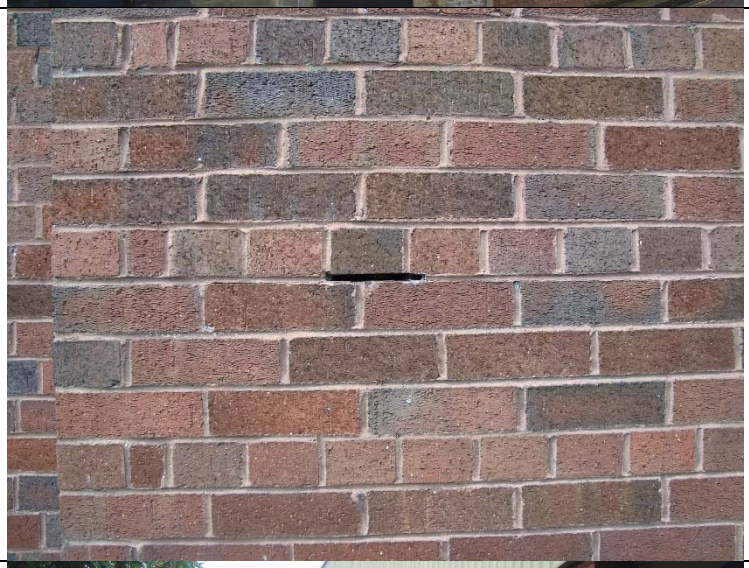
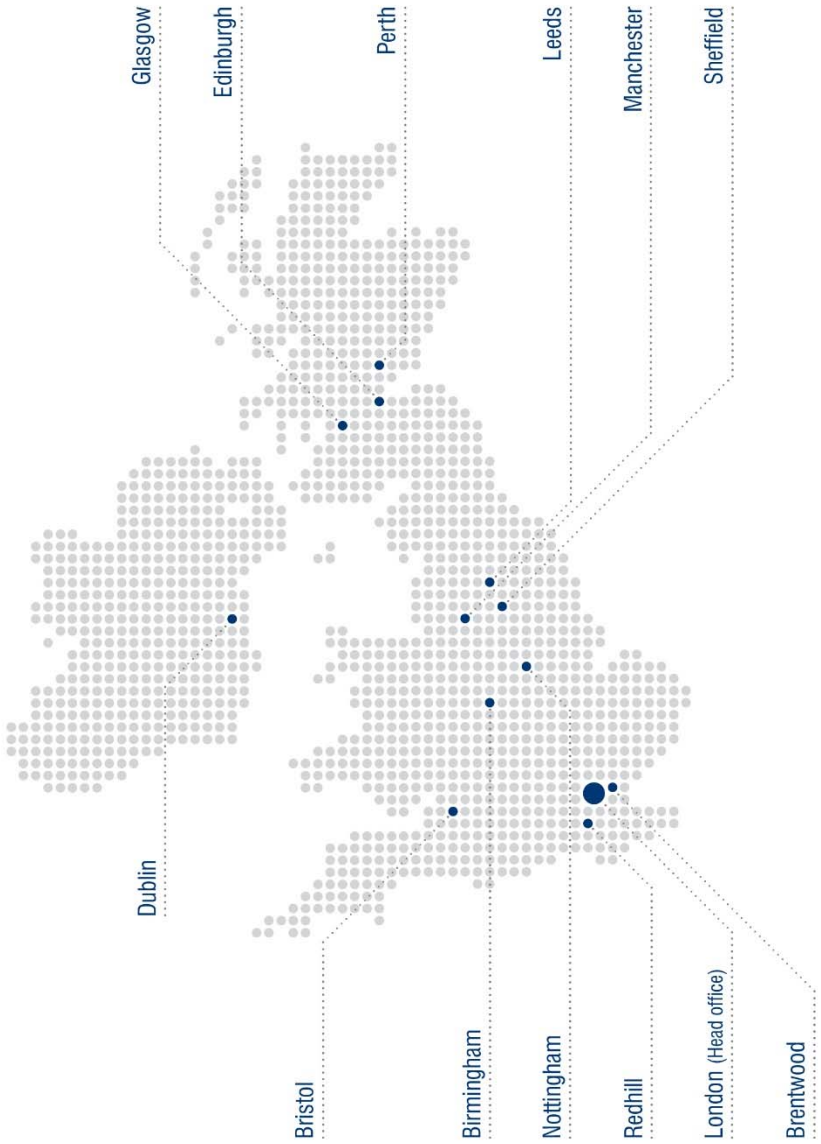
Name	Photograph
P40 Mortar loss below metal pipe in brick wall	
P41 Loss of render along bottom face of wall	
P42 Crack at the top of the wall	

Name	Photograph
P43 Loss of mortar along bottom face of brick wall	
P44 Loss of mortar along bottom face of brick wall	
P45 Mortar loss and spalling bricks	

Name	Photograph
P46 Brick staining due to the outlet of a pipe above	
P47 140mm long hole through brick wall	
P48 Existing repaired brickwork	

UK and Ireland Office Locations



D. Appendix 12.4: Maltings Building - Wall Assessment

APPENDIX 12.4
MALTINGS BUILDING - WALL ASSESSMENT

Maltings Building- Wall Assessment

Stag Brewery

August 2017

Waterman Infrastructure & Environment Limited
Pickfords Wharf, Clink Street, London, SE1 9DG
www.watermangroup.com

Client Name:	Dartmouth Capital Advisors Ltd
Document Reference:	WIE10667-102-R-2-1-3
Project Number:	WIE10667

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001:2007)

Issue	Date	Prepared by	Checked by	Approved by
00	14/08/17	Vinnothan Balakumarasingham	Lazaros Fotiadis	Ali Karbassi

Comments

Comments

Disclaimer

This report has been prepared by Waterman Infrastructure & Environment Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Contents

Figures

Tables

Appendices

Executive Summary

The purpose of this report is to present the assessment of the external walls of the Maltings building on the corner of a proposed development, adjacent to the River Thames, in Mortlake South West London. The walls were assessed against the actions applied by the River Thames water levels rising to the flood defence level currently predicted to occur in 2100.

Figure 1: Wall to be assessed and architectural proposal

The wall was assessed in accordance with Eurocode 6, BD21/01 and the latest architectural drawings which show the windows extending to ground level. A typical section was assessed against the actions of water levels rising and in each instance the element was considered to be one way spanning.

Standard	Bending	Shear
Eurocode 6	2.7	2.0
BD 21/01	2.2	1.9

Table 1: Assessment Results- Factors of Safety

The assessment showed the wall to have sufficient capacity to resist the increase in water level that occurs when the river rises to the 2100 flood defence levels (Table 1).

It should be noted that the assessment presented within this report is based on the assumptions stated in Section 2. Should these assumptions change then the report may have to be revised and reissued.

This report does not cover the capacity of the windows and the measures that would need to be put in place to support them once they have been extended to ground floor level.

1. Introduction

1.1 Project Background

A residential development is proposed on the site of the former Stag Brewery near Mortlake in South West London (Figure 2). A new river wall, constructed behind the existing river wall, is to be provided and this is to tie in with the corner of the listed Maltings building. Preliminary architectural drawings for the scheme can be found in Appendix A.

Figure 2: Site location

1.2 Report Purpose

The purpose of this report is to present the assessment of the external walls of the Maltings building on the corner of the development. The walls were assessed against the actions applied by the River Thames water levels rising to the flood defence level currently predicted to occur in 2100.

