment - eq 6.55

$M_{b,Rd} = \chi_{LT,mod} \times W_{pl,y} \times f_y / \gamma_{M1} = \mathbf{118.8 \text{ kNm}}$
PASS - Design buckling resistance moment exceeds design bending moment



Harlow – 01279 430888
Norwich – 01603 300360

Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
Part of Structure B11				Sheet no./rev. 4	
Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024	Rev'd by	Date
Ref.	Calculations			Output	

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = 26.8 \text{ mm}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = 24.723 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B12

Sheet no./rev.
1

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

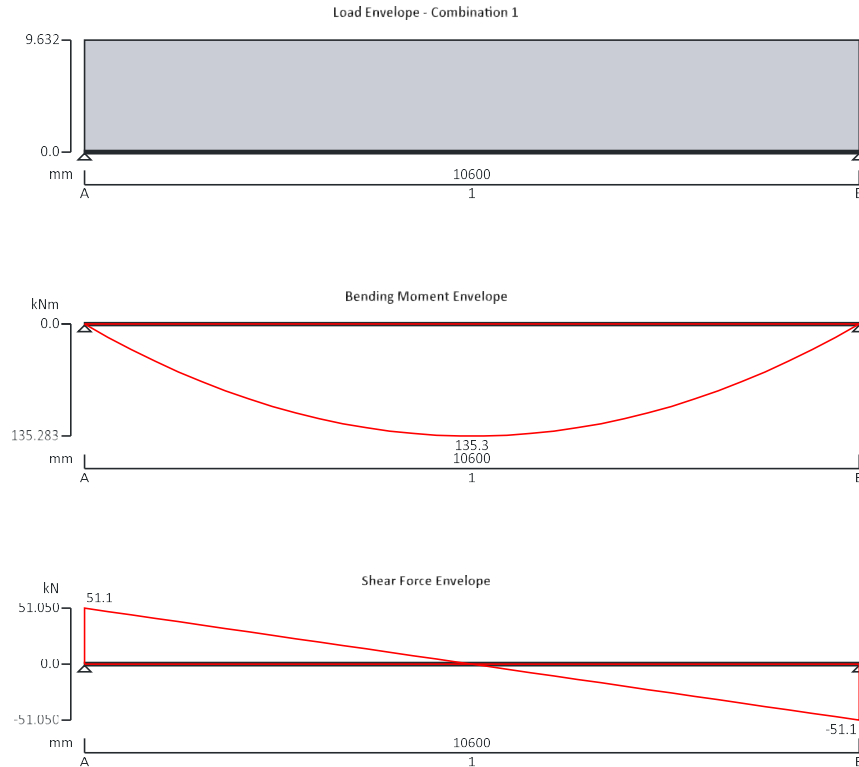
Output

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Permanent full UDL 3 kN/m

Variable full UDL 3 kN/m

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$

Permanent $\times 1.35$

Variable $\times 1.50$

Support B

Permanent $\times 1.35$



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B12

Sheet no./rev.
2

Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024
----------------	--------------------	----------	--------------------

Rev'd by	Date
----------	------

Ref.

Calculations

Output

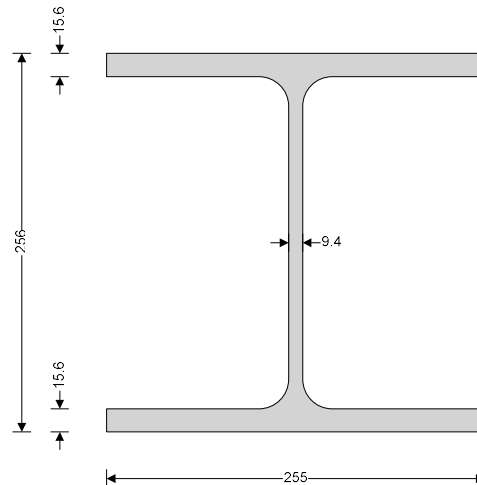
Variable $\times 1.50$

Analysis results

Maximum moment	$M_{\max} = 135.3 \text{ kNm}$	$M_{\min} = 0 \text{ kNm}$
Maximum shear	$V_{\max} = 51.1 \text{ kN}$	$V_{\min} = -51.1 \text{ kN}$
Deflection	$\delta_{\max} = 41.6 \text{ mm}$	$\delta_{\min} = 0 \text{ mm}$
Maximum reaction at support A	$R_{A_{\max}} = 51.1 \text{ kN}$	$R_{A_{\min}} = 51.1 \text{ kN}$
Unfactored permanent load reaction at support A	$R_{A_{\text{Permanent}}} = 20.1 \text{ kN}$	
Unfactored variable load reaction at support A	$R_{A_{\text{Variable}}} = 15.9 \text{ kN}$	
Maximum reaction at support B	$R_{B_{\max}} = 51.1 \text{ kN}$	$R_{B_{\min}} = 51.1 \text{ kN}$
Unfactored permanent load reaction at support B	$R_{B_{\text{Permanent}}} = 20.1 \text{ kN}$	
Unfactored variable load reaction at support B	$R_{B_{\text{Variable}}} = 15.9 \text{ kN}$	

Section details

Section type **UC 254x254x81 (British Steel Section Range 2022)**
Steel grade **S355**
EN 10025-2:2004 - Hot rolled products of structural steels
Nominal thickness of element $t = \max(t_f, t_w) = 15.6 \text{ mm}$
Nominal yield strength $f_y = 355 \text{ N/mm}^2$
Nominal ultimate tensile strength $f_u = 470 \text{ N/mm}^2$
Modulus of elasticity $E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections	$\gamma_{M0} = 1.00$
Resistance of members to instability	$\gamma_{M1} = 1.00$
Resistance of tensile members to fracture	$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis	$K_y = 1.000$
Effective length factor in minor axis	$K_z = 1.000$
Effective length factor for torsion	$K_{LT,A} = 1.400 + 2 \times h$ $K_{LT,B} = 1.000$

 Harlow – 01279 430888 Norwich – 01603 300360		Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
		Part of Structure B12				Sheet no./rev. 3	
		Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024	Rev'd by	Date
Ref.	Calculations					Output	
Classification of cross sections - Section 5.5 $\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.81$ Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3) Width of section $c = d = 184.8 \text{ mm}$ $c / t_w = 24.2 \times \varepsilon \leq 72 \times \varepsilon$ Class 1 Outstand flanges - Table 5.2 (sheet 2 of 3) Width of section $c = (b - t_w - 2 \times r) / 2 = 102.8 \text{ mm}$ $c / t_f = 8.1 \times \varepsilon \leq 9 \times \varepsilon$ Class 1 Section is class 1 Check shear - Section 6.2.6 Height of web $h_w = h - 2 \times t_f = 224.8 \text{ mm}$ Shear area factor $\eta = 1.000$ $h_w / t_w < 72 \times \varepsilon / \eta$ Shear buckling resistance can be ignored Design shear force $V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 51.1 \text{ kN}$ Shear area - cl 6.2.6(3) $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 3227 \text{ mm}^2$ Design shear resistance - cl 6.2.6(2) $V_{c,Rd} = V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 661.4 \text{ kN}$ PASS - Design shear resistance exceeds design shear force Check bending moment major (y-y) axis - Section 6.2.5 Design bending moment $M_{Ed} = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 135.3 \text{ kNm}$ Design bending resistance moment - eq 6.13 $M_{c,Rd} = M_{pl,Rd} = W_{pl,y} \times f_y / \gamma_{M0} = 394.8 \text{ kNm}$ Slenderness ratio for lateral torsional buckling Correction factor - Table 6.6 $K_c = 1$ $C_1 = 1 / K_c^2 = 1$ Destabilised load condition factor $D = 1.2$ Curvature factor $g = \sqrt{[1 - (I_z / I_y)]} = 0.814$ Poissons ratio $\nu = 0.3$ Shear modulus $G = E / [2 \times (1 + \nu)] = 80769 \text{ N/mm}^2$ Unrestrained length $L = (1.4 \times L_{s1} + 2 \times h + 1.2 \times L_{s1}) / 2 = 14036 \text{ mm}$ Elastic critical buckling moment $M_{cr} = C_1 \times \pi^2 \times E \times I_z / (L^2 \times g) \times \sqrt{[I_w / I_z + L^2 \times G \times I_t / (\pi^2 \times E \times I_z)]} = 227.4 \text{ kNm}$ Slenderness ratio for lateral torsional buckling $\bar{\lambda}_{LT} = D \times \sqrt{(W_{pl,y} \times f_y / M_{cr})} = 1.581$ Limiting slenderness ratio $\bar{\lambda}_{LT,0} = 0.4$ $\bar{\lambda}_{LT} > \bar{\lambda}_{LT,0}$ - Lateral torsional buckling cannot be ignored Design resistance for buckling - Section 6.3.2.1 Buckling curve - Table 6.5 b Imperfection factor - Table 6.3 $\alpha_{LT} = 0.34$ Correction factor for rolled sections $\beta = 0.75$ LTB reduction determination factor $\phi_{LT} = 0.5 \times [1 + \alpha_{LT} \times (\bar{\lambda}_{LT} - \bar{\lambda}_{LT,0}) + \beta \times \bar{\lambda}_{LT}^2] = 1.638$ LTB reduction factor - eq 6.57 $\chi_{LT} = \min(1 / [\phi_{LT} + \sqrt{(\phi_{LT}^2 - \beta \times \bar{\lambda}_{LT}^2)}], 1, 1 / \bar{\lambda}_{LT}^2) = 0.394$ Modification factor $f = \min(1 - 0.5 \times (1 - K_c) \times [1 - 2 \times (\bar{\lambda}_{LT} - 0.8)^2], 1) = 1.000$ Modified LTB reduction factor - eq 6.58 $\chi_{LT,mod} = \min(\chi_{LT} / f, 1) = 0.394$ Design buckling resistance moment - eq 6.55 $M_{b,Rd} = \chi_{LT,mod} \times W_{pl,y} \times f_y / \gamma_{M1} = 155.6 \text{ kNm}$ PASS - Design buckling resistance moment exceeds design bending moment							



Harlow – 01279 430888
Norwich – 01603 300360

Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
Part of Structure B12				Sheet no./rev. 4	
Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024	Rev'd by	Date
Ref.	Calculations			Output	

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = 42.4 \text{ mm}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = 41.591 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit



Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.
10056

Part of Structure
B14

Sheet no./rev.
1

Calc. by	Date	Chk'd by	Date
VM	29/08/2024		29/08/2024

Rev'd by	Date

Ref.

