Structural Calculations

West Bergholt Community Hub and Office

Ref: 2405-05

03/05/2024

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Document Review Sheet:

Project: West Bergholt Community Hub and Office

Client: West Bergholt Parish Council

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Signature: 

Date: 03/05/2024

Document Status: Final

Revision: -

Design Codes: Building Regulations Part A, BS5268, BS5628, BS5950, BS6399, BS8004, BS8110

Drawings Referenced: Mclean Architecture drawings.

Notes: -

1. Introduction

1.1. Morgan Engineering Consultants Ltd has been instructed by the client to undertake the structural design for the proposed;

- Single-storey extension.

1.2. The general building materials are; concrete foundations, concrete ground floor, timber roof and masonry load-bearing walls.

1.3. Vertical loads are transferred from the roof into the load-bearing walls and down into the foundations.

1.4. Horizontal loads are transferred by diaphragm action of the roof transferring the horizontal load into the load-bearing masonry walls and down into the foundations.

2. Loadings (BS6399)

2.1. General Loads

	Dead Load (kN/m2)	Live Load (kN/m2)
Roof	1.25	0.85
Ground Floor	5.00	2.50
Internal blockwork	2.50	0.00
External Cavity wall	4.50	0.00

3. General Notes

3.1. Do not scale drawings. The Contractor is to check all dimensions on site before carrying out any work.

3.2. This specification together with the Structural Engineer's drawings are to be read in conjunction with Architect's and all other Consultant's drawings and specifications, which should be used to verify layout, setting out, finishes etc. Any discrepancies are to be reported to the Architect before proceeding with the works.

3.3. The Contractor must ensure that the Architect has agreed all necessary party wall notices prior to carrying out works under, on or adjacent to the party wall.

3.4. The Contractor must ensure all Planning, Grade listed & Building Control Approvals are in place prior to carrying out the works.

3.5. Setting out details are shown on the Architect's drawings unless noted otherwise on the drawings.

3.6. All setting-out dimensions are to be confirmed on-site by the contractor.

3.7. The Contractor is to inform the Architect and Structural Engineer if the existing fabric, including foundations, is opened up and found to be inadequate, unsuitable to support the proposed works, or at variance from the details shown on the drawings.

3.8. Items noted on the drawings "to be confirmed on-site" are to be exposed by the Contractor for inspection by the Structural Engineer at the earliest opportunity.

3.9. Holes or chases must not be cut through any structural members without the written consent of the Structural Engineer.

3.10. Nothing included or omitted from this outline specification will relieve the Contractor of his duty to carry out the works in accordance with current standards of safety and good building practice.

3.11. All finishes DPC, DPM, Waterproofing, Insulations etc. are to be specified by other consultants and are to meet Building Regulation Standards as a minimum.

3.12. All materials and workmanship are to be to Approved Document 7 & the standards set out within.

3.13. The contractor is to implement all standards set out within the Building Regulations Documents (lateral restraint straps, tying etc) as part of the general build.

3.14. All lengths in the calculations are structural opening sizes. Full length of beams, columns, joists etc are to be confirmed on site by the contractor.

4. Calculations

4.1. Item 1 – L1

L = 5200mm

Loading

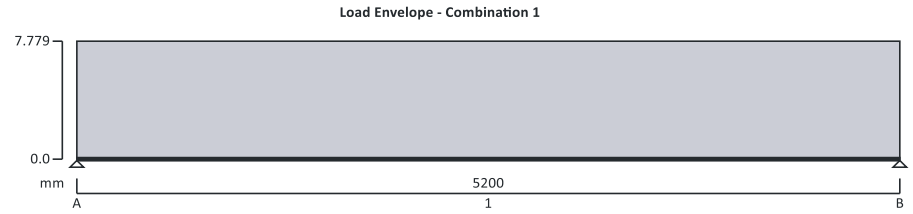
UDL					
ITEM	DL	IL	WIDTH	DL UDL	IL UDL
ROOF	1.25	0.85	2.40	3.00	2.04
FIRST FLOOR	0.75	2.00	0.00	0.00	0.00
GROUND	5.00	2.50	0.00	0.00	0.00
WALL	4.50	0.00	0.00	0.00	0.00
TOTAL UDL SLS kN/m				3.00	2.04