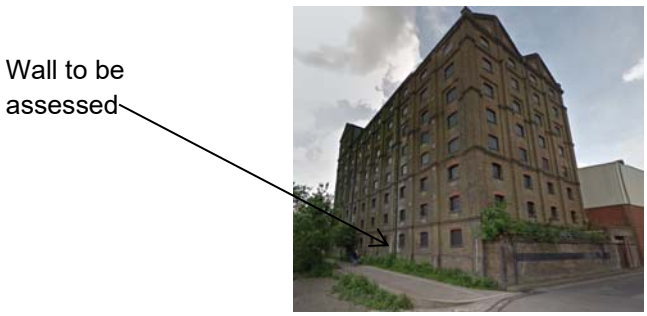


Figure 3: Wall to be assessed

The wall is to be assessed in accordance with Eurocode 6 and BD 21/01. The analysis method is described in Section 4 and a full set of the assessment calculations can be found in Appendix B.

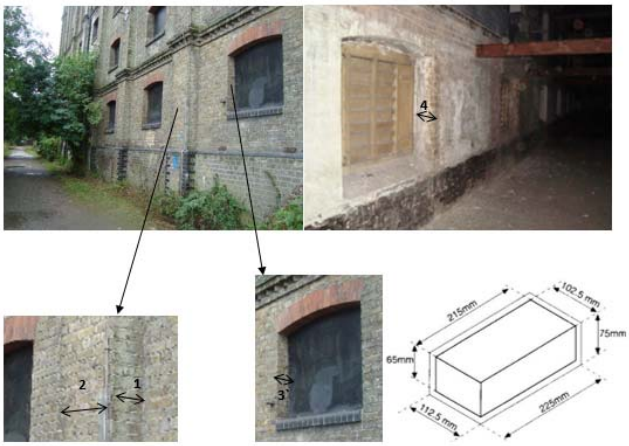
2. Assumptions

2.1 Geometric

Based on the available dimensions the wall measures 30m long and 25m high. Standard brick dimensions of 225mm x 105mm x 75mm shall be adopted.

Figure 4: Dimensions of wall to be assessed

2.1.1 Dimensions for Assessment



Based on standard brick dimensions:

1) 225mm
2) 788mm
3) 225mm
4) 225mm

Wall thickness = 3+4 = 225mm+225mm = 450mm (Therefore consider a 1000mm x 450mm section)

Column cross section = b x h = 2 x (1+3+4) = 788 x (225+225+225) = 788mm x 675mm

Figure 5: Assessment Dimensions

2.2 Material

The wall is constructed out of clay bricks and the photos taken on site suggest that the wall is four bricks thick. In the absence of site specific core holes the following material properties were adopted.

Material Property	Value
Masonry Group [1]	Group 1
Mortar Type [2]	M4 – General purpose mortar
Class of execution control [3]	2
Unit Weight	22.5 kN/m^3
Characteristic shear strength of masonry[4], f_{vk}	0.2 N/mm^2
Characteristic flexural strength of masonry having a plane of failure parallel to the bed joints[5], f_{xk1}	0.5 N/mm^2
Characteristic flexural strength of masonry having a plane of failure perpendicular to the bed joints[5], f_{xk2}	1.5 N/mm^2
Compressive strength of mortar [6]	4 N/mm^2
γ_m [7] Bending	2.7
γ_m [7] Shear	2.5

Table 2: Material properties adopted in the assessment

Notes

1) In accordance with Table 3.1, EN 1996-1-1:2005

2) In accordance with clause 3.2.3.1, EN 1996-1-1:2005

3) Adopt this class in absence of construction information.

4) Table NA.5, NA to BS EN 1996-1-1:2005

5) Table NA.6, NA to BS EN 1996-1-1:2005

6) Table NA.2, NA to BS EN 1996-1-1:2005

7) Material factors adopted Table NA.1 of NA to BS EN 1996-1-1:2005

2.3 Loading

The primary purpose of this report is to assess the wall for the effects that result from the increase in river level. As such this action was considered to act on the bottom 2m of the wall. This is derived from the flood defence level rising to 6.70m AOD in the year 2100 and the minimum existing ground level being taken at 4.70m based on available survey information. The building is currently subject to wind loads so this has been applied to the section of the column that is not subject to water pressures.

The loading calculations can be found in Appendix B.

3. References

3.1 Standards and Technical Documents

Reference	Title
BS EN 1996-1-1:2005	Eurocode 6 — Design of masonry structures — Part 1-1: General rules for reinforced and unreinforced masonry structures
WIE10667-100-R-2-1-4-DO	Stag Brewery, Mortlake Flood Risk and Drainage Briefing Note
BS EN 1991-1-4:2005	Eurocode 1: Actions on structures — Part 1-4: General actions — Wind Actions
BS 5628-1: 2005	Code of practice for the use of masonry — Part 1: Structural use of unreinforced masonry
-	Manual for the design of plain masonry in building structures to Eurocode 6, The Institution of Structural Engineers
-	How to design masonry structures to Eurocode 6, Roberts and Brooker.
BD 21/01	The Assessment of Highway Bridges and Structures
BS 5628-1: 2005	Code of practice for the use of masonry — Part 1: Structural use of unreinforced masonry

Table 3: Standards and Technical Documents Referenced

3.2 Drawings

Drawing Number	Drawing Title
WIE-SA-04-1000	Thames River Wall Condition Survey Defect Plan
WIE-SA-04-1004	Thames River Wall Condition Survey Defect Elevation Sketch

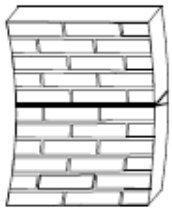
Table 4: Drawings Referenced

4. Assessment

4.1 Methodology

Figure 6: Dimensions of wall and architectural intent for the scheme.

The current architectural intent for the scheme is to extend the ground floor windows down to ground level. As such in the event of the 2100 storm event the water will apply a pressure to the wall panels and columns either side of the windows. The assessment was carried out by considering a 'T-shaped' column section comprising the column and the wall panels either side. The section was assumed to have a fixed support at foundation level and a pinned prop at first floor level.



a) plane of failure parallel to bed joints, f_{xk1}

Figure 7: Planes of failure considered (Figure 3.1 EN 1996-1-1:2005)

The section is to be considered as one way spanning with the critical plane of failure being parallel to the bed joints (Figure 7). The assessment was carried out in accordance with Eurocode 6 and BD21/01. In both instances the wall was treated as being subject to a permanent water pressure load arising from the water rising to the flood defence level.

The assessment calculations can be found in Appendix B. However, the assessment does not consider any of the support arrangements that may be required for the windows to resist the applied water pressure.

