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Structural Calculations

Project Reference	212600
Site	Cringleford Pavillion, Oakfields Road, Cringleford, Norwich, NR4 6XF.
Client	Cringleford Parish Council.
Project Overview	Calculations and details for structural elements in relation to proposed alterations.
Prepared By	Jack Powell BEng (Hons)
Checked By	Nigel Evans EngTech TIStructE
Revision History	January 2018 – First Issue

Design Information

Project Reference 212600 **Date** Jan 2019

Client	**Cringleford Parish Council.**
Project Address	**Cringleford Pavillion, Oakfields Road, Cringleford, Norwich, NR4 6XF.**
Project Description	**Calculations and details for structural elements in relation to proposed alterations.**

Intended Building Usage	Leisure

Subsoil Conditions	Assumed allowable ground bearing pressure of 100kN/m^2 TBC on site by L.A.B.C officer.	**S.I. Report by**	None

Specialist Design by Others	

Relevant British Standards, Codes of Practice and Design Standards Used In This Project			
BS 648:1964 - Weights of Materials	☒	**BS 5268 Pt 2:1996 -** Timber	☒
BS 6399 Pt 1:1996 - Building Loads	☒	**BS 5628 Pt 1: 1992 -** Masonry	☒
BS 6399 Pt 2:2002 - Wind Loading	☒	**Building Regs Approved Doc. A: 2004**	☒
BS 6399 Pt 3:1988 - Snow Loading	☒	**NHBC Standards**	☒
BS 5950 Pt 1:2000 - Steelwork	☒		☐
BS 8110 Pt 1:1997 - Concrete	☒		☐

CDM 2015 Design Considerations	**Principal Designer:**	Others

This design has been considered under CDM 2015 - to eliminate, reduce or control foreseeable risks that may arise during construction, and the maintenance and use of a building once it is built.

Risks - *Consider those difficult to manage, unusual, or not likely to be obvious to a suitably-experienced contractor or designer*

Area of Hazard	**Assessed** (Yes | No | N/A)	**Method of Hazard Elimination/Reduction**	**Residual Risk**	
			Risk	Significant
Access to work area	Yes	To be arranged by Client	☒	☐
Demolition	Yes	Removal of existing wall(s)	☒	☐
Services	Yes	Contractor to identify services prior to construction	☒	☐
Installation	Yes	Design elements as light as possible. Deliver elements as close as possible to installation point. Use mechanical plant for lifting were possible	☒	☐
Excavation	Yes	Contractor to provide all req'd shoring and propping	☒	☐
Sequencing	Yes	Contractor's choice	☒	☐
Falls from height	Yes	Contractor to provide scaffold, fall arrest and edge protection where required	☒	☐
Post-tensioning/ pre-tensioning	No		☐	☐
Materials	Yes	Contractor to adopt safe working practices. Wear PPE to prevent contact with hazardous materials.	☒	☐
Hotworks	No		☐	☐
Future Maintenance	No		☐	☐
Final Demolition	No		☐	☐

Does this project require a separate Designers Risk Assessment?	Yes	☐	No	☒

Project Reference	**212600**
Site	**Cringleford Pavillion, Oakfields Road, Cringleford, Norwich, NR4 6XF.**
Client	**Cringleford Parish Council.**

Design Statement

Canham Consulting have been appointed to provide structural calculations in relation to the proposed works at the above address.

The following calculations and details should be read in conjunction with the architectural drawings.

All dimensions within these calculations are for design purposes only. Accurate on-site measurements must be carried out prior to fabrication of any structural elements.

Within this calculation package are structural calculations for the proposed steel beams and posts required to form the proposed internal alterations.

Please refer to architectural drawings by SMG Charatered Architects and the following structural calculations and details.

Contents

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Loading Schedule

Vaulted Roof		
Composite panels =	0.25	
	0.25	
Roof Angle =	20	
Plan Dead =	**0.27**	**kN/m²**
Plan Live =	**0.60**	**kN/m²**

Vaulted Roof		
Composite panels =	0.50	
	0.50	
Roof Angle =	20	
Plan Dead =	**0.53**	**kN/m²**
Plan Live =	**0.60**	**kN/m²**

Internal Walls		
Plaster & Skim =	0.36	
100mm Blockwork =	1.50	
Plan Dead =	**1.86**	**kN/m²**

New Purlin

Asuume Grade: C24 $B := 75\ mm$ $D := 150\ mm$ Span $L := 3.00\ m$ Centres = $s := 0.4\ m$

Characteristic bending stress: $\sigma_b := 7.5\ \frac{N}{mm^2}$ Young's Modulus: $E := 7200\ \frac{N}{mm^2}$

Load duration factor: $K_3 := 1.25$

Depth factor: $K_7 := \left(\frac{300\ mm}{D}\right)^{0.11} = 1.08$

Therefore permissible bending stress: $\sigma_{adm} := \sigma_b \cdot K_3 \cdot K_7$ $\sigma_{adm} = 10.12\ \frac{N}{mm^2}$

Loading: Dead Loads Live Loads

Vaulted roof = $G_{k1} := 0.27\ \frac{kN}{m^2} \cdot \frac{2.25\ m}{2} = 0.30\ \frac{kN}{m}$ $Q_{k1} := 0.60\ \frac{kN}{m^2} \cdot \frac{2.25\ m}{2} = 0.68\ \frac{kN}{m}$

Total Dead Load = $G_k := G_{k1}$ $G_k = 0.30\ \frac{kN}{m}$

Total Live Load = $Q_k := Q_{k1}$ $Q_k = 0.68\ \frac{kN}{m}$

Service UDL = $w := (G_k + Q_k)$ $w = 0.98\ \frac{kN}{m}$

Check section for bending:

Moment = $M := \frac{w \cdot L^2}{8}$ $M = 1.10\ kN \cdot m$

Zxx Required: $Z_{xxreq} := \frac{M}{\sigma_{adm}}$ $Z_{xxreq} = 109\ cm^3$

Zxx Provided: $Z_{xxprov} := \frac{(B \cdot D^2)}{6}$ $Z_{xxprov} = 281\ cm^3$

Bending unity check: $U_b := \frac{Z_{xxreq}}{Z_{xxprov}} = 0.39$ < 1.0 Therefore OK

Check section for deflection:

Limiting Deflection = $\delta := \frac{L}{333}$ $\delta = 9.01\ mm$

Ixx Required: $I_{xxreq} := \frac{5 \cdot w \cdot L^4}{384 \cdot E \cdot \delta}$ $I_{xxreq} = 1591\ cm^4$

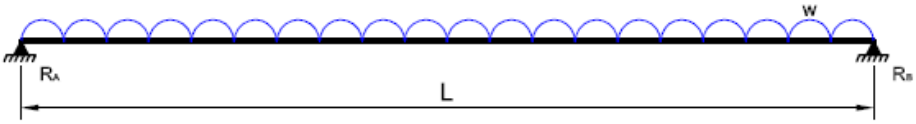
Ixx Provided: $I_{xxprov} := \frac{(B \cdot D^3)}{12}$ $I_{xxprov} = 2109\ cm^4$

Deflection unity check: $U_d := \frac{I_{xxreq}}{I_{xxprov}} = 0.75$ < 1.0 Therefore OK

$B = 75.00\ mm$ $D = 150.00\ mm$

Therefore provide minimum 75 x 150 C24 Purlins where required.

New Steel Beams.



Span of beam required = $L := 4.00\ m$

Loading: Dead Loads $[G_{k1}\ \dots] := [0\ \dots]\ \frac{kN}{m}$ Live Loads $[Q_{k1}\ \dots] := [0\ \dots]\ \frac{kN}{m}$

Vaulted roof = $G_{k1} := 0.27\ \frac{kN}{m^2} \cdot \frac{4.50\ m}{2} = 0.61\ \frac{kN}{m}$ $Q_{k1} := 0.75\ \frac{kN}{m^2} \cdot \frac{4.50\ m}{2} = 1.69\ \frac{kN}{m}$

Wall = $G_{k2} := 1.86\ \frac{kN}{m^2} \cdot 1.50\ m = 2.79\ \frac{kN}{m}$

S/W = $G_{k3} := 0.25\ \frac{kN}{m} = 0.25\ \frac{kN}{m}$

Total Dead Load = $G_k := [G_{k1}\ \dots]$ $G_k := \sum G_k$ $G_k = 3.65\ \frac{kN}{m}$

Total Live Load = $Q_k := [Q_{k1}\ \dots]$ $Q_k := \sum Q_k$ $Q_k = 1.69\ \frac{kN}{m}$

Ultimate UDL = $w_u := (G_k \cdot 1.4 + Q_k \cdot 1.6)$ $w_u = 7.81\ \frac{kN}{m}$

Service UDL = $w_s := (G_k + Q_k)$ $w_s = 5.34\ \frac{kN}{m}$

Check section for Bending:

Moment = $M := \frac{w_u \cdot L^2}{8}$ $M = 15.61\ kN \cdot m$

Check section for Deflection:

Young's Modulus = $E := 205000\ \frac{N}{mm^2}$

Limiting Deflection = $\delta := \frac{L}{500}$ $\delta = 8.00\ mm$

Ixx Required = $I_{xxreq} := \frac{5 \cdot w_s \cdot L^4}{384 \cdot E \cdot \delta}$ $I_{xxreq} = 1084\ cm^4$

From TATA Steel "Bluebook": 203x102x23 UB

Moment capacity = $M_c := 64.4\ kN \cdot m$

Depth of section = $D := 203\ mm$ Span to depth ratio = $\lambda := \frac{L}{D}$ $\lambda = 19.70$

Effective Length = $L_E := 1.4 \cdot L + 2 \cdot D$ $L_E = 6.01\ m$

Buckling capacity = $M_b := 18.08\ kN \cdot m$

Second Moment of Area = $I_{xx} := 2105\ cm^4$

Utilisation ratios:

Bending =	$M_c = 64.4\ kN \cdot m$	>	$M = 15.61\ kN \cdot m$	$U_b := \frac{M}{M_c} = 0.24$	< 1.0 Therefore OK
Buckling =	$M_b = 18.08\ kN \cdot m$	>	$M = 15.61\ kN \cdot m$	$U_b := \frac{M}{M_b} = 0.86$	< 1.0 Therefore OK
Deflection =	$I_{xx} = 2105\ cm^4$	>	$I_{xxreq} = 1084\ cm^4$	$U_d := \frac{I_{xxreq}}{I_{xx}} = 0.52$	< 1.0 Therefore OK

Therefore provide 203 x 102 x 23 UB

Reactions:

Ultimate:	$R1_{Auls} := \frac{w_u \cdot L}{2}$	$R1_{Auls} = 15.61\ kN$
Service:	$R1_{Asls} := \frac{w_s \cdot L}{2}$	$R1_{Asls} = 10.67\ kN$
Dead:	$R1_{AGk} := \frac{G_k \cdot L}{2}$	$R1_{AGk} = 7.30\ kN$
Live:	$R1_{AQk} := \frac{Q_k \cdot L}{2}$	$R1_{AQk} = 3.38\ kN$

Bearings on masonry wall.

Block Strength =		$f_k := 3.50\ \frac{N}{mm^2}$
Material Safety Factor =		$\gamma_m := 3.50$
Padstone size =	Length =	$b := 440\ mm$
	Width =	$d := 100\ mm$
Beam reaction =	$F := R1_{Auls} \cdot \frac{L + 2.5\ m}{L}$	$F = 25.37\ kN$
Allowable bearing stress =	$\sigma_p := 1.25 \cdot \frac{f_k}{\gamma_m}$	$\sigma_p = 1.25\ \frac{N}{mm^2}$
Applied Bearing Stress =	$\sigma_a := \frac{F}{b \cdot d}$	$\sigma_a = 0.58\ \frac{N}{mm^2}$

Therefore provide 440 x 100 x 215mm deep dense concrete block padstones.