Calculations

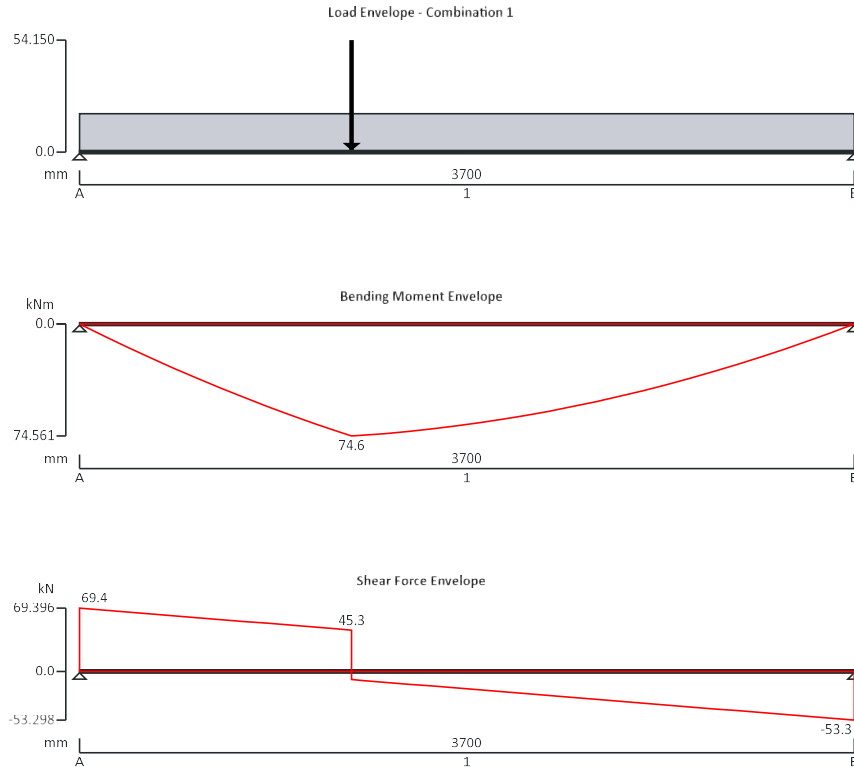
Output

STEEL BEAM ANALYSIS & DESIGN (EN1993)

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Permanent full UDL 8.6 kN/m

Variable full UDL 4.2 kN/m

Permanent point load 19 kN at 1300 mm

Variable point load 19 kN at 1300 mm

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$

Permanent $\times 1.35$



Harlow – 01279 430888
Norwich – 01603 300360

Project

Redevelopment of East Court, East Grinstead, RH19 3LT

Job Ref.

10056

Part of Structure

B14

Sheet no./rev.

2

Calc. by

VM

Date

29/08/2024

Chk'd by

Date

29/08/2024

Rev'd by

Date

Ref.

Calculations

Output

Analysis results

Maximum moment

$M_{\max} = 74.6 \text{ kNm}$

$M_{\min} = 0 \text{ kNm}$

Maximum moment span 1 segment 1

$M_{s1_seg1_max} = 74.6 \text{ kNm}$

$M_{s1_seg1_min} = 0 \text{ kNm}$

Maximum moment span 1 segment 2

$M_{s1_seg2_max} = 66.9 \text{ kNm}$

$M_{s1_seg2_min} = 0 \text{ kNm}$

Maximum shear

$V_{\max} = 69.4 \text{ kN}$

$V_{\min} = -53.3 \text{ kN}$

Maximum shear span 1 segment 1

$V_{s1_seg1_max} = 69.4 \text{ kN}$

$V_{s1_seg1_min} = -19 \text{ kN}$

Maximum shear span 1 segment 2

$V_{s1_seg2_max} = 0 \text{ kN}$

$V_{s1_seg2_min} = -53.3 \text{ kN}$

Deflection segment 3

$\delta_{\max} = 7 \text{ mm}$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A

$R_{A_max} = 69.4 \text{ kN}$

$R_{A_min} = 69.4 \text{ kN}$

Unfactored permanent load reaction at support A

$R_{A_Permanent} = 29.1 \text{ kN}$

Unfactored variable load reaction at support A

$R_{A_Variable} = 20.1 \text{ kN}$

Maximum reaction at support B

$R_{B_max} = 53.3 \text{ kN}$

$R_{B_min} = 53.3 \text{ kN}$

Unfactored permanent load reaction at support B

$R_{B_Permanent} = 23.4 \text{ kN}$

Unfactored variable load reaction at support B

$R_{B_Variable} = 14.4 \text{ kN}$

Section details

Section type

UC 203x203x46 (British Steel Section Range 2022 (BS4-1))

Steel grade

S355

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element

$t = \max(t_f, t_w) = 11.0 \text{ mm}$

Nominal yield strength

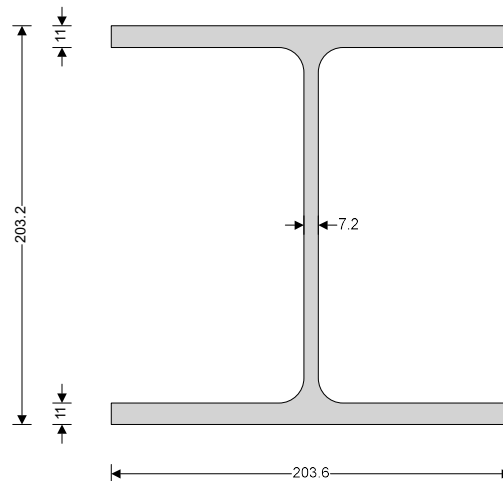
$f_y = 355 \text{ N/mm}^2$

Nominal ultimate tensile strength

$f_u = 470 \text{ N/mm}^2$

Modulus of elasticity

$E = 210000 \text{ N/mm}^2$



Partial factors - Section 6.1

Resistance of cross-sections

$\gamma_{M0} = 1.00$

Resistance of members to instability

$\gamma_{M1} = 1.00$

Resistance of tensile members to fracture

$\gamma_{M2} = 1.10$

Lateral restraint

Span 1 has lateral restraint at supports plus midspan

barter hill

Harlow – 01279 430888
Norwich – 01603 300360

Project
Redevelopment of East Court, East Grinstead, RH19 3LT

Part of Structure
B14

Calc. by
VM

Date
29/08/2024

Chk'd by

Date
29/08/2024

Job Ref.
10056

Sheet no./rev.
3

Rev'd by

Date

Ref.

Calculations

Output

Effective length factors

Effective length factor in major axis

Effective length factor in minor axis

Effective length factor for torsion

Classification of cross sections - Section 5.5

Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)

Width of section

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section

Check shear - Section 6.2.6

Height of web

Shear area factor

Design shear force

Shear area - cl 6.2.6(3)

Design shear resistance - cl 6.2.6(2)

Check bending moment at span 1 segment 1 major (y-y) axis - Section 6.2.5

Design bending moment

Design bending resistance moment - eq 6.13

Slenderness ratio for lateral torsional buckling

Correction factor - Table 6.6

Destabilised load condition factor

Curvature factor

Poissons ratio

Shear modulus

Unrestrained length

Elastic critical buckling moment

Slenderness ratio for lateral torsional buckling

Limiting slenderness ratio

Design resistance for buckling - Section 6.3.2.1

Buckling curve - Table 6.5

Imperfection factor - Table 6.3

Correction factor for rolled sections

LTB reduction determination factor

$K_y = 1.000$

$K_z = 1.000$

$K_{LT,A} = 1.400 + 2 \times h$

$K_{LT,B} = 1.000$

$\varepsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.81$

$c = d = 155.8 \text{ mm}$

$c / t_w = 26.6 \times \varepsilon \leq 72 \times \varepsilon$ Class 1

$c = (b - t_w - 2 \times r) / 2 = 85.5 \text{ mm}$

$c / t_f = 9.6 \times \varepsilon \leq 10 \times \varepsilon$ Class 2

Section is class 2

$h_w = h - 2 \times t_f = 181.2 \text{ mm}$

$\eta = 1.000$

$h_w / t_w < 72 \times \varepsilon / \eta$

Shear buckling resistance can be ignored

$V_{Ed} = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 69.4 \text{ kN}$

$A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 1802 \text{ mm}^2$

$V_{c,Rd} = V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 369.3 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

$M_{Ed} = \max(\text{abs}(M_{s1_seg1_max}), \text{abs}(M_{s1_seg1_min})) = 74.6 \text{ kNm}$

$M_{c,Rd} = M_{pl,Rd} = W_{pl,y} \times f_y / \gamma_{M0} = 178.1 \text{ kNm}$

$k_c = 1$

$C_1 = 1 / k_c^2 = 1$

$D = 1.2$

$g = \sqrt{[1 - (I_z / I_y)]} = 0.815$

$\nu = 0.3$

$G = E / [2 \times (1 + \nu)] = 80769 \text{ N/mm}^2$

$L = (1.4 \times L_{s1_seg1} + 2 \times h + 1.2 \times L_{s1_seg1}) / 2 = 2608 \text{ mm}$

$M_{cr} = C_1 \times \pi^2 \times E \times I_z / (L^2 \times g) \times \sqrt{[I_w / I_z + L^2 \times G \times I_t / (\pi^2 \times E \times I_z)]} = 666.1 \text{ kNm}$

$\bar{\lambda}_{LT} = D \times \sqrt{(W_{pl,y} \times f_y / M_{cr})} = 0.62$

$\bar{\lambda}_{LT,0} = 0.4$

$\bar{\lambda}_{LT} > \bar{\lambda}_{LT,0}$ - Lateral torsional buckling cannot be ignored

$\alpha_{LT} = 0.34$

$\beta = 0.75$

$\phi_{LT} = 0.5 \times [1 + \alpha_{LT} \times (\bar{\lambda}_{LT} - \bar{\lambda}_{LT,0}) + \beta \times \bar{\lambda}_{LT}^2] = 0.682$



Harlow – 01279 430888
Norwich – 01603 300360

Project Redevelopment of East Court, East Grinstead, RH19 3LT				Job Ref. 10056	
Part of Structure B14				Sheet no./rev. 4	
Calc. by VM	Date 29/08/2024	Chk'd by	Date 29/08/2024	Rev'd by	Date

Ref.	Calculations	Output
------	--------------	--------

LTB reduction factor - eq 6.57 $\chi_{LT} = \min(1 / [\phi_{LT} + \sqrt{(\phi_{LT}^2 - \beta \times \bar{\lambda}_{LT}^2)}], 1, 1 / \bar{\lambda}_{LT}^2) = \mathbf{0.908}$

Modification factor $f = \min(1 - 0.5 \times (1 - k_c) \times [1 - 2 \times (\bar{\lambda}_{LT} - 0.8)^2], 1) = \mathbf{1.000}$

Modified LTB reduction factor - eq 6.58 $\chi_{LT,mod} = \min(\chi_{LT} / f, 1) = \mathbf{0.908}$

Design buckling resistance moment - eq 6.55 $M_{b,Rd} = \chi_{LT,mod} \times W_{pl,y} \times f_y / \gamma_{M1} = \mathbf{161.7 \text{ kNm}}$

PASS - Design buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 7.2.1

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 = \mathbf{14.8 \text{ mm}}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = \mathbf{7.013 \text{ mm}}$

PASS - Maximum deflection does not exceed deflection limit

 Harlow Norwich - 01279 430888 - 01603 300360	Project Redevelopment of East Court				Job Ref. 10056	
	Part of Structure Apartment				Sheet no./rev. 8.1	
	Calc. by VM	Date Sep 24	Chck'd by JGW	Date Sep 24	Rev'd by	Date
Ref.	Calculations				Output	

General stability check

All external wall lines appear to be adequately braced and of sufficient thickness to comply with Building Regulation Part A: Table 3.