4.2 Results

Standard	Bending	Shear
Eurocode 6	2.7	2.0
BD 21/01	2.2	1.9

Table 5: Assessment Results – Factors of safety

5. Conclusion

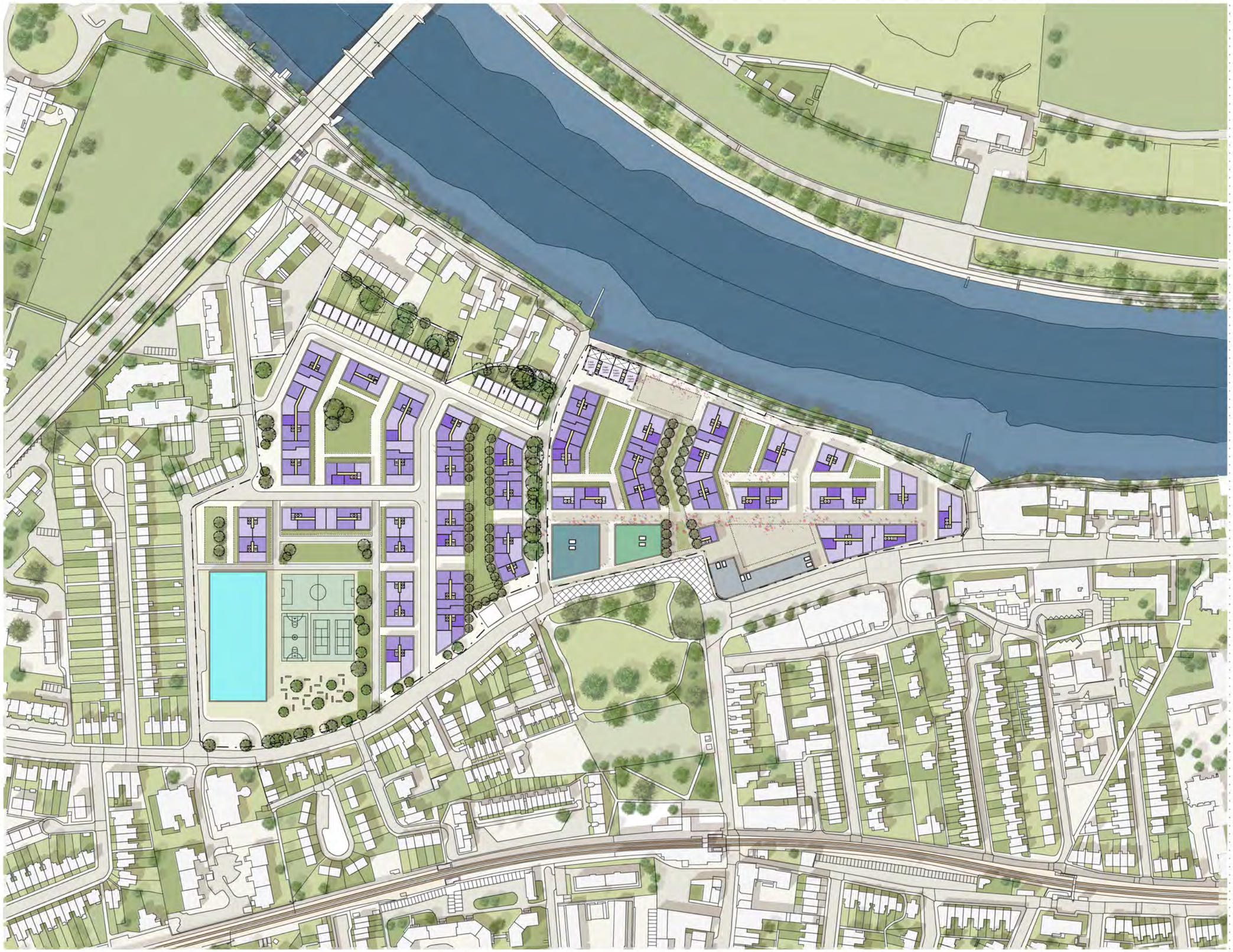
The purpose of this report was to assess the river facing wall of the maltings building on the corner of the proposed development site at Mortlake. The assessment shows the wall to have sufficient capacity to resist the increase in water level that arises when the river rises to the 2100 flood defence levels.

It should be noted that the assessment presented within this report is based on the assumptions stated in Section 2. Should these assumptions change then the report may have to be revised and reissued.

This report does not cover the capacity of the windows and the measures that would need to be put in place to support them once they have been extended to ground floor level.

APPENDICES

A. Reference Drawings



NOTES:

DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS TO BE CHECKED ON SITE. ALL OMISSIONS AND DISCREPANCIES TO BE REPORTED TO THE ARCHITECT IMMEDIATELY.

- 1 Bed
- 2 Bed
- 3 Bed
- 4 Bed
- House
- Hotel
- Residential Lobby
- Office
- Cinema/Gym
- School

Revision description	Date	Check	Rev

SQUIRE & PARTNERS

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info@squireandpartners.com
www.squireandpartners.com

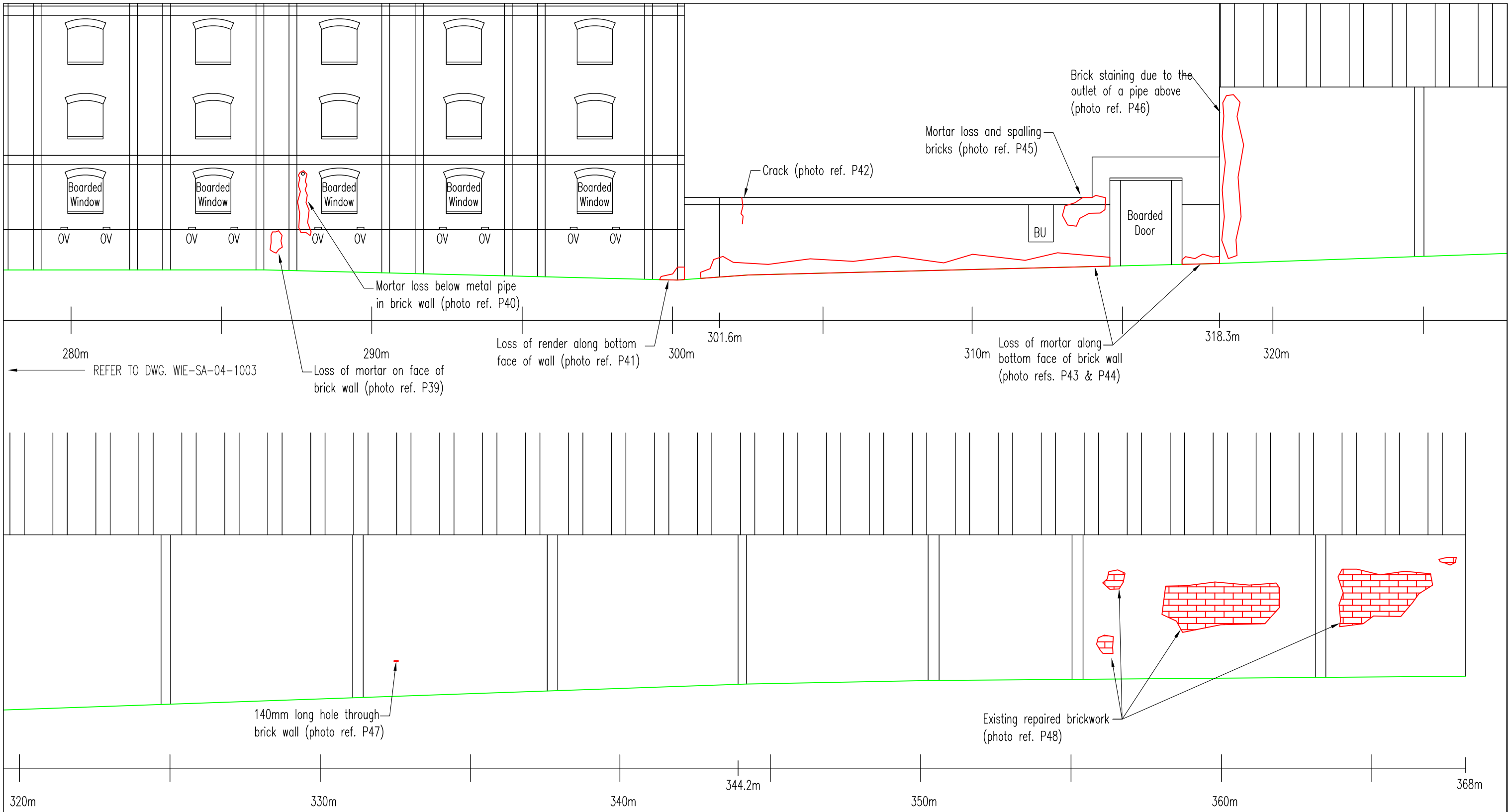
Project
Stag Brewery
Richmond

Drawing
Site Plan
Typical Level

Drawn	Date	Scale
JB	06/08/16	1 : 1250 @ A1 1 : 2500 @ A3

Job Number	Drawing number	Revision
16019	G100_P_02_001	

View of from the River with The Maltings



KEY:
BU = BRICKED UP
OV = OPEN VENT

1:125 0 1m 2m 3m 4m 5m 6m

1:1 0 10 20 30 40 50

1. THIS CONDITION SURVEY WAS CARRIED OUT ON 16TH SEPTEMBER BY TLR & TSC.
2. MINOR VEGETATION GROWTH, GRAFFITI AND WEAR OF THE BRICKS ARE PRESENT ALONG THE LENGTH OF WALL.
3. WALL COMPOSED OF MANY DIFFERENT BRICK WALL SECTIONS. STEEL COLUMNS INSTALLED BEHIND THE EASTERN HALF OF THE WALL AT INTERVALS IN ORDER TO PROVIDE SUPPORT (0m TO 163m). NEWER SECTION OF WALL FROM 163m TO 257m. MALTINGS BUILDING SECTION OF WALL RUNS FROM 257m TO 318m. NEWER SECTION OF WALL RUNS FROM 318m TO 368m.