Minimum 100mm end bearing.

Steel Posts

Height = $h := 3.0\ m$

Loading: Ultimate Loads $[P_{u1}\ \dots] := [0\ \dots]\ kN$ Service Loads $[P_{s1}\ \dots] := [0\ \dots]\ kN$

Beam reactions = $P_{u1} := R1_{Auls} = 15.61\ kN$ $P_{s1} := R1_{Asls} = 10.67\ kN$

Total Ultimate Load = $P_u := [P_{u1}\ \dots]$ $P_u := \sum P_u$ $P_u = 15.61\ kN$

Total Service Load = $P_s := [P_{s1}\ \dots]$ $P_s := \sum P_s$ $P_s = 10.67\ kN$

Wind = $w_s := 0.85\ \frac{kN}{m^2} \cdot \frac{4.50\ m}{2}$ $w_s = 1.91\ \frac{kN}{m}$

$w_u := w_s \cdot 1.4$ $w_u = 2.68\ \frac{kN}{m}$

Check section for Bending:

Load eccentricity = $e_x := 0.25\ m$

Moment = $M_x := e_x \cdot P_u + \frac{w_u \cdot h^2}{8}$ $M_x = 6.92\ kN \cdot m$

From TATA Steel "Bluebook": 100x100x4.0 SHS

Effective Height = $H_E := 1.0 \cdot h$ $H_E = 3.00\ m$

Axial capacity = $P_c := 375\ kN$

Moment capacity = $M_c := 19.3\ kN \cdot m$

Utilisation ratios:

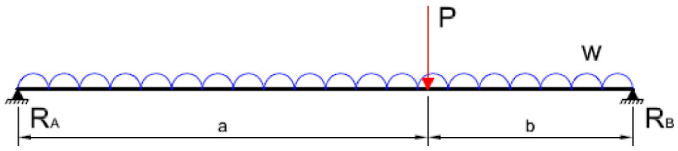
Axial =	$P_c = 375\ kN$	>	$P_u = 15.61\ kN$	$U_a := \frac{P_u}{P_c} = 0.04$	< 1.0 Therefore OK
Bending =	$M_c = 19.3\ kN \cdot m$	>	$M_x = 6.92\ kN \cdot m$	$U_b := \frac{M_x}{M_c} = 0.36$	< 1.0 Therefore OK
Combined =				$U_c := U_a + U_b = 0.40$	< 1.0 Therefore OK

Therefore provide 100 x 100 x 4.0 SHS Posts.

Reactions: Ultimate: $R2_{Auls} := P_u$ $R2_{Auls} = 15.61\ kN$

Service: $R2_{Asls} := P_s$ $R2_{Asls} = 10.67\ kN$

New Steel Beam over Serving Opening.



Span of beam required = $a := 2.50\ m$ $b := 0.50\ m$ $L := a + b = 3.00\ m$

Loading: Dead Loads $[G_{k1}\ \dots] := [0\ \dots]\ \frac{kN}{m}$ Live Loads $[Q_{k1}\ \dots] := [0\ \dots]\ \frac{kN}{m}$

w = Vaulted roof = $G_{k1} := 0.53\ \frac{kN}{m^2} \cdot \frac{3.50\ m}{2} = 0.93\ \frac{kN}{m}$ $Q_{k1} := 0.60\ \frac{kN}{m^2} \cdot \frac{3.50\ m}{2} = 1.05\ \frac{kN}{m}$

Wall = $G_{k2} := 3.98\ \frac{kN}{m^2} \cdot 0.50\ m = 1.99\ \frac{kN}{m}$

S/W = $G_{k3} := 0.25\ \frac{kN}{m} = 0.25\ \frac{kN}{m}$

Total Dead Load = $G_k := [G_{k1}\ \dots]$ $G_k := \sum G_k$ $G_k = 3.17\ \frac{kN}{m}$

Total Live Load = $Q_k := [Q_{k1}\ \dots]$ $Q_k := \sum Q_k$ $Q_k = 1.05\ \frac{kN}{m}$

Ultimate UDL = $w_u := (G_k \cdot 1.4 + Q_k \cdot 1.6)$ $w_u = 6.11\ \frac{kN}{m}$

Service UDL = $w_s := (G_k + Q_k)$ $w_s = 4.22\ \frac{kN}{m}$

w = Beam reactions =

Ultimate PL = $P_u := R1_{Auls}$ $P_u = 15.61\ kN$

Service PL = $P_s := R1_{Asls}$ $P_s = 10.67\ kN$

Check section for Bending:

Moment = $M := \frac{w_u \cdot L^2}{8} + \frac{P_u \cdot a \cdot b}{L}$ $M = 13.38\ kN \cdot m$

Check section for Deflection:

Young's Modulus = $E := 205000\ \frac{N}{mm^2}$

Limiting Deflection = $\delta := \frac{L}{500}$ $\delta = 6.00\ mm$

Ixx Required = $I_{xxreq} := \frac{5 \cdot w_s \cdot L^4}{384 \cdot E \cdot \delta} + \frac{P_s \cdot a \cdot b \cdot (L+b)}{27 \cdot E \cdot \delta \cdot L} \cdot \sqrt{3 \cdot a \cdot (L+b)}$ $I_{xxreq} = 602\ cm^4$

From TATA Steel "Bluebook": 178x102x19 UB

Moment capacity = $M_c := 47.0\ kN \cdot m$

Depth of section = $D := 178\ mm$ Span to depth ratio = $\lambda := \frac{L}{D}$ $\lambda = 16.85$