Location	=	Further checks not required
Wall height	=	<12m
Panel length	=	<9m
Thickness (actual thickness of skins+10mm)	=	210mm

Table 3 Minimum thickness of certain external walls, compartment walls and separating walls

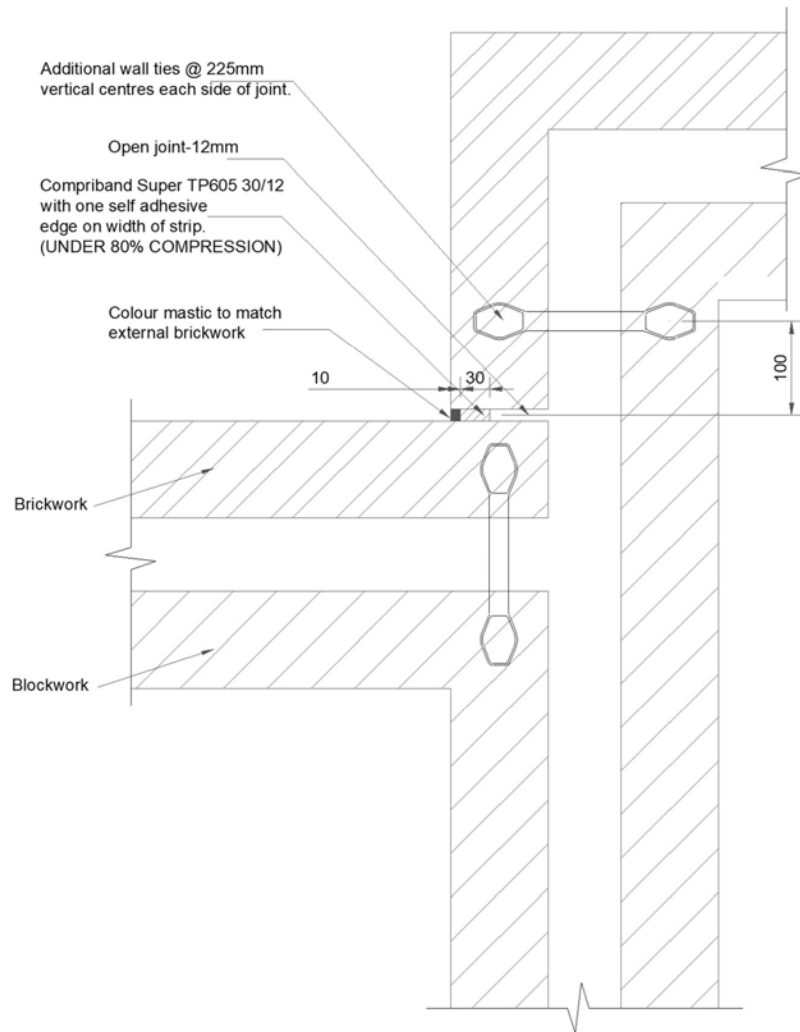
Height of wall	Length of wall	Minimum thickness of wall
Not exceeding 3.5m	Not exceeding 12m	190mm for whole of its height
Exceeding 3.5m but not exceeding 9m	Not exceeding 9m	190mm for whole of its height
	Exceeding 9m but not exceeding 12m	290mm from the base for the height of one storey and 190mm for the rest of its height
Exceeding 9m but not exceeding 12m	Not exceeding 9m	290mm from the base for the height of one storey and 190mm for the rest of its height
	Exceeding 9m but not exceeding 12m	290mm from the base for the height of two storeys and 190mm for the rest of its height

BY INSPECTION BUTTRESS WALLS REQUIRED. LENGTH OF WALL PANELS DO EXCEED 9m LONG AND HEIGHT LESS THAN 12m.

NOTES:

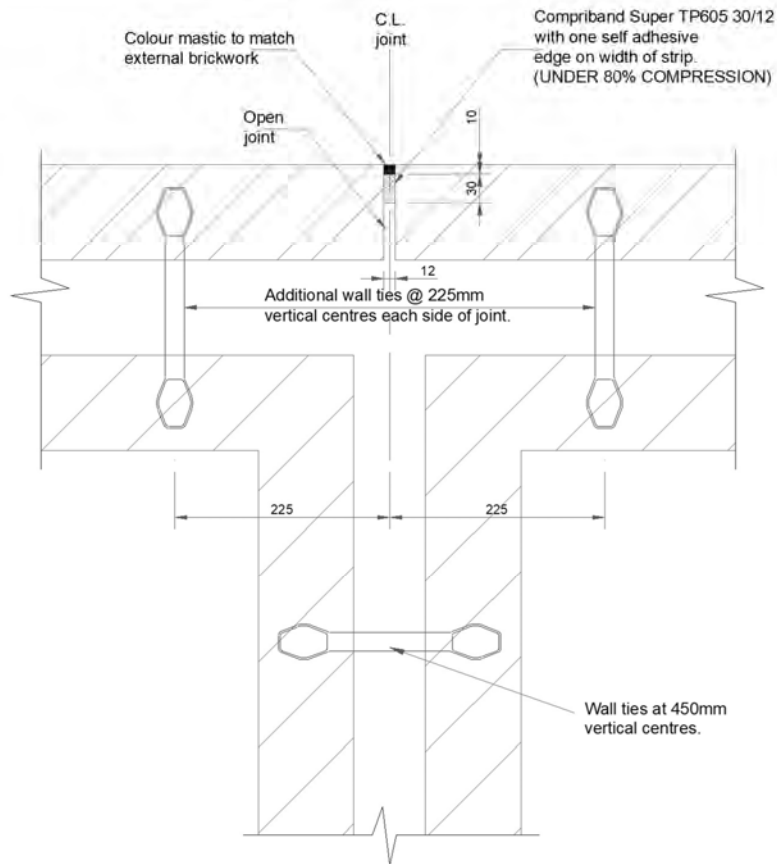
1. For buttress wall requirements refer to Diagram 12 and 13 of B.Reg's part A.
2. For plan locations and buttress wall details, refer to section 3 of the calculations

 Harlow - 01279 430888 Norwich - 01603 300360	Project Redevelopment of East Court				Job Ref. 10056	
	Part of Structure Apartment				Sheet no./rev. 10.4	
	Calc. by VM	Date Sep 24	Chck'd by JGW	Date Sep 24	Rev'd by	Date
Ref.	Calculations				Output	



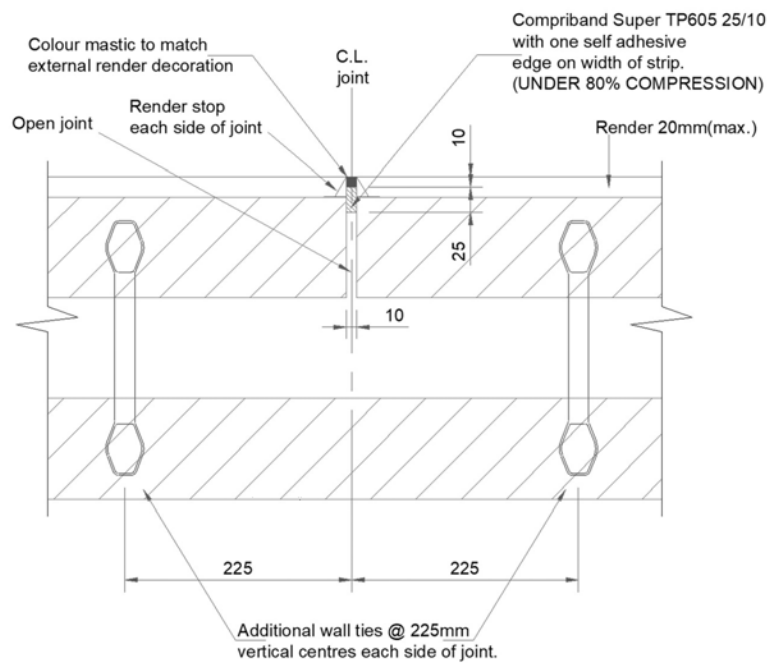
External Brick Joint – BB

 Harlow Norwich - 01279 430888 - 01603 300360	Project Redevelopment of East Court				Job Ref. 10056	
	Part of Structure Apartment				Sheet no./rev. 10.5	
	Calc. by VM	Date Sep 24	Chck'd by JGW	Date Sep 24	Rev'd by	Date
Ref.	Calculations				Output	



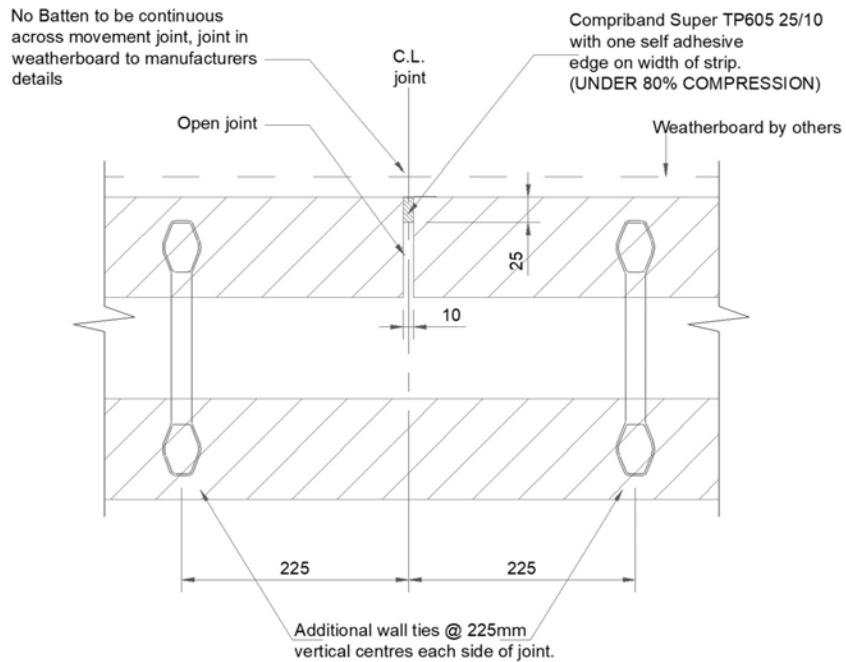
External Brick Joint – BC

 Harlow - 01279 430888 Norwich - 01603 300360	Project Redevelopment of East Court				Job Ref. 10056	
	Part of Structure Apartment				Sheet no./rev. 10.6	
	Calc. by VM	Date Sep 24	Chck'd by JGW	Date Sep 24	Rev'd by	Date
Ref.	Calculations				Output	