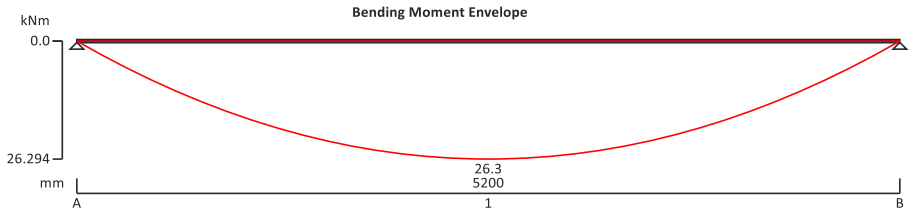
: USE 152X152X23UC + 10mm S275 BOTTOM PLATE

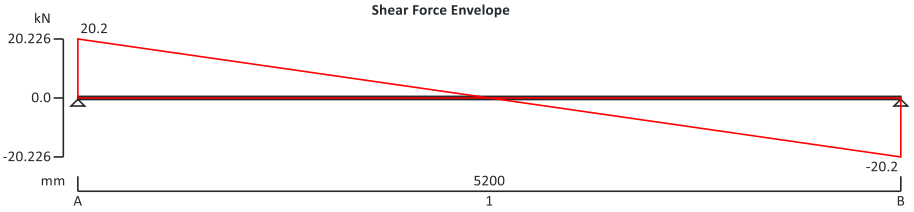
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07







Support conditions

Support A	Vertically restrained	
	Rotationally free	
Support B	Vertically restrained	
	Rotationally free	

Applied loading

Beam loads	Dead self weight of beam × 1	
	Dead full UDL 3 kN/m	
	Imposed full UDL 2.04 kN/m	

Load combinations

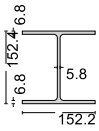
Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **26.3** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **20.2** kN	V_{min} = **-20.2** kN
Deflection	δ_{max} = **19.6** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **20.2** kN	R_{A_min} = **20.2** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **8.4** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **5.3** kN	
Maximum reaction at support B	R_{B_max} = **20.2** kN	R_{B_min} = **20.2** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **8.4** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **5.3** kN	

Section details

Section type	**UC 152x152x23 (British Steel Section Range 2022**
(BS4-1))	
Steel grade	**S355**
From table 9: Design strength p_y	
Thickness of element	max(T, t) = **6.8** mm
Design strength	p_y = **355** N/mm^2
Modulus of elasticity	E = **205000** N/mm^2



Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis	K_x = **1.00**
Effective length factor in minor axis	K_y = **1.00**
Effective length factor for lateral-torsional buckling	$K_{LT.A}$ = **1.00**
	$K_{LT.B}$ = **1.00**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275\ N/mm^2 / p_y]}$ = **0.88**

Internal compression parts - Table 11

Depth of section	d = **123.6** mm	
	$d / t = 24.2 \times \varepsilon <= 80 \times \varepsilon$	Class 1 plastic

Outstand flanges - Table 11

Width of section	b = B / 2 = **76.1** mm	
	$b / T = 12.7 \times \varepsilon <= 15 \times \varepsilon$	Class 3 semi-compact

Section is class 3 semi-compact

Shear capacity - Section 4.2.3

Design shear force	$F_v = max(abs(V_{max}), abs(V_{min}))$ = **20.2** kN
	$d / t < 70 \times \varepsilon$
	Web does not need to be checked for shear buckling
Shear area	$A_v = t \times D$ = **884** mm^2
Design shear resistance	$P_v = 0.6 \times p_y \times A_v$ = **188.3** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment $M = max(abs(M_{s1\_max}), abs(M_{s1\_min}))$ = **26.3** kNm

Effective plastic modulus - Section 3.5.6

Limiting value for class 2 compact flange	$\beta_{2f} = 10 \times \varepsilon$ = **8.801**
Limiting value for class 3 semi-compact flange	$\beta_{3f} = 15 \times \varepsilon$ = **13.202**
Limiting value for class 2 compact web	$\beta_{2w} = 100 \times \varepsilon$ = **88.014**

Limiting value for class 3 semi-compact web $\beta_{3w} = 120 \times \varepsilon =$ **105.617**