Effective Length = $L_E := 1.4 \cdot L + 2 \cdot D$ $L_E = 4.56\ m$

Buckling capacity = $M_b := 17.3\ kN \cdot m$

Second Moment of Area = $I_{xx} := 1356\ cm^4$

Utilisation ratios:

Bending =	$M_c = 47\ kN \cdot m$	>	$M = 13.38\ kN \cdot m$	$U_b := \frac{M}{M_c} = 0.28$	< 1.0 Therefore OK
Buckling =	$M_b = 17.3\ kN \cdot m$	>	$M = 13.38\ kN \cdot m$	$U_b := \frac{M}{M_b} = 0.77$	< 1.0 Therefore OK
Deflection =	$I_{xx} = 1356\ cm^4$	>	$I_{xxreq} = 602\ cm^4$	$U_d := \frac{I_{xxreq}}{I_{xx}} = 0.44$	< 1.0 Therefore OK

Therefore provide 178 x 102 x 19 UB

Reactions:

Ultimate: $R3_{Auls} := \frac{w_u \cdot L}{2} + \frac{P_u \cdot b}{L}$ $R3_{Auls} = 11.77\ kN$

Service: $R3_{Asls} := \frac{w_s \cdot L}{2} + \frac{P_s \cdot b}{L}$ $R3_{Asls} = 8.10\ kN$

Ultimate: $R3_{Buls} := \frac{w_u \cdot L}{2} + \frac{P_u \cdot a}{L}$ $R3_{Buls} = 22.18\ kN$

Service: $R3_{Bsls} := \frac{w_s \cdot L}{2} + \frac{P_s \cdot a}{L}$ $R3_{Bsls} = 15.22\ kN$

Bearings on masonry wall.

Block Strength = $f_k := 3.50\ \frac{N}{mm^2}$

Material Safety Factor = $\gamma_m := 3.50$

Padstone size = Length = $b := 215\ mm$

Width = $d := 100\ mm$

Beam reaction = $F := R3_{Buls}$ $F = 22.18\ kN$

Allowable bearing stress = $\sigma_p := 1.25 \cdot \frac{f_k}{\gamma_m}$ $\sigma_p = 1.25\ \frac{N}{mm^2}$

Applied Bearing Stress = $\sigma_a := \frac{F}{b \cdot d}$ $\sigma_a = 1.03\ \frac{N}{mm^2}$

Therefore provide 215 x 100 x 65mm deep engineering brick padstones,

Minimum 150mm end bearing.

project		project ref		
CRINGLEFORD PAVILLION OAKFIELDS ROAD NR4 6XF		212600		
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CRINGLEFORD PARISH COUNCIL		JP		01/19

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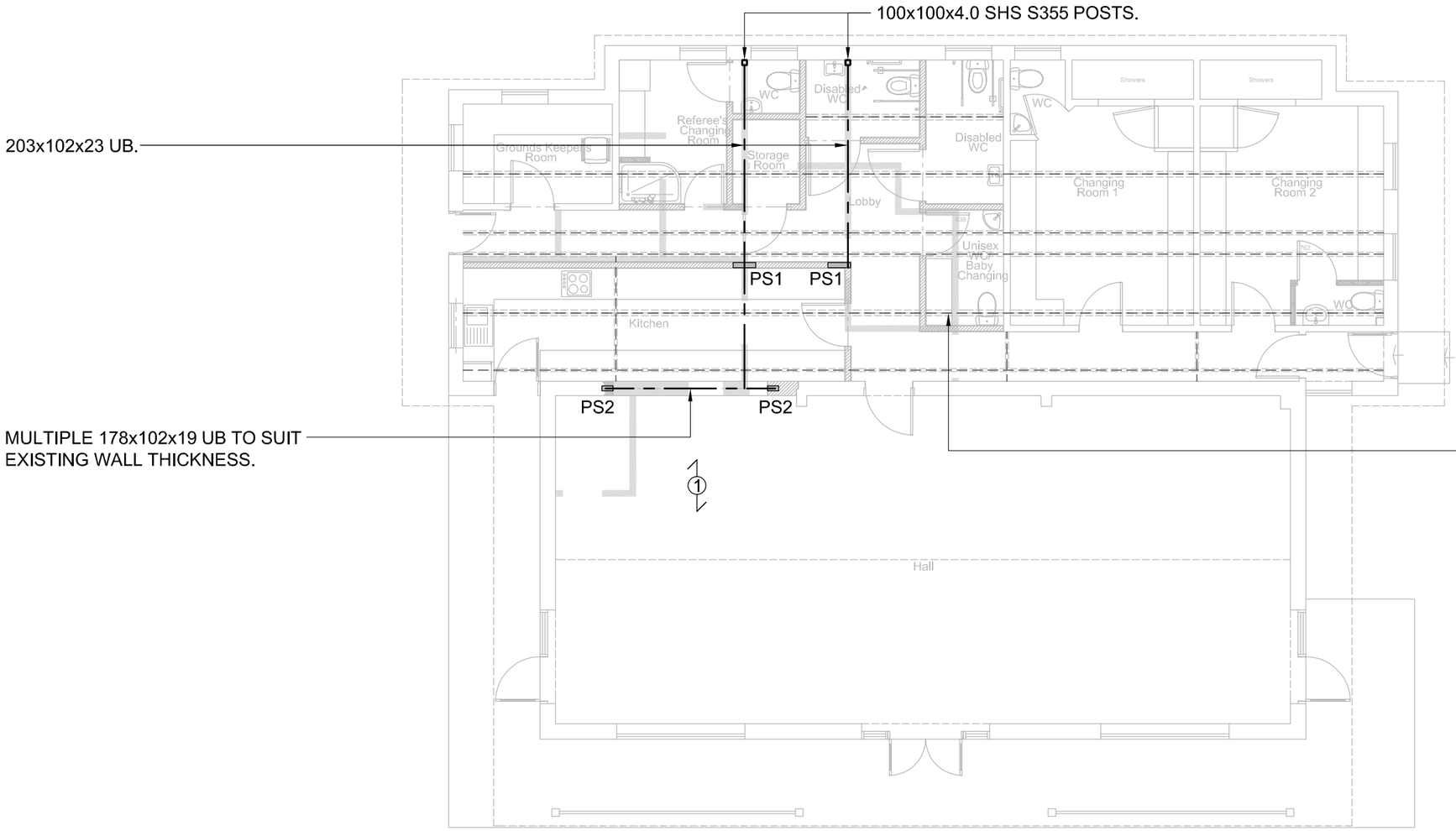
① ASSUMED SPAN DIRECTION OF EXISTING ROOF STRUCTURE.