GENERAL NOTES

Rev	Date	Description	By
A01	14.12.16	ISSUED FOR INFORMATION	TLR

Amendments

Waterman

Pickfords Wharf Clink Street London SE19DG

t 020 7928 7888

mail@watermangroup.com www.watermangroup.com

Project
STAG BREWERY, MORTLAKE

Title
THAMES RIVER WALL
CONDITION SURVEY
DEFECT ELEVATION SKETCH
(SHEET 1 of 4)

Client
DARTMOUTH CAPITAL ADVISORS LTD

Drawing Status
PRELIMINARY

Designed by TLR	Checked by AAK	Project No WIE10667	
Drawn by TLR	Date DECEMBER 2016		
Scales @ A3 work to figured dimensions only 1:125		Computer File No WIE-10667-SA-04-1004.dwg	

Publisher	Zone	Category	Number	Revision
WIE	SA	04	1004	A01

A3L-Wat-S

B. Calculations

Calculations	Office: London		Project No: WIE10667
Job Title: Stag Brewery - Mortlake	Prepared by: VB	Date: 14/02/17	
Calculations Title: Maltings Building External Wall Assessment	Checked by:	Date:	

Loading

-Determine the load that results from the river rising to the flood defence level.

Existing Ground level	=	4.7	m
2100 Flood defence level	=	6.7	m
Height of water	=	2	m
Unit weight of water	=	10	kN/m3
Accidental load factor	=	1	
Applied pressure	=	20	kN/m2

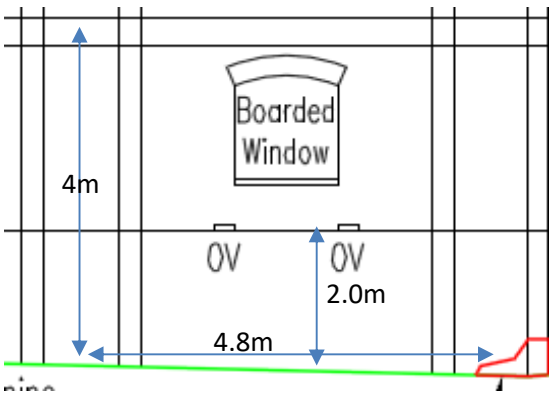
Wind pressure

The building is currently subject to wind pressures and these will be applied to the top section of the column that is not subject to water pressures.

Wind Pressure	=	0.9	kN/m2

Span arrangements

The architectural intent is to extend the windows on the bottom floor down to ground level.

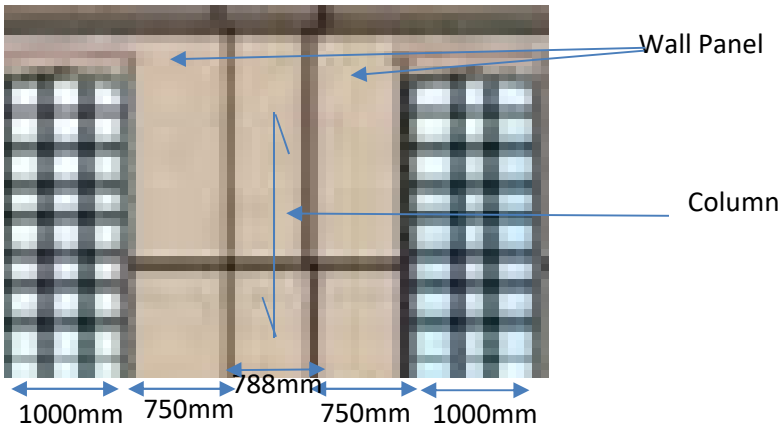


Calculations	Office: London		Project No: WIE10667
Job Title: Stag Brewery - Mortlake	Prepared by: VB	Date: 14/02/17	
Calculations Title: Maltings Building External Wall Assessment	Checked by:	Date:	

The wall panels and column section will be considered as one section with the load from the windows transferrred to the masonry. The combined section will then be considered to span between the ground and the first floor.

A fixed edge condition will be taken for the bottom of the wall and a free edge support condition will be taken for the top of the wall.

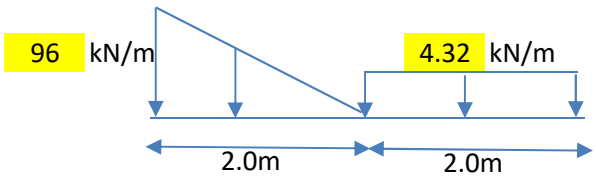
Dimensions:



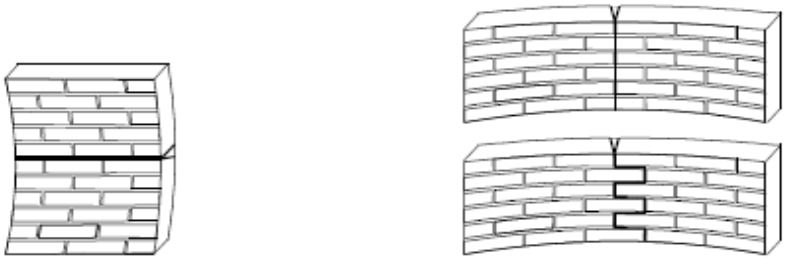
Distance Between Columns = 4800 mm

Loading Diagrams

Determine the total load applied to the column.



Planes of failure



a) plane of failure parallel to bed joints, f_{xk1} b) plane of failure perpendicular to bed joints, f_{xk2}

Calculations	Office: London		Project No: WIE10667
Job Title: Stag Brewery - Mortlake	Prepared by: VB	Date: 14/02/17	
Calculations Title: Maltings Building External Wall Assessment	Checked by:	Date:	

Analysis

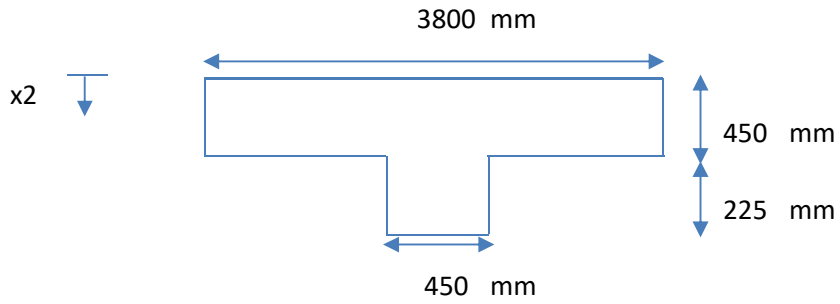
Column

The column spans between the ground and first floor. The bottom two metres is subject to a water pressure in a 2100 storm event.

An analysis model was created in Staad Pro V8i considering a column with a fixed and connection at foundation level and a pinned end connection at first floor level. A hydrostatic water pressure was applied to the bottom two metres of the column and a wind pressure was applied to the top 2m of the column.