Effective plastic modulus - cl.3.5.6.2

$S_{eff} = \min(Z_{xx} + (S_{xx} - Z_{xx}) \times \min([((\beta_{3w} / (d / t))^2 - 1) / ((\beta_{3w} / \beta_{2w})^2 - 1)], [(\beta_{3f} / (b / T) - 1) / (\beta_{3f} / \beta_{2f} - 1)]), S_{xx}) =$ **170473** mm^3

Moment capacity low shear - cl.4.2.5.2 $M_c = \min(p_y \times S_{eff}, 1.2 \times p_y \times Z_{xx}) =$ **60.5** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling $L_E = 1.0 \times L_{s1} =$ **5200** mm

Slenderness ratio $\lambda = L_E / r_{yy} =$ **140.620**

Equivalent slenderness - Section 4.3.6.7

Buckling parameter $u =$ **0.840**

Torsional index $x =$ **20.701**

Slenderness factor $v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25} =$ **0.742**

Ratio - cl.4.3.6.9 $\beta_W = S_{eff} / S_{xx} =$ **0.937**

Equivalent slenderness - cl.4.3.6.7 $\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]} =$ **84.731**

Limiting slenderness - Annex B.2.2 $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5} =$ **30.198**

$\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant $\alpha_{LT} =$ **7.0**

Perry factor $\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0) =$ **0.382**

Euler stress $p_E = \pi^2 \times E / \lambda_{LT}^2 =$ **281.8** N/mm^2

$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2 =$ **372.2** N/mm^2

Bending strength - Annex B.2.1 $p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5}) =$ **176** N/mm^2

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment $M_2 =$ **19.7** kNm

Moment at centre-line of segment $M_3 =$ **26.3** kNm

Moment at three quarter point of segment $M_4 =$ **19.7** kNm

Maximum moment in segment $M_{abs} =$ **26.3** kNm

Maximum moment governing buckling resistance $M_{LT} = M_{abs} =$ **26.3** kNm

Equivalent uniform moment factor for lateral-torsional buckling

$m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{abs}, 0.44) =$ **0.925**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment $M_b = p_b \times S_{eff} =$ **30** kNm

$M_b / m_{LT} =$ **32.4** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection $\delta_{lim} = L_{s1} / 250 =$ **20.8** mm

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **19.564** mm

PASS - Maximum deflection does not exceed deflection limit

4.2. Item 2 – L2

L = 1200mm

Loading

UDL					
ITEM	DL	IL	WIDTH	DL UDL	IL UDL
ROOF	1.25	0.85	2.40	3.00	2.04
FIRST FLOOR	0.75	2.00	0.00	0.00	0.00
GROUND	5.00	2.50	0.00	0.00	0.00
WALL	4.50	0.00	0.00	0.00	0.00
TOTAL UDL SLS kN/m				3.00	2.04

Working load = 1.2x1.1x5.04 = 6.65kN

:- USE CATNIC STANDARD DUTY CAVITY WALL LINTEL SWL = 15kN

4.3. Item 3 – SB1

L = 4800mm

Loading

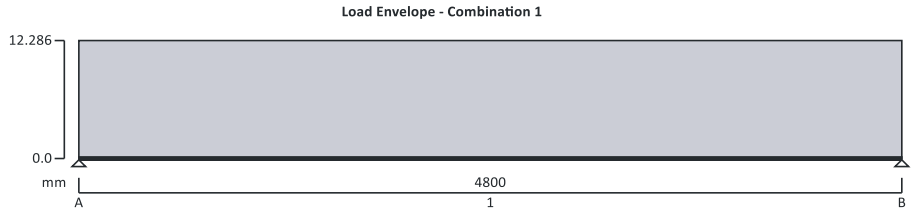
UDL					
ITEM	DL	IL	WIDTH	DL UDL	IL UDL
ROOF	1.25	0.85	2.40	3.00	2.04
FIRST FLOOR	0.75	2.00	0.00	0.00	0.00
GROUND	5.00	2.50	0.00	0.00	0.00
WALL	4.50	0.00	0.70	3.15	0.00
TOTAL UDL SLS kN/m				6.15	2.04