PS1 440x100x215mm DEEP DENSE CONCRETE BLOCK PADSTONE, MIN. 100mm END BEARING.

PS2 215x100x65mm DEEP ENGINEERING BRICK PADSTONE, MIN. 150mm END BEARING.



PROPOSED GROUND FLOOR LAYOUT SHOWING STRUCTURE OVER.

SCALE 1:100

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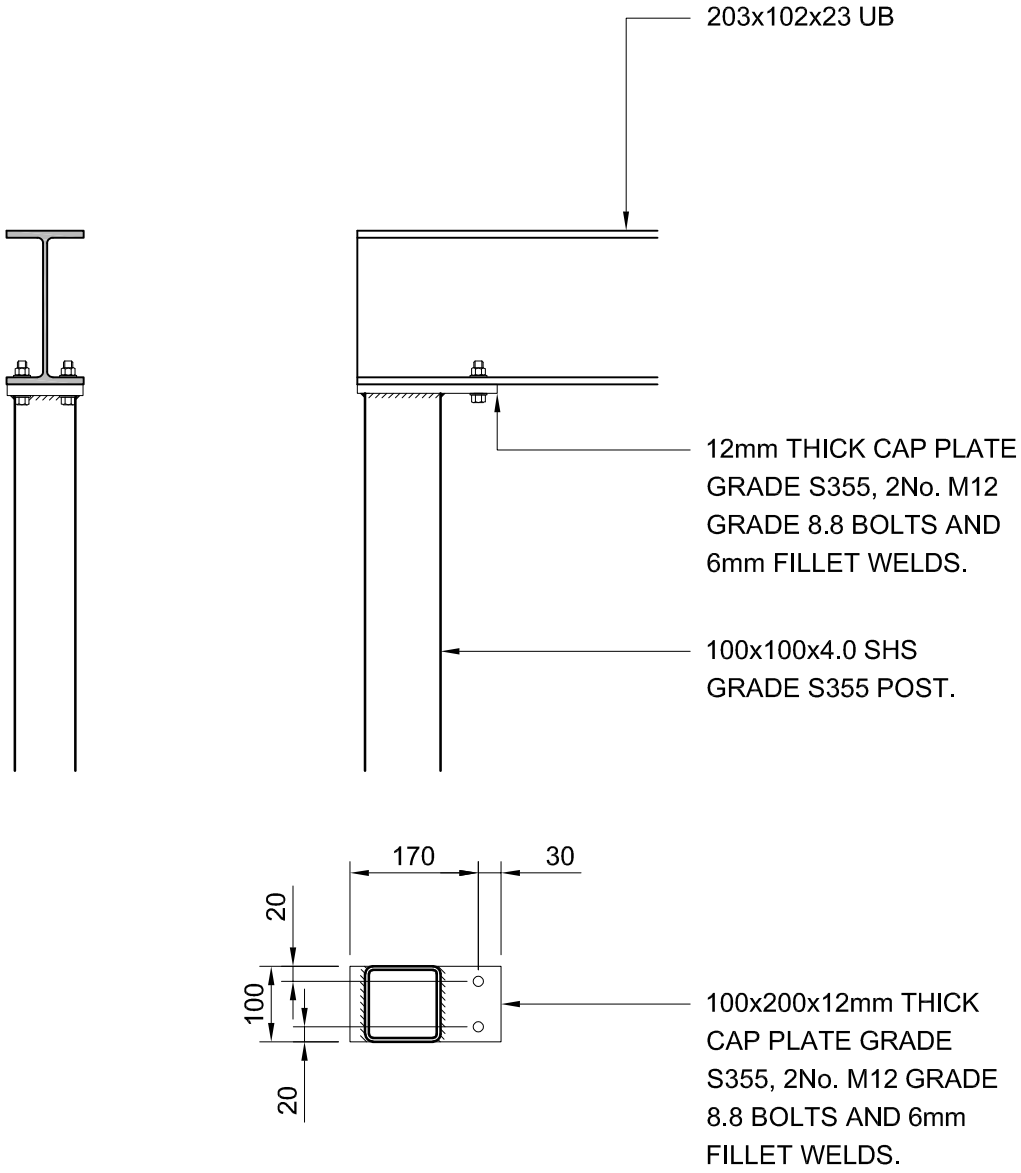