M = 46 kNm
V = 94 kN

Section Dimensions



Determine section Z value

x2 = 244 mm
I = 4E+10 mm^4
Z = I/x2
Z = 2E+08 mm^3

Bending and shear stresss checks

Applied bending Stress = M/Z

Z = 2E+08 mm^3
Applied bending Stress = 0.2792 N/mm^2

The critical case for the column in this instance is bending parallel to the bed joint

Characteristic flexural strength of masonry, f_{xk1} = 0.5 N/mm^2
γ_m = 2.70
Capacity = fxk1/γm + σd (σd limited to 0.2fk/γm)

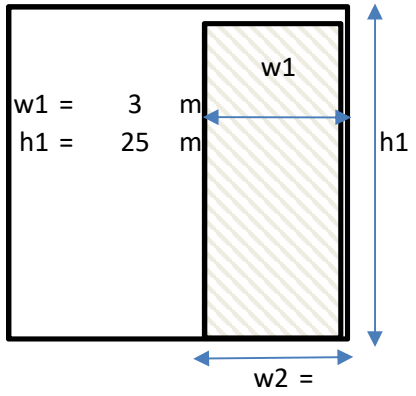
Determine limiting σ_d value:

$f_k = k f_b^{\alpha} f_m^{\beta}$ cl3.6.1.2 EN 1996-1-1:2005
k = 0.75
fb = 50 N/mm^2

Calculations	Office: London		Project No: WIE10667
Job Title: Stag Brewery - Mortlake	Prepared by: VB	Date: 14/02/17	
Calculations Title: Maltings Building External Wall Assessment	Checked by:	Date:	

fm =	4	N/mm^2
α =	0.7	
β =	0.3	
f_k =	17.58	N/mm^2
σ_d =	1.30	N/mm^2

Determine actual σ_d value:



Actual σ_d =	Force / Area	
Force =	Unit Weight x Cross section area x height	
Unit Weight =	22.5	kN/m3
Force =	1018.8	kN
Area =	Cross section Area	
Area =	1.8113	m^2
Actual σ_d =	0.56	N/mm^2
Capacity =	fxk1/γm + σd	
γ_m =	2.50	
Capacity =	0.7625	N/mm^2
FOS =	2.73	

Shear

- Check that the interface between the panel and the wall has sufficient shear capacity
- Checks in accordance with cl 3.6.2 of BS EN 1996-1-1

Applied force =	94.0	kN	
Stress =	0.21	N/mm^2	

Capacity: fvk = 0.5fvko + 0.4 σd $\leq$ 0.045fb

Table 3.4

fvko =	0.2	N/mm^2	(1)
0.045f_b =	2.25	N/mm^2	

Determine sd for panel section

Force =	Unit Weight x Cross section area x height	
Force =	424	kN
Cross section Area =	0.7538	m^2
Actual σ_d =	0.5625	N/mm^2
fvk = =	0.425	N/mm^2
FOS =	2.0	N/mm^2

Calculations	Office: London		Project No: WIE10667
Job Title: Stag Brewery - Mortlake	Prepared by: VB	Date: 14/02/17	
Calculations Title: Maltings Building External Wall Assessment	Checked by:	Date:	

Checks in accordance with BD 21/01

Since the structure would have been designed and constructed prior to the introduction of the Eurocodes an additional check will be carried out in accordance with BD 21/01.

Section 7.16 states that assesments are to be carried out in accordance with BS 5628.

Table 3 of BS 5628 presents the same values as Table NA.6 of BS EN 1996-1-1:2005 as such the same Characteristic flexural strength of masonry will be adopted.

Flexural strength

Characteristic flexural strength of masonry, f_{kx} = 0.5 N/mm^2

32.5.3 flexural resistance = $(f_{xk}/\gamma_m + g_d)$ N/mm^2

table 4 γ_m = 2.5

g_d = design vertical dead load per unit area

The design vertical load per unit area is equivalent to the EC6 σ_d calculation.

flexural strength = 0.76 N/mm^2

Characteristic shear strength

The characteristic shear strength of the masonry is determined in accordance with BS 5628 cl 21.1.1

fv = $f_{vk0} + 0.6g_a$ < 1.4 N/mm^2

cl 21.1.2 (c) f_{vk0} = 0.15 N/mm^2

g_a = design vertical load per unit area

The design vertical load per unit area is equivalent to the EC6 σ_d calculation.

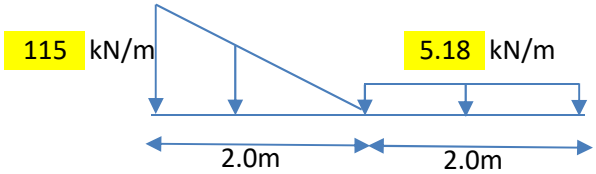
g_a = 0.56 N/mm^2

fv = 0.49 N/mm^2

Applied loads

In accordance with clause 18 of BS 5628 consider the applied loading to be be equal to 1.2Gk+1.2Qk+1.2Wk where Gk, Qk and Wk are equal to design dead, imposed and wind loads. For the raised flood level case the dead load is not applicable for assessing flexure and shear.

Loading Diagram



Calculations	Office: London		Project No: WIE10667
Job Title: Stag Brewery - Mortlake	Prepared by: VB	Date: 14/02/17	
Calculations Title: Maltings Building External Wall Assessment	Checked by:	Date:	

-Staad pro results:

M = 57 kNm
V = 115 kN

Capacity Checks

Bending:

Applied bending Stress = M/Z
Applied bending Stress = 0.35 N/mm^2
Capacity = 0.76 N/mm^2
FOS = 2.2

Shear:

Applied shear stress = Shear force / cross section
Applied shear stress = 0.26 N/mm^2
Capacity = 0.49 N/mm^2
FOS = 1.91

FOS Summary

	Bending	Shear
EC 6	2.7	2.0
BD 21/01	2.2	1.9

C. Column Analysis Model Input and Output

Job Information

	Engineer	Checked	Approved
Name:	VB		
Date:	24-APR-17		

Structure Type	SPACE FRAME

Number of Nodes	2	Highest Node	2
Number of Elements	1	Highest Beam	1

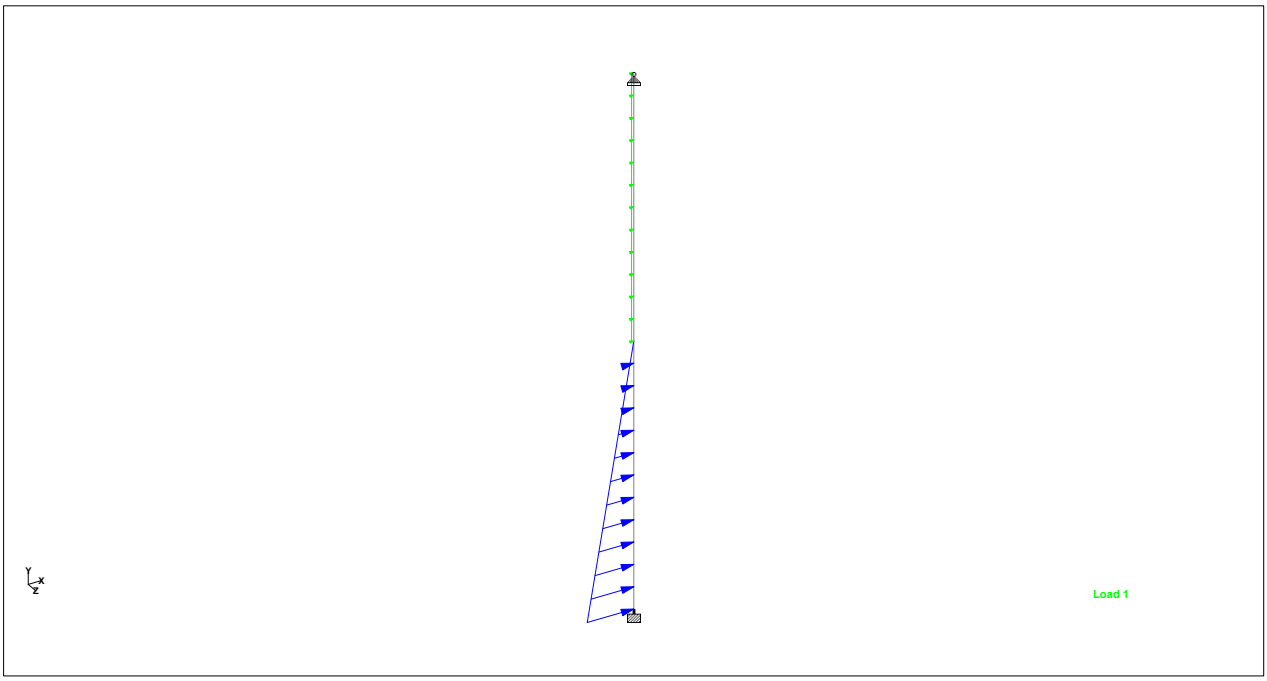
Number of Basic Load Cases	2
Number of Combination Load Cases	0