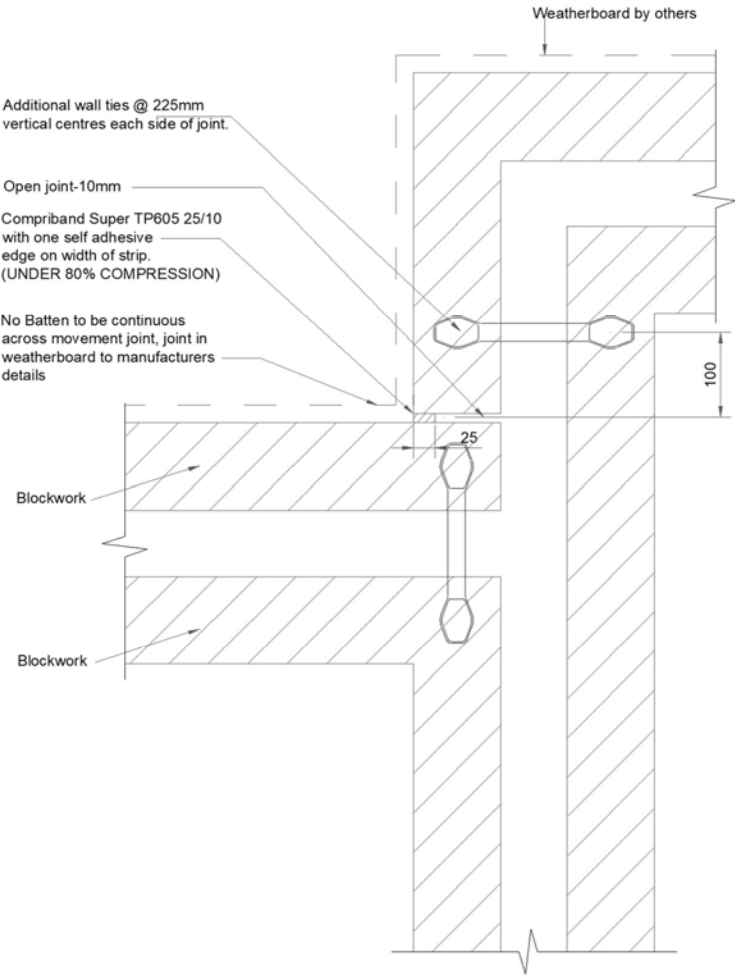
External Rendered Joint – RA

 Harlow - 01279 430888 Norwich - 01603 300360	Project Redevelopment of East Court				Job Ref. 10056	
	Part of Structure Apartment				Sheet no./rev. 10.9	
	Calc. by VM	Date Sep 24	Chck'd by JGW	Date Sep 24	Rev'd by	Date
Ref.	Calculations				Output	



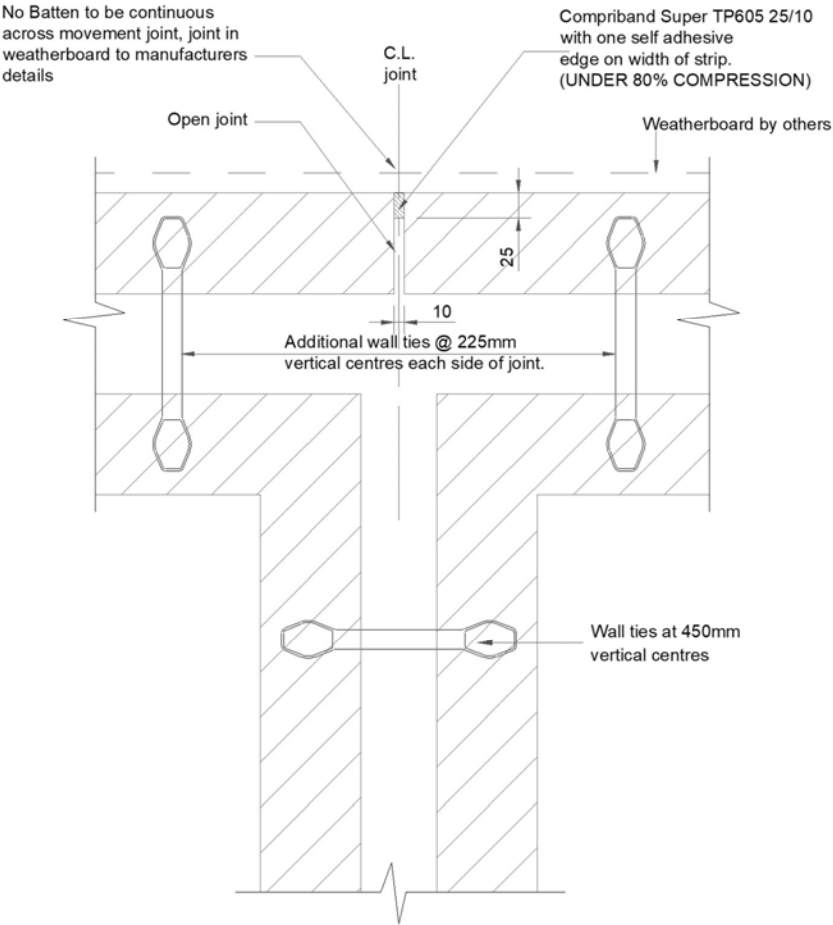
External Weatherboard Joint – WA

 Harlow - 01279 430888 Norwich - 01603 300360	Project Redevelopment of East Court				Job Ref. 10056	
	Part of Structure Apartment				Sheet no./rev. 10.10	
	Calc. by VM	Date Sep 24	Chck'd by JGW	Date Sep 24	Rev'd by	Date
Ref.	Calculations				Output	



External Weatherboard Joint – WB

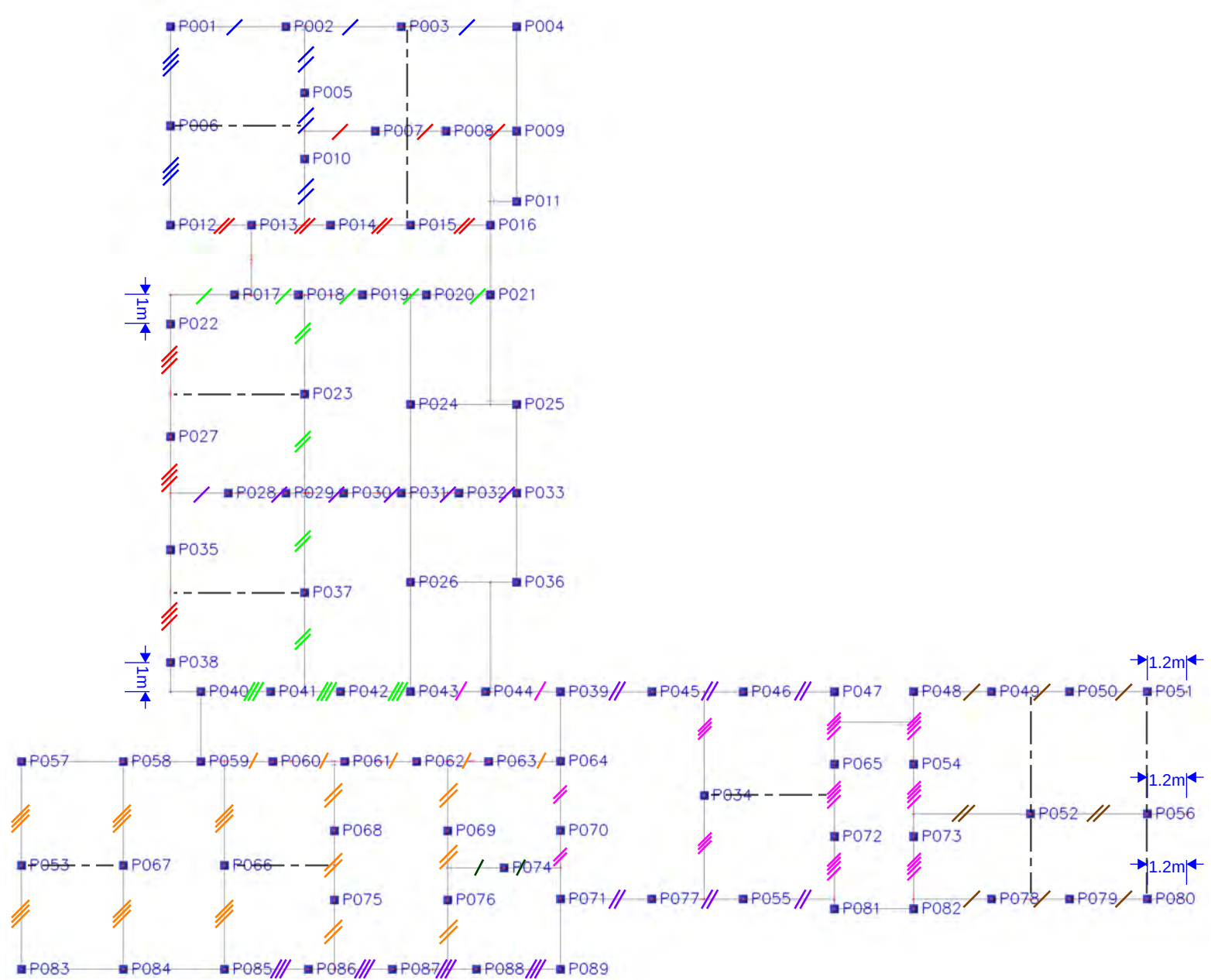
 Harlow Norwich - 01279 430888 - 01603 300360	Project Redevelopment of East Court				Job Ref. 10056	
	Part of Structure Apartment				Sheet no./rev. 10.11	
	Calc. by VM	Date Sep 24	Chck'd by JGW	Date Sep 24	Rev'd by	Date
Ref.	Calculations				Output	