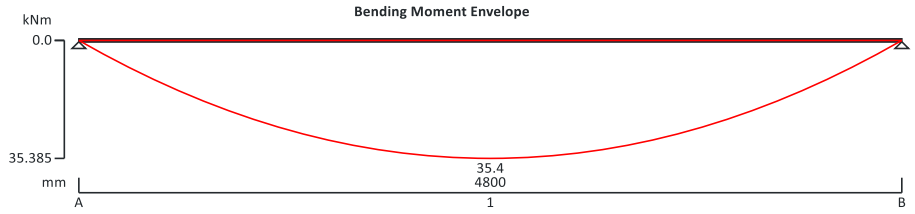
: USE 152X152X30UC + 10mm S275 TOP PLATE

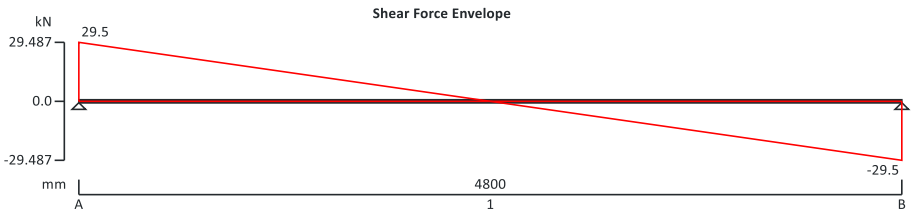
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07







Support conditions

Support A	Vertically restrained	
	Rotationally free	
Support B	Vertically restrained	
	Rotationally free	

Applied loading

Beam loads	Dead self weight of beam × 1	
	Dead full UDL 6.15 kN/m	
	Imposed full UDL 2.04 kN/m	

Load combinations

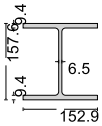
Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **35.4** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **29.5** kN	V_{min} = **-29.5** kN
Deflection	δ_{max} = **16.4** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **29.5** kN	R_{A_min} = **29.5** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **15.5** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **4.9** kN	
Maximum reaction at support B	R_{B_max} = **29.5** kN	R_{B_min} = **29.5** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **15.5** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **4.9** kN	

Section details

Section type	**UC 152x152x30 (British Steel Section Range 2022**
(BS4-1))	
Steel grade	**S355**
From table 9: Design strength p_y	
Thickness of element	max(T, t) = **9.4** mm
Design strength	p_y = **355** N/mm^2
Modulus of elasticity	E = **205000** N/mm^2



Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis	K_x = **1.00**
Effective length factor in minor axis	K_y = **1.00**
Effective length factor for lateral-torsional buckling	$K_{LT.A}$ = **1.00**
	$K_{LT.B}$ = **1.00**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275\ N/mm^2 / p_y]}$ = **0.88**

Internal compression parts - Table 11

Depth of section	d = **123.6** mm	
	$d / t = 21.6 \times \varepsilon <= 80 \times \varepsilon$	Class 1 plastic

Outstand flanges - Table 11

Width of section	b = B / 2 = **76.5** mm	
	$b / T = 9.2 \times \varepsilon <= 10 \times \varepsilon$	Class 2 compact

Section is class 2 compact

Shear capacity - Section 4.2.3

Design shear force	$F_v = max(abs(V_{max}), abs(V_{min}))$ = **29.5** kN
	$d / t < 70 \times \varepsilon$
	Web does not need to be checked for shear buckling
Shear area	$A_v = t \times D$ = **1024** mm^2
Design shear resistance	$P_v = 0.6 \times p_y \times A_v$ = **218.2** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment	$M = max(abs(M_{s1\_max}), abs(M_{s1\_min}))$ = **35.4** kNm
Moment capacity low shear - cl.4.2.5.2	$M_c = min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx})$ = **87.9** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling	$L_E = 1.0 \times L_{s1}$ = **4800** mm
Slenderness ratio	$\lambda = L_E / r_{yy}$ = **125.417**

Equivalent slenderness - Section 4.3.6.7

Buckling parameter	u = **0.849**
Torsional index	x = **15.999**
Slenderness factor	$v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25}$ = **0.704**
Ratio - cl.4.3.6.9	β_W = **1.000**
Equivalent slenderness - cl.4.3.6.7	$\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]}$ = **74.912**
Limiting slenderness - Annex B.2.2	$\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5}$ = **30.198**