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	LOAD CASE 1
Primary	2	LOAD CASE 2



Whole Structure (Input data was modified after picture taken)

Nodes

Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000
2	0.000	4.000	0.000

Beams

Beam	Node A	Node B	Length (m)	Property	β (degrees)
1	1	2	4.000	1	0

Supports

Node	X (kN/mm)	Y (kN/mm)	Z (kN/mm)	rX (kN-m/deg)	rY (kN-m/deg)	rZ (kN-m/deg)
1	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
2	Fixed	Fixed	Fixed	-	-	-

Primary Load Cases

Number	Name	Type
1	LOAD CASE 1	None
2	LOAD CASE 2	None

Beam End Forces

Sign convention is as the action of the joint on the beam.

			Axial	Shear		Torsion	Bending	
Beam	Node	L/C	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
1	1	1:LOAD CASE	0.000	93.675	0.000	0.000	0.000	46.099
		2:LOAD CASE	0.000	115.081	0.000	0.000	0.000	56.589
	2	1:LOAD CASE	0.000	10.925	0.000	0.000	0.000	0.000
		2:LOAD CASE	0.000	13.319	0.000	0.000	0.000	0.000

Beam Maximum Moments

Distances to maxima are given from beam end A.

Beam	Node A	Length (m)	L/C		d (m)	Max My (kNm)	d (m)	Max Mz (kNm)
1	1	4.000	1:LOAD CASE	Max +ve	0.000	0.000	0.000	46.099
				Max -ve	0.000	0.000	1.667	-13.729
			2:LOAD CASE	Max +ve	0.000	0.000	0.000	56.589
				Max -ve	0.000	0.000	1.667	-16.848

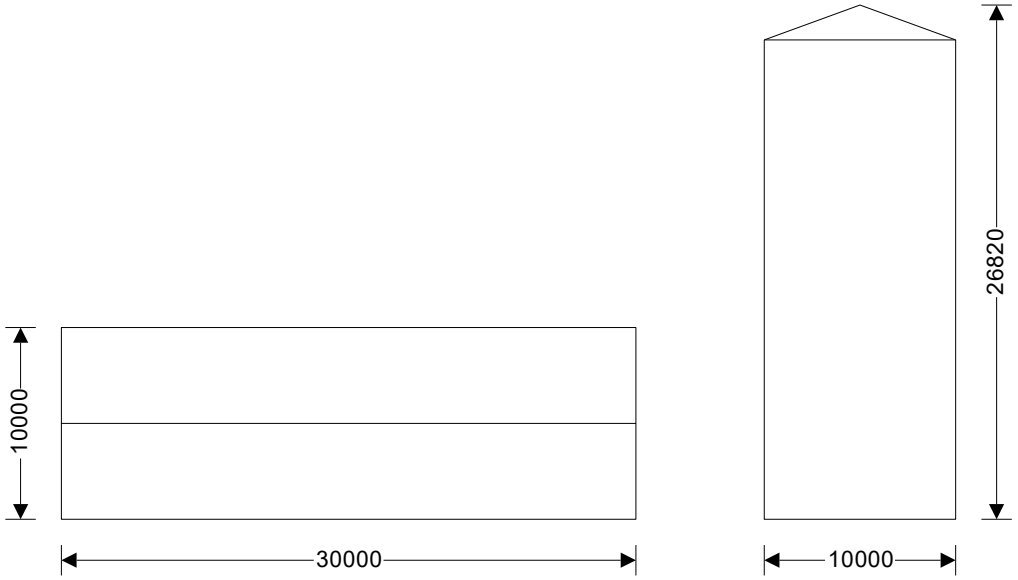
Beam Maximum Shear Forces

Distances to maxima are given from beam end A.

Beam	Node A	Length (m)	L/C		d (m)	Max Fz (kN)	d (m)	Max Fy (kN)
1	1	4.000	1:LOAD CASE	Max +ve	0.000	0.000	0.000	93.675
				Max -ve	0.000	0.000	4.000	-10.925
			2:LOAD CASE	Max +ve	0.000	0.000	0.000	115.081
				Max -ve	0.000	0.000	4.000	-13.319

WIND LOADING (EN1991-1-4)

TEDDS calculation version 3.0.16



Plan Elevation

Building data

Type of roof	Duopitch
Length of building	L = **30000** mm
Width of building	W = **10000** mm
Height to eaves	H = **25000** mm
Pitch of roof	α_0 = **20.0** deg
Total height	h = **26820** mm

Basic values

Location	London
Wind speed velocity (FigureNA.1)	$v_{b,map}$ = **21.4** m/s
Distance to shore	L_{shore} = **66.00** km
Altitude above sea level	A_{alt} = **8.0**m
Altitude factor	$c_{alt} = A_{alt} \times 0.001m^{-1} + 1$ = **1.008**
Fundamental basic wind velocity	$v_{b,0} = v_{b,map} \times c_{alt}$ = **21.6** m/s
Direction factor	c_{dir} = **1.00**
Season factor	c_{season} = **1.00**
Shape parameter K	K = **0.2**
Exponent n	n = **0.5**
Probability factor	$c_{prob} = [(1 - K \times \ln(-\ln(1-p)))/(1 - K \times \ln(-\ln(0.98)))]^n$ = **1.00**
Basic wind velocity (Exp. 4.1)	$v_b = c_{dir} \times c_{season} \times v_{b,0} \times c_{prob}$ = **21.6** m/s
Reference mean velocity pressure	$q_b = 0.5 \times \rho \times v_b^2$ = **0.285** kN/m^2

Orography

Orography factor not significant	c_o = 1.0
Terrain category	Town
Displacement height (sheltering effect excluded)	h_{dis} = 0mm

The velocity pressure for the windward face of the building with a 0 degree wind is to be considered as 1 part as the height h is less than b (cl.7.2.2)

Peak velocity pressure - windward wall - Wind 0 deg

Reference height (at which q is sought)	z = **25000**mm
Displacement height (sheltering effects excluded)	h_{dis} = **0** mm
Exposure factor (Figure NA.7)	c_e = **2.96**
Exposure correction factor (Figure NA.8)	$c_{e,T}$ = **1.00**
Peak velocity pressure	$q_p = c_e \times c_{e,T} \times q_b$ = **0.84** kN/m^2

Structural factor

Structural damping	δ_s = **0.100**
Height of element	h_{part} = **25000** mm
Size factor (Table NA.3)	c_s = **0.892**
Dynamic factor (Figure NA.9)	c_d = **1.000**
Structural factor	$c_{sCd} = c_s \times c_d$ = **0.892**