External Weatherboard Joint – WC

All Ground Beams 600x450dp UNO

300x300dp Tie Beam



Pile Number	SLS Load [kN]	Pile Number	SLS Load [kN]
P01	275	P49	350
P02	450	P50	275
P03	375	P51	325
P04	250	P52	225
P05	300	P53	400
P06	450	P54	350
P07	325	P55	400
P08	325	P56	150
P09	400	P57	275
P10	325	P58	425
P11	100	P59	375
P12	275	P60	375
P13	450	P61	425
P14	350	P62	350
P15	350	P63	400
P16	225	P64	400
P17	400	P65	325
P18	400	P66	200
P19	375	P67	200
P20	450	P68	275
P21	375	P69	150
P22	275	P70	250
P23	200	P71	425
P24	225	P72	300
P25	225	P73	350
P26	250	P74	200
P27	300	P75	300
P28	425	P76	250
P29	400	P77	375
P30	400	P78	350
P31	425	P79	275
P32	400	P80	325
P33	400	P81	300
P34	225	P82	275
P35	325	P83	250
P36	225	P84	450
P37	200	P85	350
P38	225	P86	350
P39	350	P87	375
P40	350	P88	400
P41	425	P89	225
P42	400		
P43	400		
P44	425		
P45	350		
P46	400		
P47	275		
P48	275		



Norwich Office
13 Meridian Way
Meridian Business Park
Norwich
NR7 0TA

Phone: 01603 300 360

Essex Office
Greenway Business Centre
Greenway
Harlow
Essex
CM19 5QE

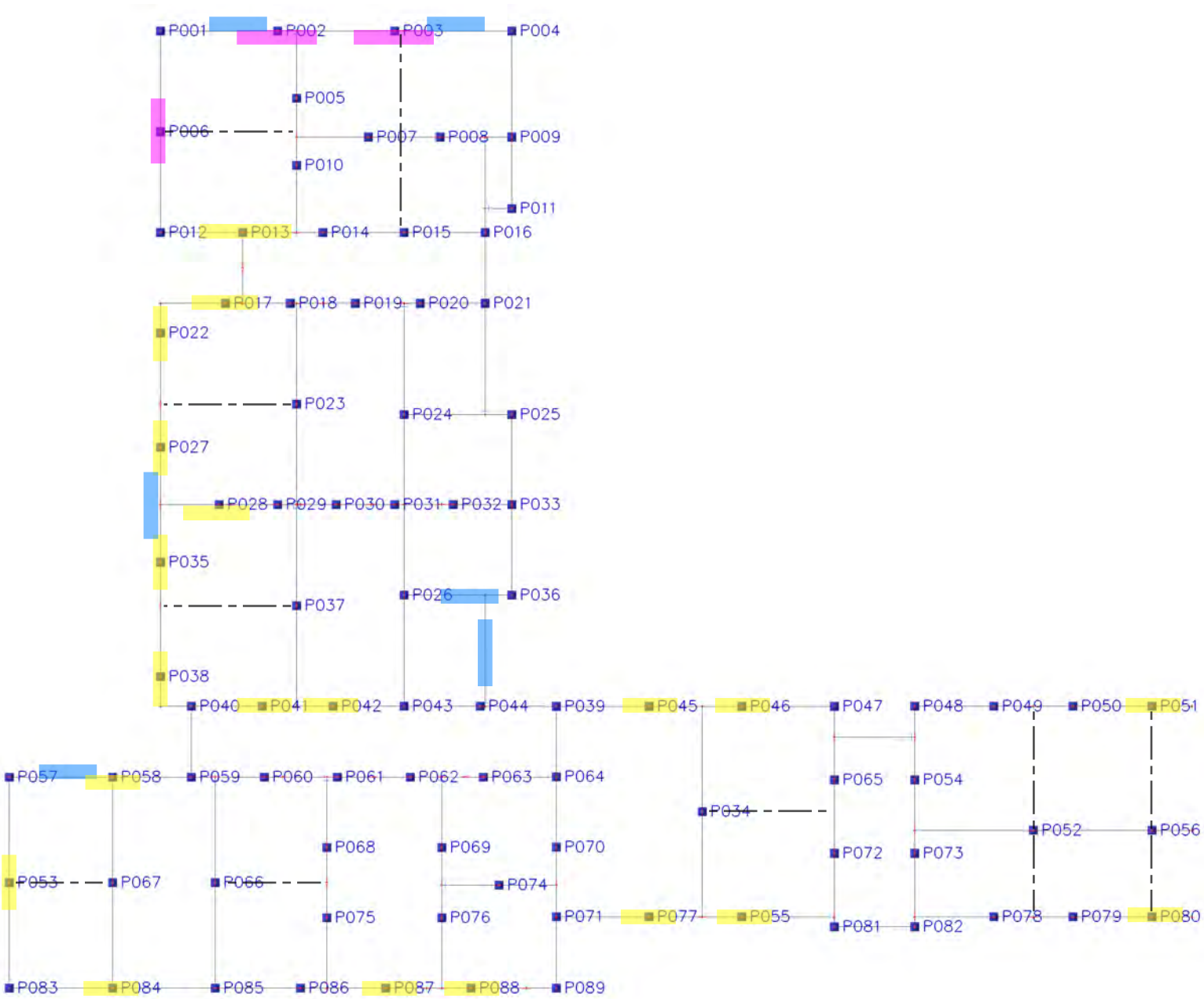
Phone: 01279 430 888

Project Name: Redevelopment of East Court		Project Number: 10056	
Drawing Title: Apartment Pile and GB Layout			
Designed By: VM	Checked By: JGW	Date: Jan 2025	Revision: 01

Concrete Grade: C28/35
Top Cover 40mm
Side Cover 75mm
Bottom Cover 40mm

All Ground Beams 600x450dp UNO

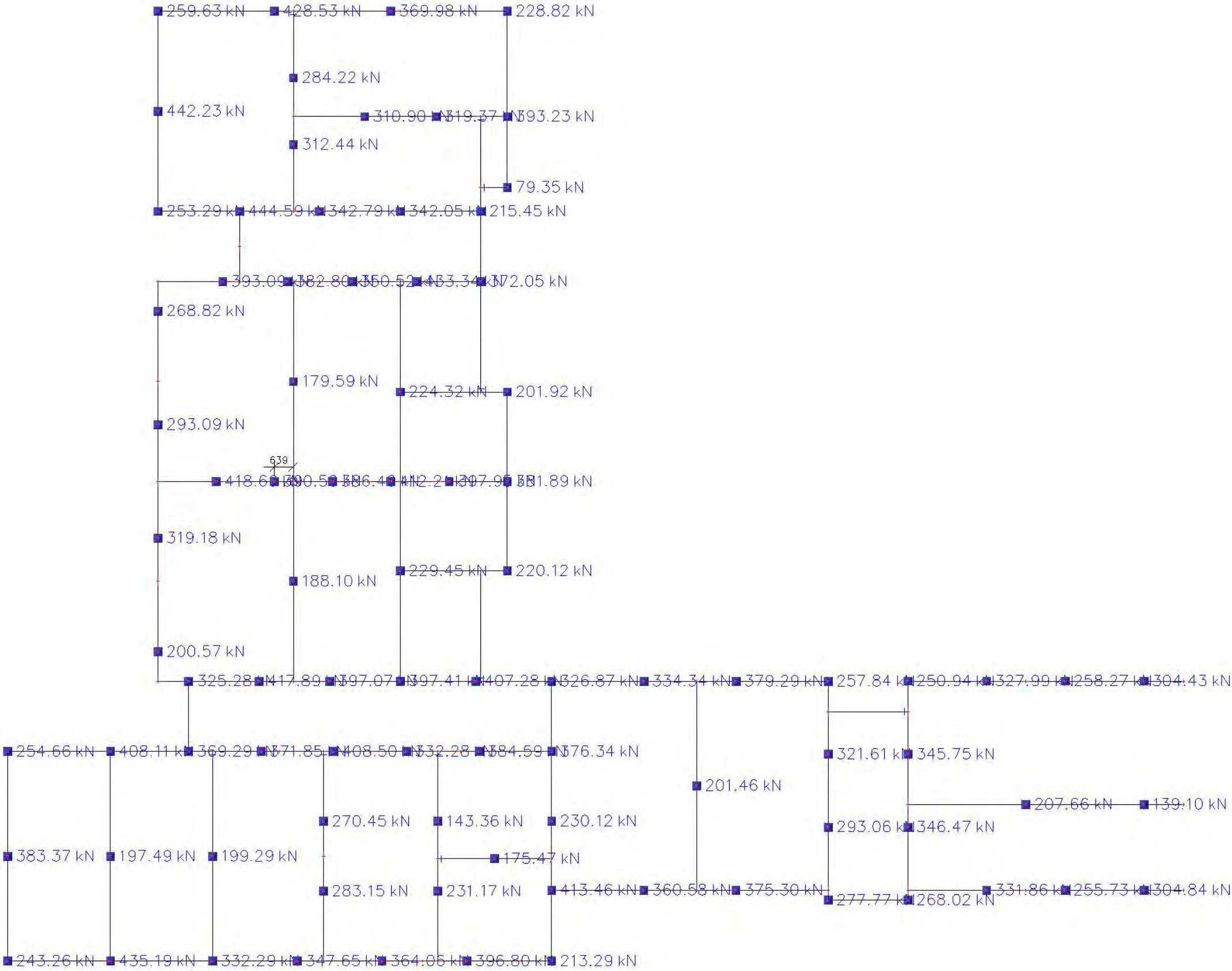
- - - - - 300x300dp Tie beam



barter hill Norwich Office 13 Meridian Way Meridian Business Park Norwich NR7 0TA Phone: 01603 300 360 Essex Office Greenway Business Centre Greenway Harlow Essex CM19 5QE Phone: 01279 430 888		Project Name: Redevelopment of East Court		Project Number: 10056			
		Drawing Title: Apartment Ground beam RC					
Designed By: VM		Checked By: JGW		Date: Jan 2025		Revision: 01	