203x102x23 UB TO 100x100x4.0 SHS POST TOP CONNECTION DETAIL

SCALE 1:10

CCL CS 02.15

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project	project ref		
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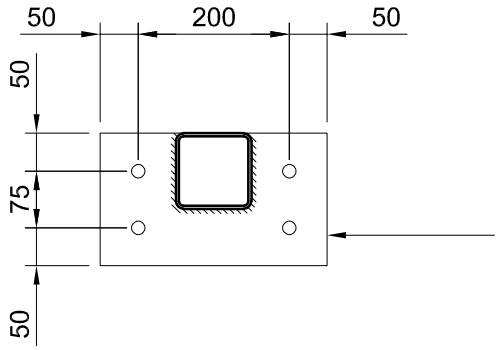
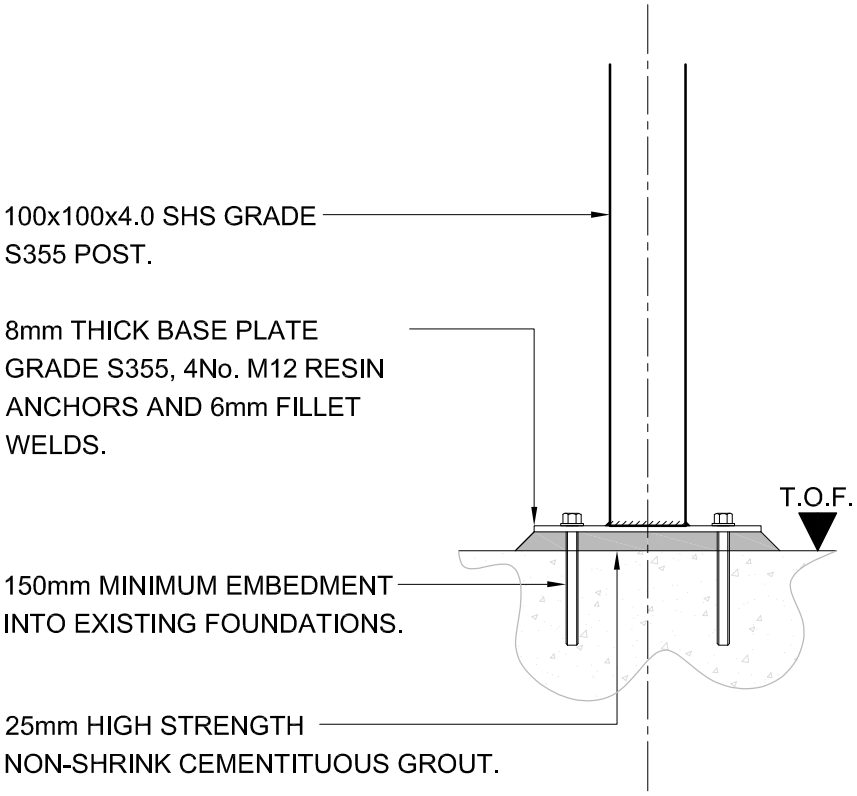


220x220x8mm THICK BASE PLATE GRADE S355, 4No. M12 RESIN ANCHORS AND 6mm FILLET WELDS.



100x100x4.0 SHS BASE PLATE DETAIL

SCALE 1:10

CCL CS 02.15

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Job Number: 212600

Job Title: Cringleford Pavillion

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The Building Regulations

Building Regulations apply to most new buildings and many alterations of existing buildings in England and Wales, whether for domestic, commercial and industrial use. Compliance is a legal requirement.

Unless specifically requested, we assume that the Lead Consultant, Contractor or Client will communicate and coordinate with Building Control or an Approved Inspector throughout the project. This will include the timely issue of information.

Planning Permission

Most projects will require Planning Permission.

Unless specifically requested, we assume that the Lead Consultant, Contractor or Client will communicate and coordinate with the Planning Authority.
There will be instances when we communicate with the Planning Officers, for example on projects which may be sensitive in terms of conservation. However, unless specifically stated the lead will be taken by others.

The Party Wall etc Act 1996

The Party Wall etc Act 1996 provides a framework for preventing and resolving disputes in relation to party walls, boundary walls and excavations near neighbouring buildings.

A building owner proposing to start work covered by the Act must give adjoining owners notice of their intentions in the way set down in the Act. Adjoining owners can agree or disagree with what is proposed. Where they disagree, the Act provides a mechanism for resolving disputes. The Act is separate from obtaining planning permission or building regulations approval.

Job Number: 212600

Job Title: Cringleford Pavillion

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The Construction (Design and Management) Regulations 2015

The CDM 2015 regulations set out what people involved in construction work need to do to protect themselves from harm and anyone the work affects, improving health and safety in the construction industry

The role of CDM Co-ordinator from CDM 2007 has been removed within CDM 2015 with those duties being placed on other members of the project team, namely the Client, Principal Contractor and the new role of the Principal Designer. In effect the structure of the new regulations has been simplified and introduces early participation and additional duties from the appointed professionals and client in respect to Health and Safety matters on construction projects.

Domestic clients not previously encompassed by CDM must also take on duties, although domestic clients may discharge their duties onto the contractor or agreeing with the designer that they coordinate and manage the project through the construction phase rather than the role automatically passing to the contractor.

Unless previously agreed, Canham Consulting will not as default undertake the role as Principal Designer.

Extract from CDM 2015 - Table 1: A summary of roles and duties under CDM Dutyholders*

Clients - are organisations or individuals for whom a construction project is carried out

Roles/Duties - Make suitable arrangements for managing a project. This includes making sure:
- other dutyholders are appointed;
- sufficient time and resources are allocated;

Making sure:
- relevant information is prepared and provided to other dutyholders;
- the principal designer and principal contractor carry out their duties;
- welfare facilities are provided.

Domestic clients - are people who have construction work carried out on their own home, or the home of a family member that is not done as part of a business, whether for profit or not

Domestic clients are in scope of CDM 2015, but their duties as a client are normally transferred to:
- the contractor, on a single contractor project; or;
- the principal contractor, on a project involving more than one contractor.

However, the domestic client can choose to have a written agreement with the principal designer to carry out the client duties.

Designers – are those, who as part of a business, prepare or modify designs for a building, product or system relating to construction work.

Roles/Duties - When preparing or modifying designs, to eliminate, reduce or control foreseeable risks that may arise during:
construction; and
the maintenance and use of a building once it is built.

Provide information to other members of the project team to help them fulfil their duties.

Job Number: 212600

Job Title: Cringleford Pavillion

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The Construction (Design and Management) Regulations 2015

Principal designers – are designers appointed by the client in projects involving more than one contractor. They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role.

Roles/Duties - Plan, manage, monitor and coordinate health and safety in the pre-construction phase of a project. This includes:
- identifying, eliminating or controlling foreseeable risks;
- ensuring designers carry out their duties;

Prepare and provide relevant information to other dutyholders;
Liaise with the principal contractor to help in the planning, management, monitoring and coordination of the construction phase.