$\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant	α_{LT} = **7.0**
Perry factor	$\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0)$ = **0.313**
Euler stress	$p_E = \pi^2 \times E / \lambda_{LT}^2$ = **360.5** N/mm^2
	$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2$ = **414.2** N/mm^2
Bending strength - Annex B.2.1	$p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5})$ = **205.5** N/mm^2

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment	M_2 = **26.5** kNm
Moment at centre-line of segment	M_3 = **35.4** kNm
Moment at three quarter point of segment	M_4 = **26.5** kNm
Maximum moment in segment	M_{abs} = **35.4** kNm
Maximum moment governing buckling resistance	$M_{LT} = M_{abs}$ = **35.4** kNm

Equivalent uniform moment factor for lateral-torsional buckling

$m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{abs}, 0.44)$ = **0.925**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment	$M_b = p_b \times S_{xx}$ = **50.9** kNm
	M_b / m_{LT} = **55** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection	$\delta_{lim} = L_{s1} / 250$ = **19.2** mm
Maximum deflection span 1	$\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min}))$ = **16.365** mm

PASS - Maximum deflection does not exceed deflection limit

4.4. Item 4 – FRJ1

L = 900mm

Loading

AREA		
ITEM	DL	IL
ROOF	1.25	0.85
kN/m2		

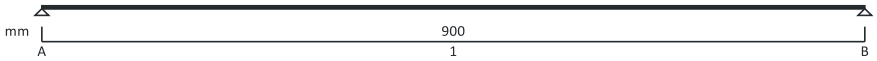
:-USE 47X100 @ 600mm CTRS

TIMBER JOIST DESIGN (BS5268-2:2002)

Tedds calculation version 1.1.04

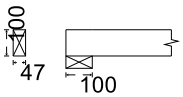
Joist details

Joist breadth	b = **47** mm
Joist depth	h = **100** mm
Joist spacing	s = **600** mm
Timber strength class	**C24**
Service class of timber	**1**



Span details

Number of spans	N_{span} = **1**
Length of bearing	L_b = **100** mm
Effective length of span	L_{s1} = **900** mm



Section properties

Second moment of area	I = b × h^3 / 12 = **3916667** mm^4
Section modulus	Z = b × h^2 / 6 = **78333** mm^3

Loading details

Joist self weight	$F_{swt} = b \times h \times \rho_{char} \times g_{acc} =$ **0.02** kN/m
Dead load	$F_{d\_udl} =$ **1.25** kN/m^2
Imposed UDL(Long term)	$F_{i\_udl} =$ **0.85** kN/m^2
Imposed point load (Medium term)	$F_{i\_pt} =$ **1.40** kN

Modification factors

Service class for bending parallel to grain	$K_{2m} =$ **1.00**
Service class for compression	$K_{2c} =$ **1.00**
Service class for shear parallel to grain	$K_{2s} =$ **1.00**
Service class for modulus of elasticity	$K_{2e} =$ **1.00**
Section depth factor	$K_7 =$ **1.13**
Load sharing factor	$K_8 =$ **1.10**

Consider long term loads

Load duration factor	$K_3 =$ **1.00**
Maximum bending moment	M = **0.129** kNm
Maximum shear force	V = **0.574** kN
Maximum support reaction	R = **0.574** kN
Maximum deflection	$\delta =$ **0.307** mm

Check bending stress

Bending stress	$\sigma_m =$ **7.500** N/mm^2
Permissible bending stress	$\sigma_{m\_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8 =$ **9.310** N/mm^2
Applied bending stress	$\sigma_{m\_max} = M / Z =$ **1.649** N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Shear stress	$\tau =$ **0.710** N/mm^2
Permissible shear stress	$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8 =$ **0.781** N/mm^2
Applied shear stress	$\tau_{max} = 3 \times V / (2 \times b \times h) =$ **0.183** N/mm^2

PASS - Applied shear stress within permissible limits

Check bearing stress

Compression perpendicular to grain (no wane)	$\sigma_{cp1} =$ **2.400** N/mm^2
Permissible bearing stress	$\sigma_{c\_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8 =$ **2.640** N/mm^2
Applied bearing stress	$\sigma_{c\_max} = R / (b \times L_b) =$ **0.122** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