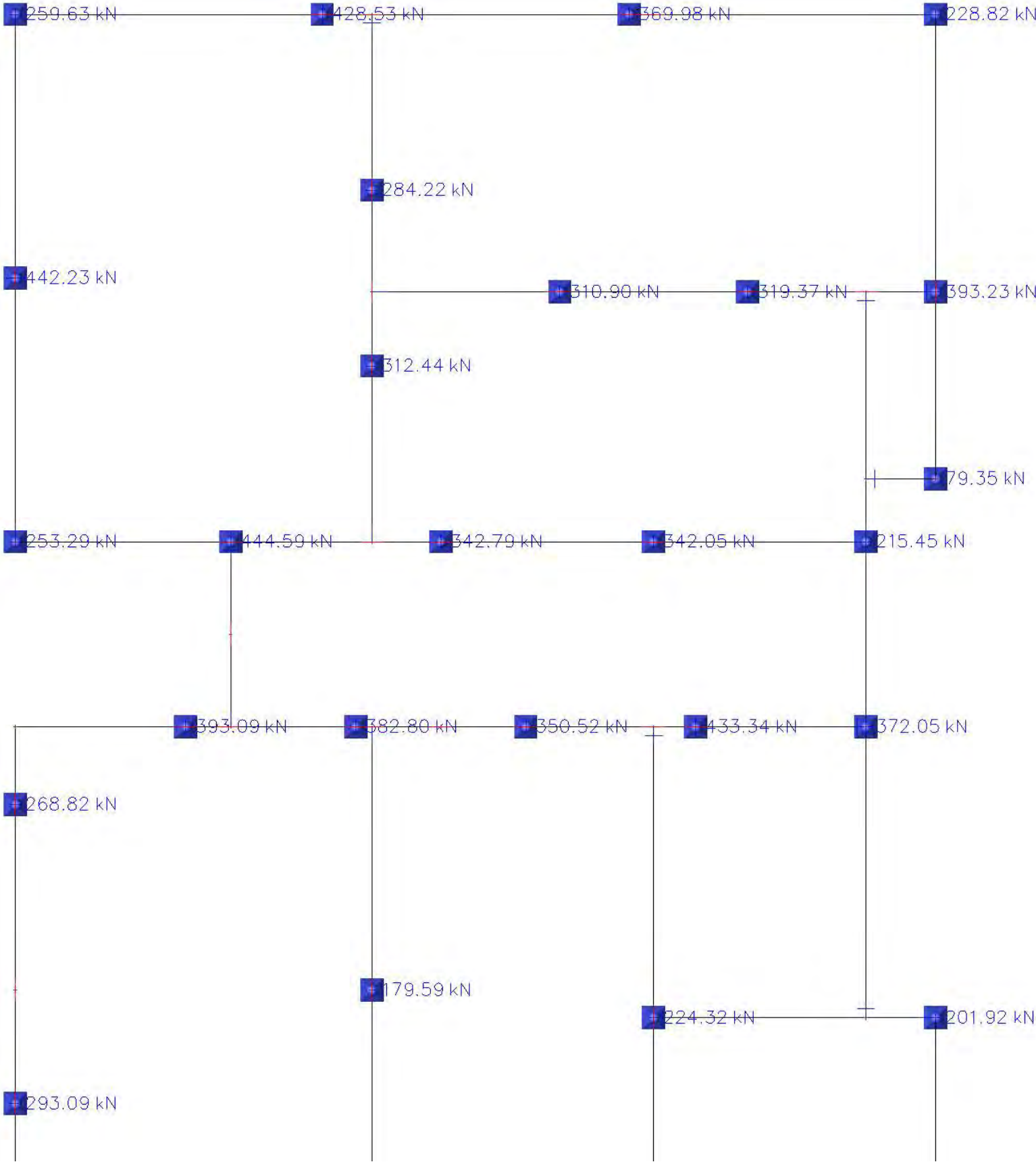
1. Reactions; R_z

Values: R_z
Linear calculation
Combination: SLS
System: Global
Extreme: Member
Selection: All



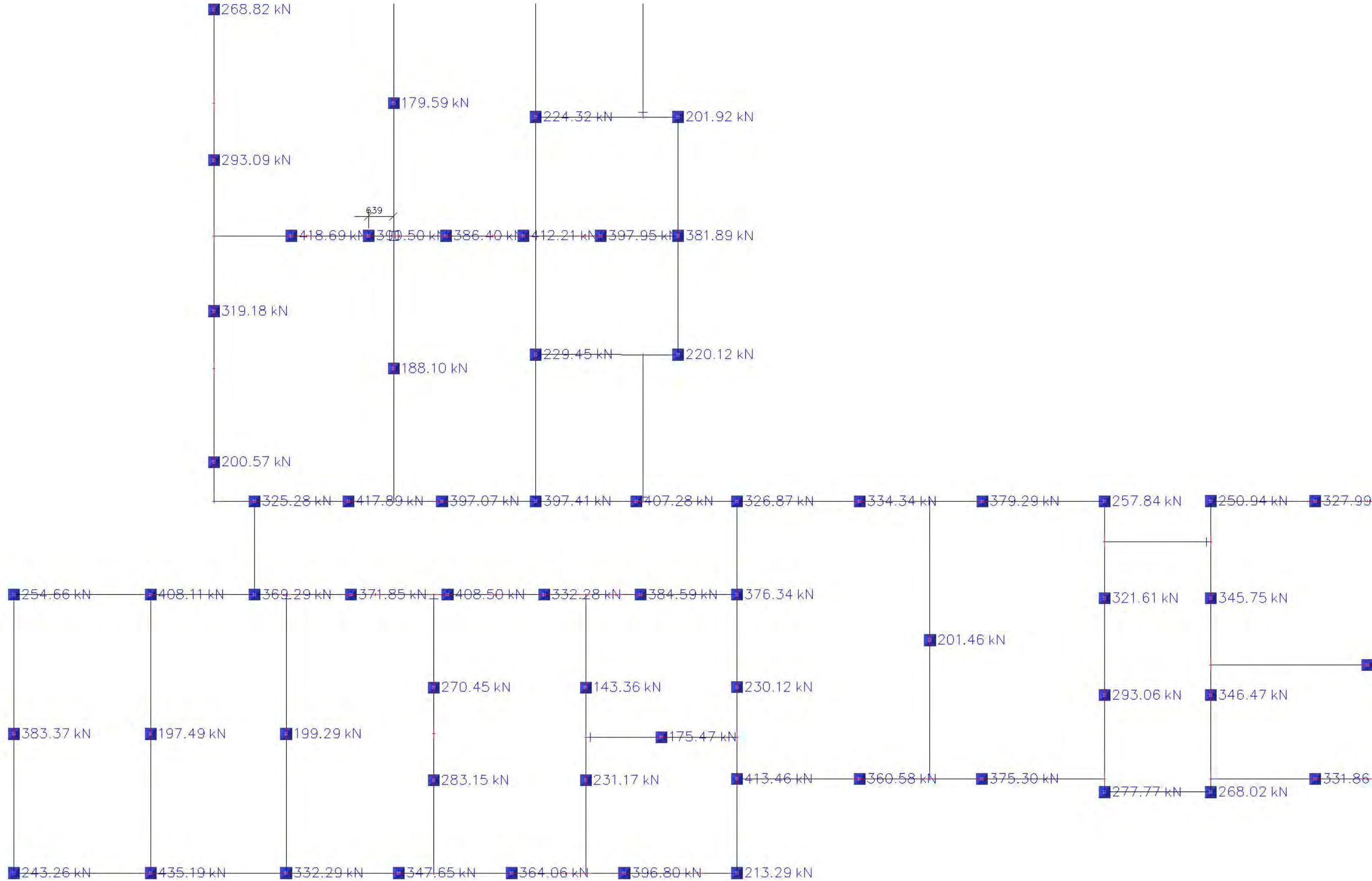
2. Reactions; R_z

Values: R_z
Linear calculation
Combination: SLS
System: Global
Extreme: Member
Selection: All

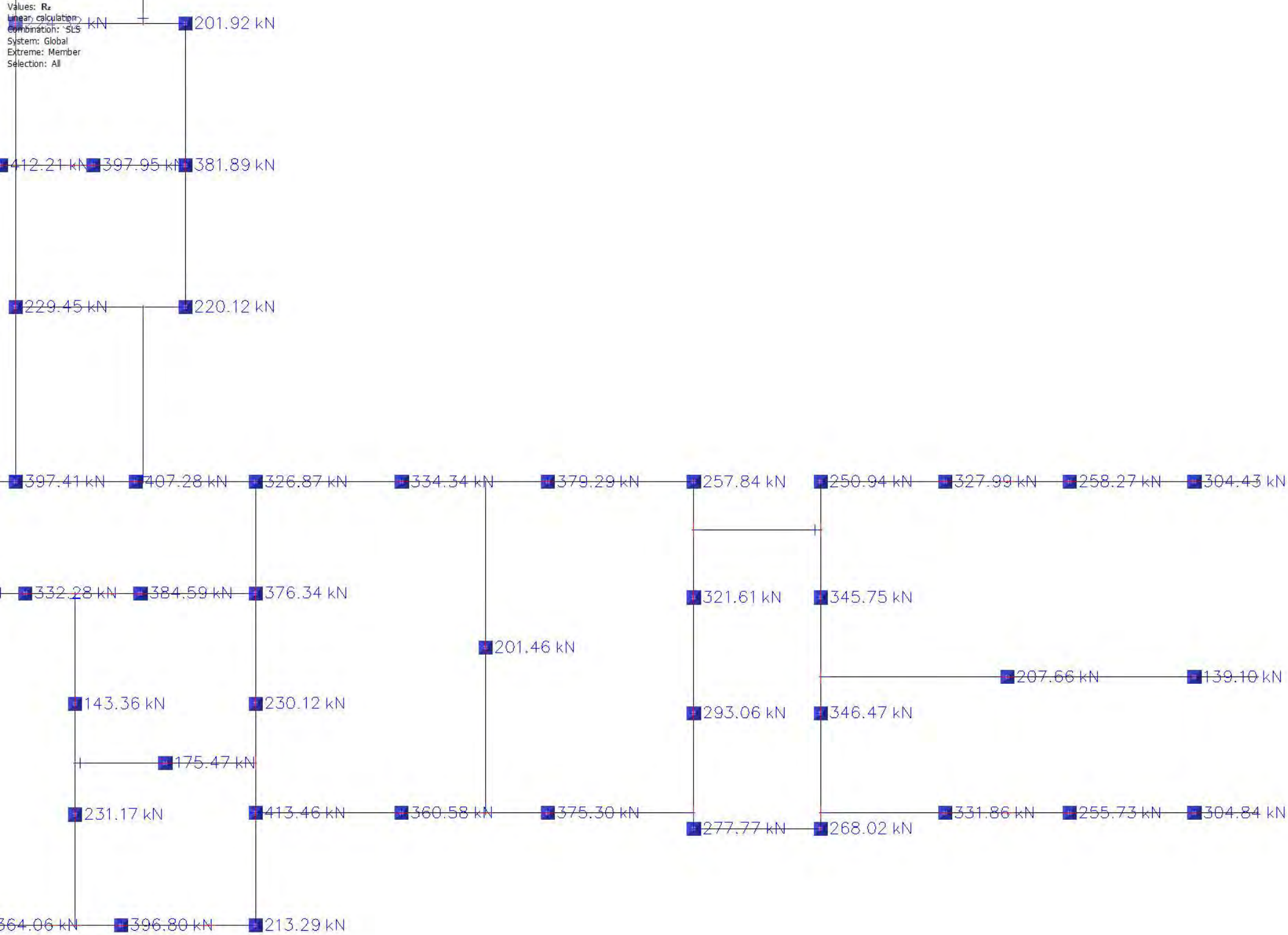


3. Reactions; R_z

Values: R_z
Linear calculation
Combination: SLS
System: Global
Extreme: Member
Selection: All