Principal contractors – are contractors appointed by the client to coordinate the construction phase of a project where it involves more than one contractor

Roles/Duties - Plan, manage, monitor and coordinate the construction phase of a project. This includes:
- liaising with the client and principal designer;
- preparing the construction phase plan;
- organising cooperation between contractors and coordinating their work.

Ensure:
- suitable site inductions are provided;
- reasonable steps are taken to prevent unauthorised access;
- workers are consulted and engaged in securing their health and safety; and
- welfare facilities are provided

Contractors - Are those who do the actual construction work and can be either an individual or a company

Roles/Duties - Plan, manage and monitor construction work under their control so that it is carried out without risks to health and safety;

For projects involving more than one contractor, coordinate their activities with others in the project team – in particular, comply with directions given to them by the principal designer or principal contractor;

For single-contractor projects, prepare a construction phase plan.

Workers - Are the people who work for or under the control of contractors on a construction site

Roles/Duties - They must:
- be consulted about matters which affect their health, safety and welfare;
- take care of their own health and safety and others who may be affected by their actions;
- report anything they see which is likely to endanger either their own or others' health and safety;
- cooperate with their employer, fellow workers, contractors and other dutyholders

* Organisations or individuals can carry out the role of more than one dutyholder, provided they have the skills, knowledge, experience and (if an organisation) the organisational capability necessary to carry out those roles in a way that secures health and safety.

For more information on CDM 2015 please follow the link below
http://www.hse.gov.uk/construction/cdm/2015/index.htm

Job Number: 212600

Job Title: Cringleford Pavillion

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Design Assumptions

Most designs will carry a certain degree of assumptions. As designers we will ensure that these are reasonable assumptions and frequently ask that these assumptions are verified by the Contractor on site.

In the absence of information regarding ground conditions we will often make educated assumptions which must be verified on site. It is the Clients and Contractors responsibility to ensure that our recommendations concerning investigation and verification of our assumptions are followed through. A typical example of this is as follows:

> A modest residential project, incorporating an extension to an existing property. Our brief is to design a series of steel beams and supports. We will design the supports and foundation requirements, assuming a certain stratum. This is often stated as “assume medium dense / dense granular material with a net allowable bearing pressure of 100kN/m2 or greater, all to be confirmed by Contractor and Building Control on site, refer to Engineer for further information”.

Where ground investigations have been undertaken, it is imperative to note that any investigation will only determine the ground conditions at the very location investigated. Differing ground conditions can and do exist elsewhere on the site and no assurance can be given this that is not the case. We will, however, make reasonable design assumptions and design with a degree of robustness and redundancy to accommodate slight variations in ground conditions.

We will typically make certain assumptions regarding forms of construction and existing materials, which must be confirmed and verified on site. This is particularly relevant with existing buildings; assumptions can be made with regards to wall construction, floor span and depth and roof construction. It is not always feasible for us to visit the site prior to undertaking our design and as such we will state any assumption which must be verified on site by the Client and Contractor.

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1.0 General Notes

1.1 For setting out dimensions and general construction details see architectural drawings.

1.2 These calculations and any drawings therein must not be scaled and if in doubt ask.

1.3 Any construction or fabrication carried out prior to obtaining all necessary statutory and other approvals is done so at the risk of the contractor.

1.4 All contractors are to check all dimensions and levels on site prior to commencing any construction or fabrication.

1.5 These calculations are to be checked and read in conjunction with all relevant engineer's, architectural, service engineer's and any specialist's drawings, together with any relevant additional engineer's specification.

1.6 Where site information or adjoining building details are contrary to issued details then the engineer is to be informed immediately.

1.7 The contractor is to ensure the stability of each element and the stability of the overall construction until the construction is complete.

1.8 All designs, connections, workmanship and materials are to comply with the current building regulations and the latest relevant British Standard specification and codes of practice or otherwise be to the specific written approval of the engineer.

1.9 Where proprietary structural elements, fixings or admixtures are used they are to be used strictly in accordance with the manufacturer's recommendations and engineer's approval.

1.10 No structural members are to be cut, notched or jointed unless shown on the engineer's details.

1.11 Unless otherwise noted all connections of structural members including laps and anchorages of reinforcement shall be capable of mobilising the full structural capacity of the member.

1.12 No holes irrespective of size are to be formed in the primary structural members (beams, columns etc.).

2.0 Superstructure Notes

2.1 In addition to the following notes reference should be made to the health and safety plan and to the full engineer's specification, where issued, copies of which shall be kept on site.

2.2 Refer to architect's drawing for details of DPC's, DPM's, waterproofing and insulation.

2.3 All multiple timber members to be C16 grade, unless noted otherwise, and to be bolted together with M12 bolts through 51mm diameter toothed plate connectors at 600mm staggered centres.

2.4 All structural timber is to be tanalised or similar preservative treated. Where timbers are bolted together such shall be hot dipped galvanised bolts.

2.5 Unless specified otherwise, securely fix strutting or noggins between joists thus -
Joist span of 2.5m to 4.5m: One row at centre of span.
Joist span over 4.5m: Two rows equally spaced.

2.6 100 x 50mm C16 bearers, spanning over 3 no. joists, to be provided under hot water cylinders and bath feet.

2.7 Steel shall be blast or mechanically wire brushed and primed with zinc phosphate primer to a minimum dry film thickness of 75microns u.n.o. any damaged primer to be made good on site.

2.8 Refer to architect's drawings for fire protection to steelwork.

2.9 All padstones to be 450L x 100W x 225D unless noted otherwise.

2.10 All masonry mortar to be 1:1:6 mix (class iii) unless noted otherwise.

2.11 All cavity wall ties are to be stainless steel and to be positioned strictly in accordance with BS 5628 : Part 3: 1985.