Permissible deflection	$\delta_{adm} = \min(L_{s1} \times 0.003, 14\text{ mm}) =$ **2.700** mm
Bending deflection (based on E_{mean})	$\delta_{bending} =$ **0.258** mm
Shear deflection	$\delta_{shear} =$ **0.049** mm
Total deflection	$\delta = \delta_{bending} + \delta_{shear} =$ **0.307** mm

PASS - Actual deflection within permissible limits

Consider medium term loads

Load duration factor	$K_3 =$ **1.25**
Maximum bending moment	M = **0.393** kNm
Maximum shear force	V = **1.745** kN
Maximum support reaction	R = **1.745** kN

Maximum deflection	δ = **0.806** mm

Check bending stress

Bending stress	σ_m = **7.500** N/mm^2
Permissible bending stress	$\sigma_{m\_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8$ = **11.637** N/mm^2
Applied bending stress	σ_{m_max} = M / Z = **5.012** N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Shear stress	τ = **0.710** N/mm^2
Permissible shear stress	$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8$ = **0.976** N/mm^2
Applied shear stress	τ_{max} = 3 × V / (2 × b × h) = **0.557** N/mm^2

PASS - Applied shear stress within permissible limits

Check bearing stress

Compression perpendicular to grain (no wane)	σ_{cp1} = **2.400** N/mm^2
Permissible bearing stress	$\sigma_{c\_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8$ = **3.300** N/mm^2
Applied bearing stress	σ_{c_max} = R / (b × L_b) = **0.371** N/mm^2

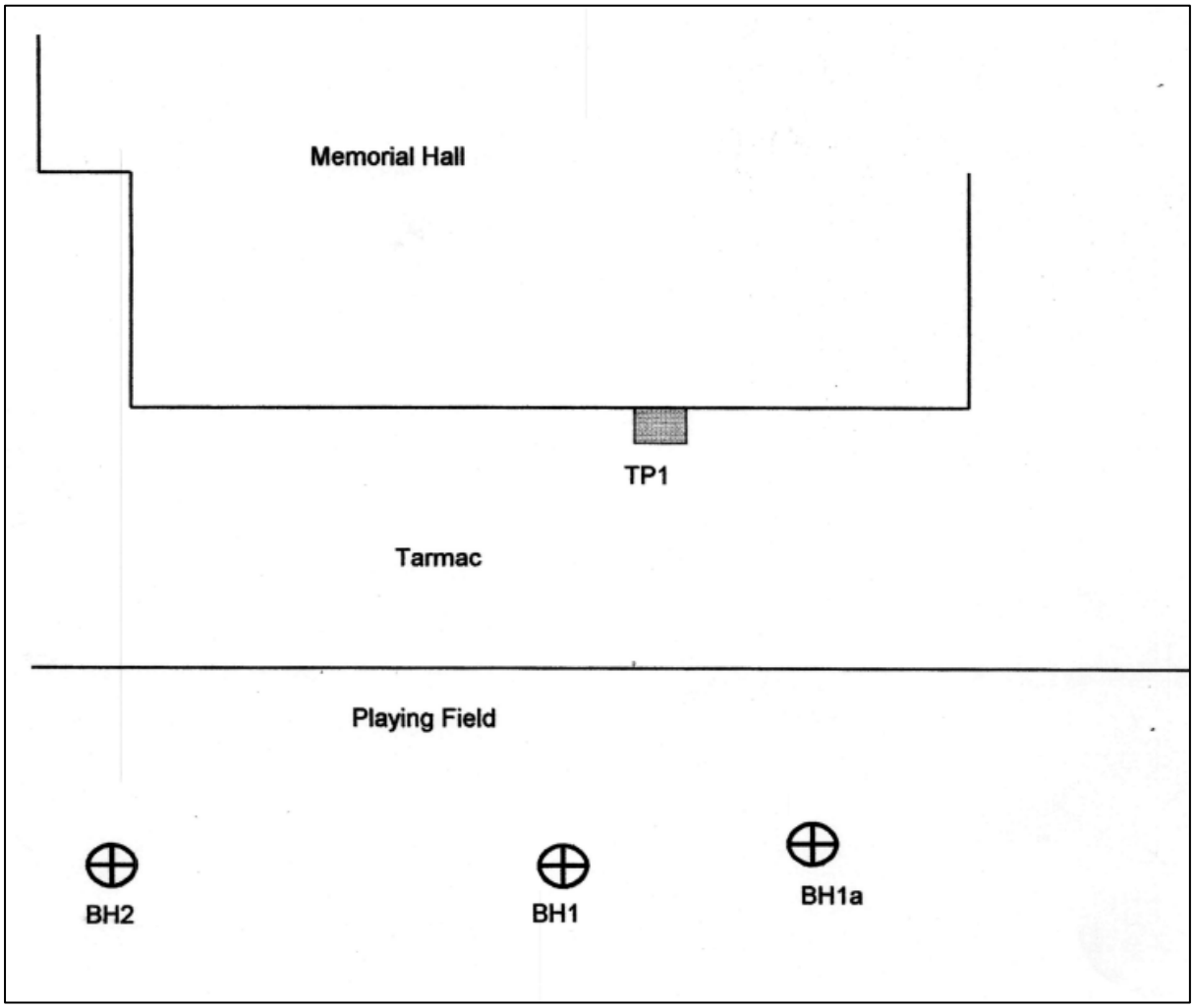
PASS - Applied bearing stress within permissible limits