Peak velocity pressure - roof

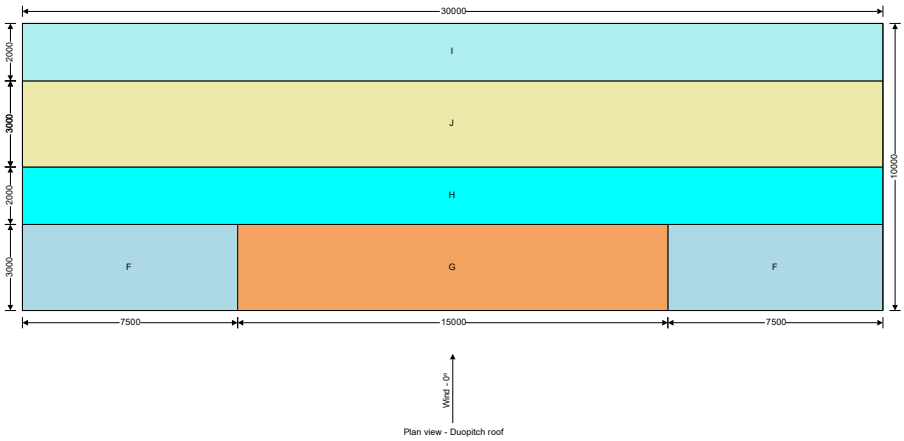
Reference height (at which q is sought)	z = **26820**mm
Displacement height (sheltering effects excluded)	h_{dis} = **0** mm
Exposure factor (Figure NA.7)	c_e = **3.01**
Exposure correction factor (Figure NA.8)	$c_{e,T}$ = **1.00**
Peak velocity pressure	$q_p = c_e \times c_{e,T} \times q_b$ = **0.86** kN/m^2

Structural factor - roof 0 deg

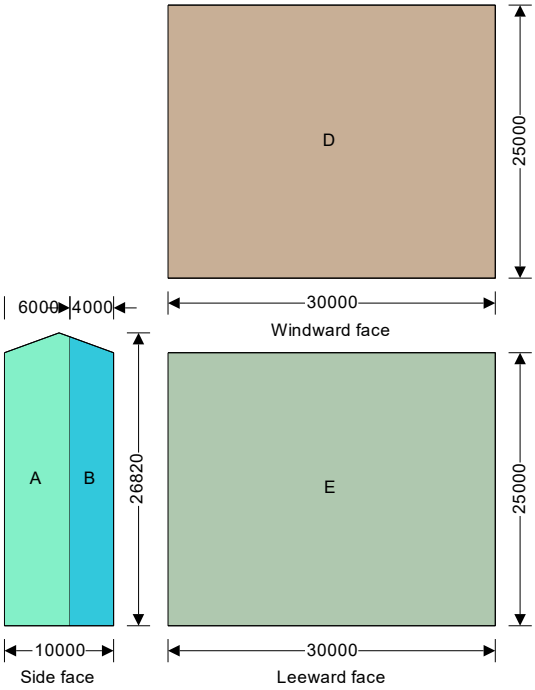
Structural damping	δ_s = **0.100**
Height of element	h_{part} = **26820** mm
Size factor (Table NA.3)	c_s = **0.893**
Dynamic factor (Figure NA.9)	c_d = **1.000**
Structural factor	$c_{sCd} = c_s \times c_d$ = **0.893**

Peak velocity pressure for internal pressure

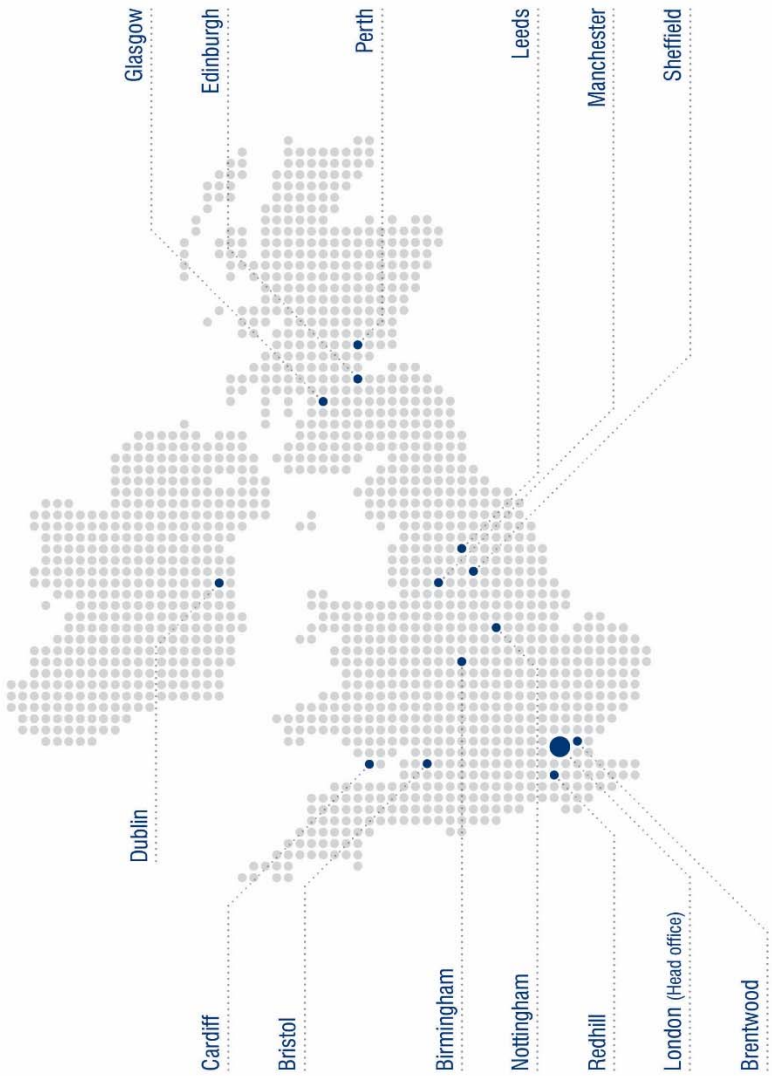
Peak velocity pressure – internal (as roof press.)	$q_{p,i}$ = **0.86** kN/m^2



Plan view - Duopitch roof


D
25000
6000
4000
30000
Windward face
A
B
26820
E
25000
10000
Side face
30000
Leeward face

UK and Ireland Office Locations



E. Appendix 12.5: Environment Agency Meeting Minutes (26.09.2016)

APPENDIX 12.5
ENVIRONMENT AGENCY MEETING MINUTES (26.09.2016)

Minutes of Meeting Held on 26th September 2016
Ergon House, Horseferry Road, London

Present:	Joe Martyn	JM	Environment Agency
	Dave Cuthbertson	DC	Environment Agency
	Joe Pring	JP	Environment Agency
	Kevin Watson	KW	Gerald Eve
	Barnaby Johnston	BJ	Squire & Partners
	Robert Copeland	RC	Gillespies
	Paul Webster	PW	Hydro-Logic
	Tamara Rowe	TR	Waterman
	Ali Karbassi	AK	Waterman
	Donal O'Donovan	DO	Waterman
	Brendan McCarthy	BM	Waterman

Action

1.0 Introductions

2.0 Scheme Overview

2.1 BJ introduced the scheme, giving an overview of the existing site and defences, as well as the proposals, setting out the benefits the scheme will bring to the area (i.e. reinstating historic routes, making the river front public etc.).

2.2 BJ gave an overview of the offsets from existing buildings to the river, advising that there is a minimum of 13m from MHWS level in the river to the defences and then a minimum of 4m from the defences to existing buildings.

2.3 BJ described the proposed ground levels across the Site and how this would provide protection from breach flooding.

2.4 BJ explained that the ownership of the land between the site and the River Thames (i.e. the tow path and bank) is unknown, and needs to be confirmed before anything can be proposed in this location. The team's aspiration being to remove the self-seeded trees and bushes and provide enhancement.