2.12 Wall ties to cavity are to be generally positioned at 450mm centres vertically and at 750mm centres horizontally staggered. To be placed at 225mm centres vertically within 225mm of openings or movement joints. To be placed at maximum 450mm centres horizontally above and below horizontal restraints.

2.13 Masonry restraint straps are to be provided at floor, ceiling and roof level in accordance with Appendix C BS 5628: Part 1:1992.

2.14 Refer to architect's drawings for movement joint details.

2.15 Blockwork movement joints to be positioned strictly in accordance with manufacturer's recommendations.

2.16 The maximum weight of any block is not to exceed 20kg.

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3.0 Steel Notes

3.1 All structural steelwork including bolts cleats etc. to be supplied by the steelwork sub-contractor.

3.2 All structural steelwork to mild steel Grade S275 u.n.o.

3.3 All structural steelwork to be Execution Class EXC2 u.n.o.

3.4 All bolts to be minimum M16 bolts Grade 8.8. u.n.o.

3.5 All welds to be 6mm continuous fillet weld u.n.o.

3.6 All plates to be 10mm thick minimum u.n.o.

3.7 All bracing members to have a minimum of two bolt connections. All beams and stanchions to have a minimum of four bolt connection.

3.8 End connections to be designed by steelwork sub-contractor subject to the minima covered in notes 1 to 7 above and to meet the requirements of BS 5950. Copies of these calculations are to be submitted to Canham consulting Ltd for review.

3.9 Fabrication drawings to be sent to Canham Consulting Ltd for review prior to fabrication of structural steelwork.

3.10 The grouting in of the stanchion bases shall be carried out by the general contractor, using Conbextra GP non-shrink cementitious grout supplied by Fosroc Ltd or similar approved.

3.11 The steelwork sub-contractor shall be responsible for taking all necessary site measurements of the existing buildings when required, prior to fabrication to ensure the correct fit of the new works on site.

3.12 The steelwork sub-contractor shall be responsible for the stability of the structure during erection and shall provide any temporary bracing as necessary.

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6.0 Masonry Notes

6.1 All masonry work is to be in accordance with BS5628 Part 1:1992, BS5628 Part 3:2001 and BS8000 Part 3:2001.

6.2 Facing brickwork is to be in accordance with the architect's specification.

6.3 All bricks are to be fired-clay units in accordance with BS3921 and are to have a minimum compressive strength of 20.0N/mm2 the minimum strength requirement of the mortar to be used is type (iii)/M4.

6.4 All blocks are to be solid blocks in accordance with BS6073 Part 1:1981 the minimum compressive strength is to be 3.5N/mm2 u.n.o. Block density is to be a minimum of approximately 1400kg per cubic metre except in party walls where the minimum density is to be 1850kg per cubic metre. It is anticipated that the high strength blocks will have a density of approximately 2200kg per cubic metre. Where individual block weights would exceed 20kg for standard size blocks then midi type blocks are to be used. All blocks are to meet the requirements of the special category of manufacturing control. Mortar is to be type (iii)/M4 u.n.o. Cut blocks are to be saw cut or a proprietary block splitter is to be used.

6.5 All blockwork below DPC level is to have a minimum compressive strength of 7.0N/mm2 or equal to the strength of the wall above, whichever is the greater. All mortar to blockwork below DPC level is to be type (ii)/M6.

6.6 Wall ties to cavity walls are to be stainless steel type 2 ties in accordance with DD 140 Part 2:1987. Ties are to have a minimum of 50mm embedment in each leaf. All ties are to comply with Part E of the building regulations.

6.7 Wall ties to the ducts above eaves level are to be stainless steel ancon two-part ties with a minimum of 75mm of embedment in each leaf.

6.8 Wall ties to cavity are to be generally positioned at 450mm centres vertically and at 750mm centres horizontally staggered. To be placed at 225mm centres vertically within 225mm of openings or movement joints. To be placed at maximum 450mm centres horizontally above and below horizontal restraints.

6.9 Wall ties for collar jointed walls are to be Ancon type SPS 20x3mm and 150mm long stainless steel or similar approved. To be built into the bed joints at 450mm centres vertically and at 450mm centres horizontally staggered. To be placed at 225mm centres vertically within 225mm of openings or movement joints.

6.10 For details of cavity closures cavity trays and damp proof courses see architect's drawings.

6.11 All proprietary lintels are to be used in strict accordance with manufacturer's recommendations.

6.12 Lintels are to have a minimum 150mm end bearing on walls u.n.o.

6.13 Full masonry units are to be provided immediately below bearings and padstones.

6.14 All steel beams are to have full width bearings on the padstone u.n.o.

6.15 Specification for padstone concrete:
- concrete is to conform to BS8500-2 and BS206-1 .
- type RC 30 designated .
- maximum aggregate size 10mm consistence class tba by user.

6.0 Masonry Notes

6.16 Concrete padstones are to be cast in-situ unless agreed with engineers. Where pre-casting of padstones is permitted the padstones are to be bedded in type (i)/M12 mortar and the surrounding masonry built tight to the padstone. Padstones are to be positioned centrally beneath beams u.n.o. All beams are to have full width bearing on padstones u.n.o.

6.17 The depth of the padstone given in the padstone schedule is the minimum depth of concrete permitted. The depth of the padstones is to be increased as required such that the bottom of the padstone coincides with a bed joint in the masonry and bears on full un-cut masonry units.

6.18 For details of the wall finishes and plaster stops see architect's drawings.

6.19 Joint sealants in external facing brickwork are to be in accordance with architect's specification. Compressible joint filler board is to be compatible with the specified joint sealant system.

6.20 Compressible joint filler board to joints in masonry is to be a flexible closed cell polyethylene filler such as Aerofil 1 by WR Grace Ltd or equal approved.

6.21 Mortar test cubes are to be taken and tested in accordance with Appendix A of BS5628 Part 1:1992.

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