Check deflection

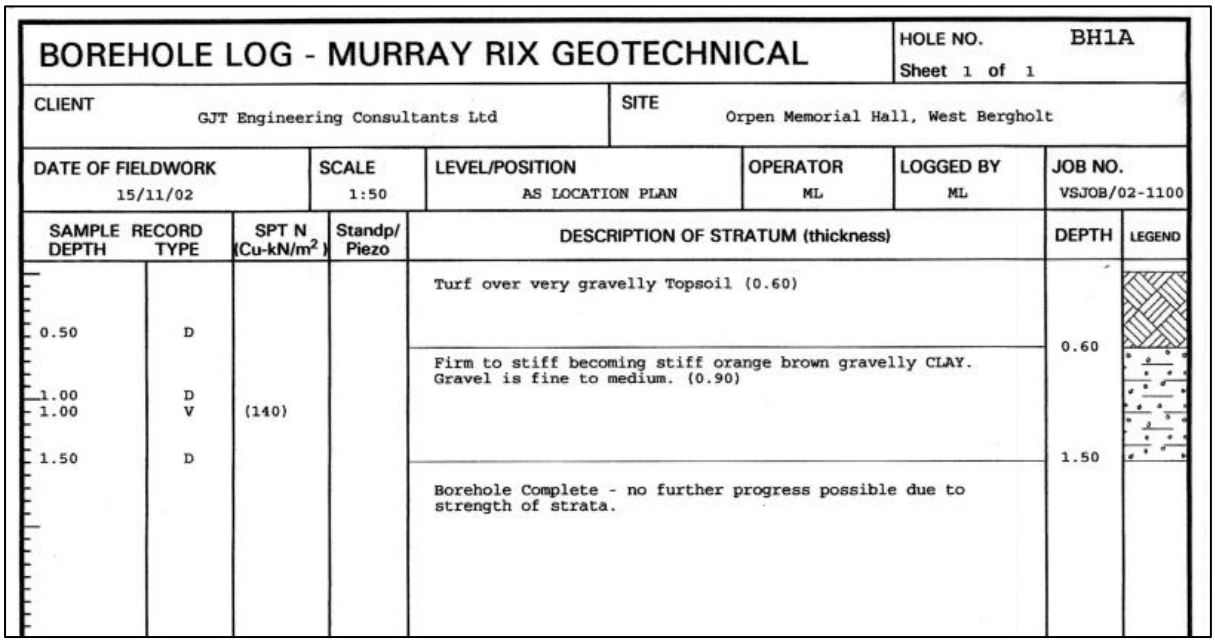
Permissible deflection	δ_{adm} = min(L_{s1} × 0.003, 14 mm) = **2.700** mm
Bending deflection (based on E_{mean})	$\delta_{bending}$ = **0.657** mm
Shear deflection	δ_{shear} = **0.148** mm
Total deflection	$\delta = \delta_{bending} + \delta_{shear}$ = **0.806** mm

PASS - Actual deflection within permissible limits

4.5. Item 5 – Foundations



Soil investigation was performed at 3 locations.