3.0 Existing Defences

3.1 TR carried out condition survey of the existing defences on the 23rd September 2016. TR gave a summary of the findings and indicated a number of defects with the existing defences. This included bricks missing with daylight visible through the defence wall, previously blocked air vents damaged and showing daylight through defences, and a number of cracks in the wall (one of which runs to the entire height). The Maltings Building is currently supported internally by a steel frame and provides suitable protection in line with the present day statutory defence level of 5.94m AOD. Air vents located above this level would need to be filled in to ensure protection in the future.

3.2 The existing wall survey report would be submitted with the planning application. **TR/AK**

4.0 Proposed Defences

4.1 DO set out that in line with the TE2100 Plan the present day statutory defence level is 5.94m AOD, which would need to be raised to 6.25m AOD by 2065 and 6.70m AOD by 2100.

4.2 DO highlighted that in line with the Environment Agency's response (as part of their response to PW's scoping FRA) the team has managed to incorporate the full amount of defence raising to 6.70m AOD. This would ensure that the Site would be protected up to the year 2100 and no further defence raising would be required in the future, based on current climate change predictions.

4.3 TR described the different options available for construction of the new defences. One option would be to pile directly on the line of the existing defences, another would be to pile on the landward side of the defences and the last to pile on the river side of the defences.

4.4 The preferred option would be to pile on the landward side of the existing defences. This would allow the existing defence to remain in place during construction, ensuring that the defences are maintained. JP confirmed that this would also be the Environment Agency's preferred option, as they would object to any advancement of defences on the river side of the existing wall.

4.5 JP/JM confirmed that if the new defence needed to be moved forward slightly this would be acceptable so long as the new defence was moved back in another location to compensate for the loss of river storage.

4.6 Piling installed along the river frontage to provide the new defence would tie in to the existing Maltings Building. The existing Maltings Building would be upgraded internally to ensure that that it is fit for purpose and provides protection to 6.7m AOD. This will involve removal/blocking up of air bricks located below 6.7m AOD.

4.7 JP indicated that although seepage through the defence wall is usually a concern, this should be mitigated through the proposed piled construction.

4.8 JP advised that the 1 in 1000 year standard of protection would need to be maintained throughout the construction sequence.

4.9 It was agreed that outline construction sequence drawings and a method statement would be submitted with the planning application. Full details would not be required at the planning stage but would be needed post planning to obtain an Environmental Permit. **TR/AK**

4.10 JM advised that in order to proceed to the detailed design of the new defences it will be necessary to undertake trial pits to confirm the construction of the existing defences. JM agreed to confirm if an Environmental Permit would be required to undertake this investigation. **JM**

4.11 DO set out that due to the existing ground levels in Ship Lane the highway currently acts as the flood defence in this area. However, it is unclear from the defence drawings provided by the Environment Agency and their Flood Map for Planning exactly where this line of the defence is located.

4.12 JP confirmed that due to the existing ground levels in Ship Lane (between 5m and 6m AOD) the defence level would need to be raised in the future in line with the TE2100 Plan.

4.13	DO advised that it would not be feasible to raise levels in Ship Lane to provide permanent protection to a level 6.7m AOD (requiring road levels to be raised by 1m) while ensuring access to properties along the river front and tying into existing accesses along Ship Lane. Whether the development takes place or not Ship Lane would therefore need to be protected by a temporary demountable defence.	
4.14	JP indicated that the Environment Agency's preference is always for permanent defences but conceded that due to the nature of Ship Lane a demountable defence may be the only feasible option. Information would need to be provided within the planning application documents that sets out why a permanent defence would be unsuitable in this location.	**DO/TR/AK**
4.15	PW explained that there is a precedent for the use of self-raising barriers that could be incorporated in the future as part of the TE2100 defence raising. Examples would be provided as part of the planning submission documents.	**PW/DO**
4.16	DO referred to drawing 16019_G100_P_L (attached to these minutes) and explained that a demountable defence running from the southwest corner of the Maltings Building across to the existing public house (The Ship) would be the best location to tie the Stag Brewery Site into the River Thames defences continuing to the west beyond the Site. This location is slightly further north along Ship Lane than the Environment Agency's Flood Map for Planning currently indicates.	
4.17	JM queried if by moving the line of defences north along Ship Lane there would be a loss in floodplain storage. PW suggested that as the River Thames is tidal in this location there would be no impact on floodplain storage.	
5.0	**Offsets to Defences**	
5.1	DO explained that in line with the Environment Agency's response to PW's scoping FRA, the development would be set no closer than 16m from the river edge.	
5.2	The proposed offsets were indicated on the plan tabled at the meeting (ref: 16019_G100_P_L). The minimum offset from the existing defences to the existing building is 4m. The proposals ensure that built development would be no closer to the defences that the current minimum of 4m and in many location would be much greater. It was also noted that the pinch point of 4m is from the defence to steps and not to a building, which is an improvement on the current situation.	
5.3	DC queried if the offsets shown on drawing 16019_G100_P_L were measured from the existing defence or the proposed defence (as if pilling took place on the landward side of the existing defence this could encroach upon the offset provided).	
5.4	AK indicated that the distance that the piling would need to be set back from the existing defence would need to be confirmed once trial pits have been undertaken.	
5.5	BJ confirmed that if the proposed wall encroaches on the 4m minimum offset then the proposed building/steps would be pulled back to ensure that the minimum offset would remain at 4m, as per the existing situation.	
5.6	JM/DC/JP confirmed that the offsets shown on drawing 16019_G100_P_L would be acceptable as long as it is confirmed that the minimum offset of 4m is not encroached upon as a result of piling behind the existing defences.	

5.7	BJ confirmed that drawings clearly showing the proposed offsets from the proposed built development and the proposed River Thames defences would be submitted with the planning application.	**BJ**
6.0	**Maintenance of Defences**	
6.1	JP asked that vehicle tracking is undertaken to ensure that the proposed defences could be maintained. JP indicated that the Environment Agency do not have a specific vehicle that needs to be tracked but instead it is the responsibility of the developer/consultant to confirm an appropriate vehicle can access and maintain the defences.	
6.2	DC/JP advised that any balconies cantilevering out towards the defences should not hinder maintenance.	
6.3	AK set out that defences would be designed with a 120 year design life. On this basis JP confirmed that the requirement for tracking would be for maintenance rather than reconstruction and so would not need to allow access for a piling rig.	
6.4	Drawings showing tracking of appropriate vehicles would be submitted with the planning application to ensure that future maintenance is achievable.	**TR/DO**
7.0	**Summary**	
7.1	In summary JP/DC/JM indicated that they were generally happy with the proposals as they stand. However, some areas (as indicated above) would need to be worked up in more detail prior to submission of the planning application to full satisfy the Environment Agency.	
7.2	DO clarified that as part of the planning submission a report would be prepared summarising all works regarding the River Thames defences. This would include input regarding proposed offsets, construction methods, maintenance etc.	**DO**
8.0	**Any Other Business**	
8.1	DC queried the potential works to be undertaken along the tow path/river bank, between the Site boundary and the river edge.	
8.2	BJ reiterated that there were ownership issues that needed to be dealt with in order to facilitate any works in this area.	
8.3	BJ/RC set out that there was appetite to undertake enhancement along the tow path/river bank subject to ownership issues being resolved. Ownership of this area would therefore be investigated.	**KW**
8.4	JM/DC asked about the use of SuDS within the proposed scheme. It was confirmed that SuDS would be incorporated in accordance with the London Plan and Richmond policy.	
8.5	JP/DC/JM indicated they would be happy to undertake a pre-app review of documents if required.	

UK and Ireland Office Locations