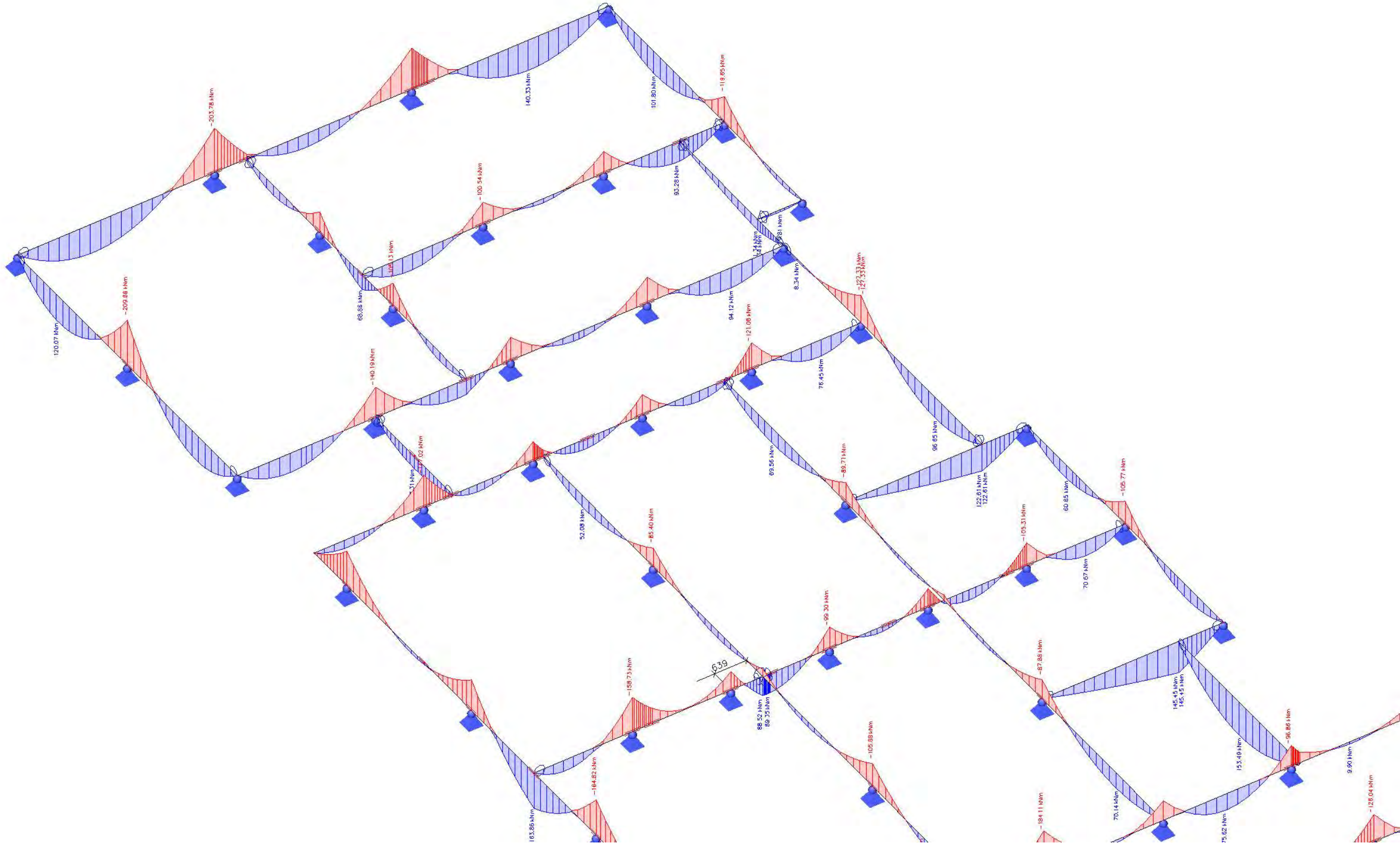


4. Reactions; R_z



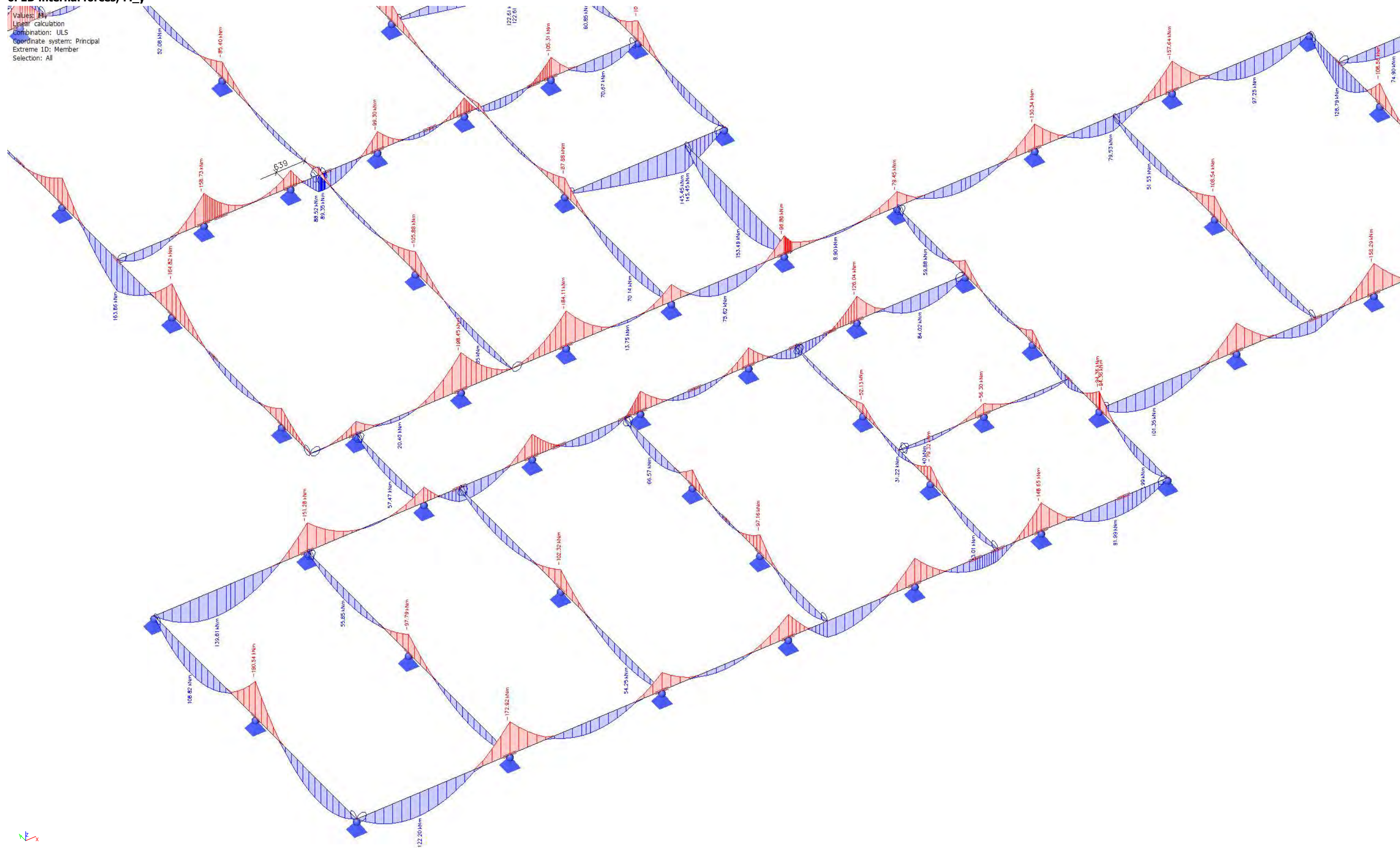
5. 1D internal forces; M_y

Values: M_y
Linear calculation
Combination: ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All