BOREHOLE LOG - MURRAY RIX GEOTECHNICAL

HOLE NO. BH1A
Sheet 1 of 1

CLIENT: GJT Engineering Consultants Ltd
SITE: Orpen Memorial Hall, West Bergholt

DATE OF FIELDWORK	SCALE	LEVEL/POSITION	OPERATOR	LOGGED BY	JOB NO.
15/11/02	1:50	AS LOCATION PLAN	ML	ML	VSJOB/02-1100

SAMPLE DEPTH	RECORD TYPE	SPT N (Cu-kN/m²)	Standp/ Piezo	DESCRIPTION OF STRATUM (thickness)	DEPTH	LEGEND
				Turf over very gravelly Topsoil (0.60)		
0.50	D				0.60	
				Firm to stiff becoming stiff orange brown gravelly CLAY. Gravel is fine to medium. (0.90)		
1.00	D					
1.00	V	(140)				
1.50	D				1.50	
				Borehole Complete - no further progress possible due to strength of strata.		

The borehole shows gravelly clay.

Prescriptive value: Allowable bearing pressure of 100kN/m2.

Loading

UDL					
ITEM	DL	IL	WIDTH	DL UDL	IL UDL
ROOF	1.25	0.85	2.40	3.00	2.04
FIRST FLOOR	0.75	2.00	0.00	0.00	0.00
GROUND	5.00	2.50	1.20	6.00	3.00
MASONRY WALL	4.50	0.00	3.70	16.65	0.00
TOTAL UDL SLS kN/m				25.65	5.04

Total SLS UDL = 30.69kN/m

Minimum width of foundation = 0.31m.

: USE 450mm WIDE GEN 3 CONCRETE FOUNDATION BEARING A MINIMUM OF 1.0m BELOW GROUND LEVEL INTO GRAVELLY CLAY WITH AN ALLOWABLE BEARING PRESSURE OF 100kN/m2.

!DUE TO THE PRESENCE OF CLAY, THE FINAL FOUNDATION DEPTH IS TO BE AGREED UPON WITH BUILDING CONTROL TAKING INTO ACCOUNT ENCOUNTERED GROUND CONDITIONS & LOCAL TREES!

4.6. Item 6 – B&B

:- USE A 150mm BEAM & BLOCK FLOOR WITH A 300mm VENTILATED VOID. THE BEAM AND BLOCK FLOOR IS TO BE DESIGNED BY THE MANUFACTURER TO BS8110, THE SPAN DIRECTIONS SHOWN & A DESIGN LOAD OF DL 2.00kN/m2 + SELF WEIGHT, IL 2.50kN/m2.

4.7. Item 7 – Padstones

PADSTONES					
BEAM	Ra ULS kN	LDS N/mm2	WIDTH (mm)	MIN LENGTH (mm)	BEARING REQUIREMENT
L1	20.20	1.50	100.00	134.67	215X65X100 ENGINEERING BRICK
SB1	29.50	1.50	100.00	196.67	215X65X100 ENGINEERING BRICK

4.8. Item 8 – Windpost

Height = 2700mm

Wind load = 0.75kN/m2

Load length = 1.60m

UDL = 1.20kN/m (SLS)

Total load = 3.24kN

: USE ANCON WP2 125X70X4 ANCON WINDPOST

Performance of WP2 Windposts to Eurocode 3

	Size a x b x t	2.5m	Total Uniform 3.0m
WP2	125x70x4	9.46	7.07
	140x70x4	12.28	9.25
	150x70x4	14.21	10.86
	130x70x6	15.83	11.93
	170x70x4	17.92	14.48
	160x70x5	20.33	15.94
	150x70x6	21.90	16.64
	170x70x5	22.75	18.29
	180x70x5	**24.76**	20.80
	150x80x8	**24.76**	22.59
	185x70x6	**24.76**	26.71
	170x80x8	**24.76**	**29.26**
	180x80x8	**24.76**	**29.26**

Note: *Table based on tie spacing of 225mm, no vertical movement joint ar*