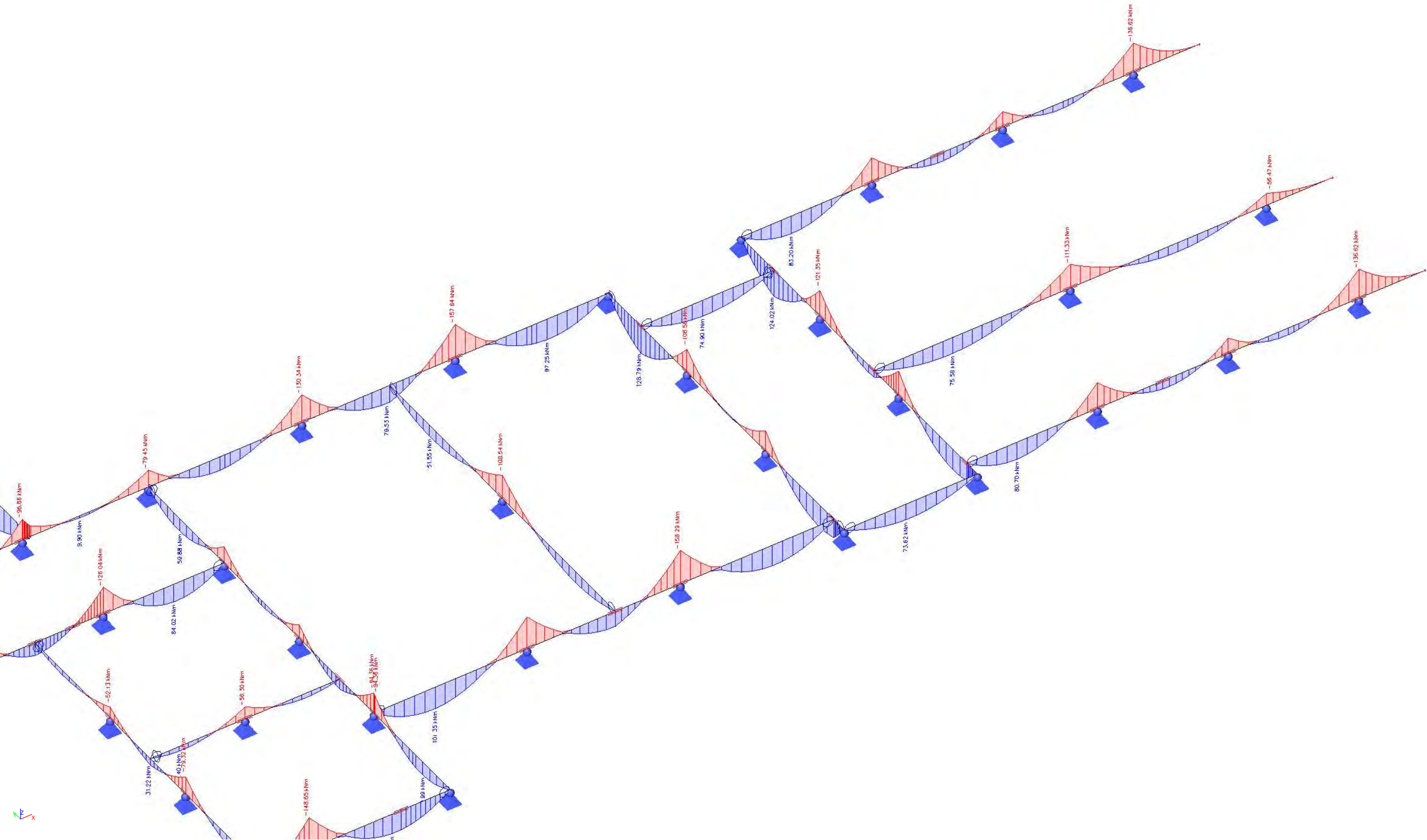
6. 1D internal forces; M_y

Values: My
Linear calculation
Combination: ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All



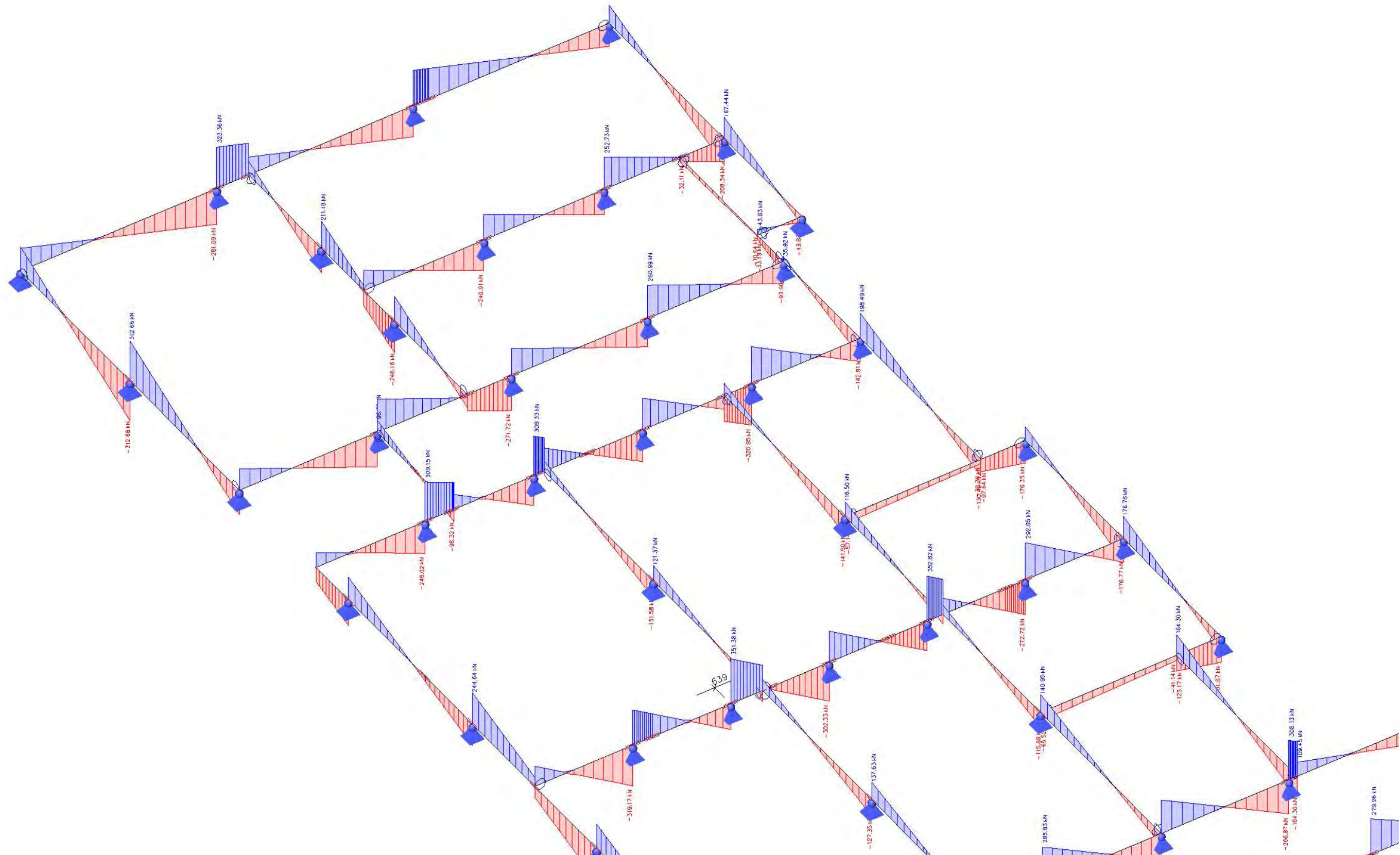
7. 1D internal forces; M_y

Values: M_y
Linear calculation
Combination: ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All



8. 1D internal forces; V_z

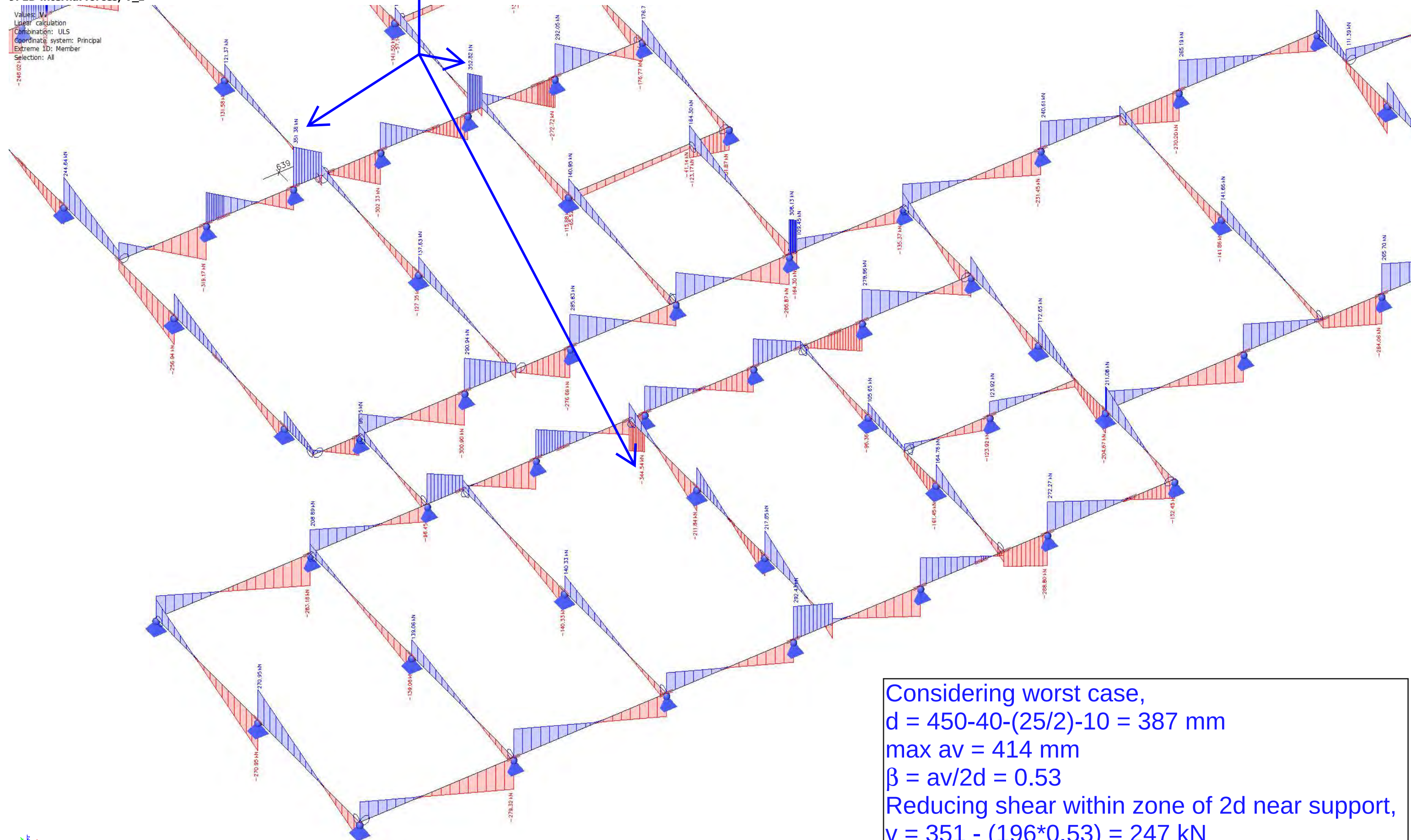
Values: V_z
Linear calculation
Combination: ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All



shear reduction
applied as $av < 2d$

9. 1D internal forces; V_z

Values: V_z
Linear calculation
Combination: ULS
Coordinate system: Principal
Extreme ID: Member
Selection: All



Considering worst case,
 $d = 450 - 40 - (25/2) - 10 = 387 \text{ mm}$
 $\max av = 414 \text{ mm}$
 $\beta = av/2d = 0.53$
 Reducing shear within zone of $2d$ near support,
 $v = 351 - (196 \cdot 0.53) = 247 \text{ kN}$
 So 2xH10 shear links is sufficient

10. 1D internal forces; V_z

Values: V_z
Linear calculation
Combination: ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All

