

8.20 STABLE BLOCK & CAFE - STRUCTURAL REPORT & DRAWINGS

THE MORTON PARTNERSHIP LTD.

CONSULTING CIVIL & STRUCTURAL ENGINEERS,
HISTORIC BUILDING SPECIALISTS
Old Timber Yard House, 55 The Timber Yard
Drysdale Street, London N1 6ND
Tel: 020 7324 7270 Fax: 020 7729 1196
email: london@themortonpartnership.co.uk
www.themortonpartnership.co.uk

**EXECUTIVE SUMMARY
STRUCTURAL STAGE 3 DRAFT REPORT
FOR PROPOSED WORKS
AT
MARBLE HILL HOUSE, LONDON**



Architect: English Heritage
Brooklands
24 Brooklands Ave
Cambridge, CB2 8BU

Prepared by: The Morton Partnership Ltd
Old Timber Yard House
55 The Timber Yard
Drysdale Street
London N1 6ND

Date: January 2017

Ref: 17549/JC/Stage 3 Exec Summary

Executive Summary

We have worked closely with the design team to develop our structural designs to RIBA Stage 3 for the proposed works at Marble Hill House. This summary Structural Stage 3 report describes the design principles for the proposed structural interventions at Marble House, for the new café at the stables, for the landscape works, and for drainage at the Sports Complex.

In developing our designs for the structural engineering aspects of the project, there are a number of issues that we have been and will continue to consider at each stage. These primarily are as follows:

- To minimise the impact on the Grade I Listed fabric;
- To maintain the existing load paths through the building where possible;
- To provide practical design solutions that can be sequenced and constructed in a safe manner.

The structural input to the principal areas of work are summarised as follows:

- New Café to the Stables;

The structural proposals being developed assume rebuilding of the existing brick boundary wall and using this to support the new monopitch café roof. If this wall is to be retained, extensive repair and some partial rebuilding will be required; the roof would then be supported on posts set back from the wall. Alternatively the wall could be rebuilt, with the retained bricks on a new deeper foundation; rebuilding would allow for the wall to support the café roof. The principal structure of the café will be supported on softwood timber bow trusses with a steel bars forming the bottom chord. This truss will be a feature of the dining area. Concealed steel plate connections will fix the elements of the timber at the joints of the truss. For the kitchen area of the café, the structure will be concealed; the roof will have principal steel beams and softwood rafters. A movement joint will be formed at the junction of the café structure and the rear wall of the stables. Following the CCTV drainage survey, it is recommended to replace the below ground drain runs within the courtyard as well as improve the ventilation to the drainage system.

Ground investigations have revealed ground bearing soil at a depth of 1.25m, however roots from the adjacent trees were encountered in the boreholes up to a depth of 2.5m. Thus the depth of the foundation should extend to a minimum of 2.5m to avoid disturbance from the root network of the retained trees. A varied foundation depth is not recommended because of the different soil strata encountered above and below 2.3m. We have allowed for a piled raft to reach the foundation depth required.

- Proposed access lift to Marble Hill House;

Preliminary information on the proposed access lift has been developed, it assumes a platform lift supported on a strengthened area of floor within the ground floor. The structural design will specify the trimming out of the first floor structure, the lateral restraint of the platform lift equipment and strengthening of the ground floor. At this stage we have assumed a solid floor below the ground floor, but at basement level there may be vaulting in this area. If vaulting is encountered below this area a new suspended structure is suggested to limit the impact on the brick vault. The platform lift will be set back from the adjacent walls to avoid the existing finishes. Lateral restraint is required at floor level; this will be provided by resin anchoring to the masonry. A steel packer will be provided to fill the gap between the new lift and the existing masonry, this will be concealed within the floor void.

- Landscape works to Marble Hill Park;

Our input mainly relates to providing foundation design of new landscape features such as play structures, fencing and gates, and also the design of minor retaining walls and paving sub bases. Ground investigations revealed firm clay at a depth of 1.25m suitable as ground bearing soil. Additionally we will be providing design input into the ground drainage to the playing field near the Thames. The existing Flood Risk Assessment from 2005 and further drain investigation will inform this design. Principally the scheme will involve new ground drains running to the existing sewer and outlet. The penstock that controls the flow of this outlet is likely to require repair. The condition of the river embankment is poor and its remediation is necessary to improve the ground drainage in this area, we suggest pursuing its repair with the Council as they are responsible for the embankment; we can advise further on this area as investigation progresses. Further investigations into the penstock and culvert conditions may be required as well as ground water monitoring.

- Sports Complex and Below Ground Drainage;

Investigation into the drainage for the Sports complex has commenced. Pressure jet cleaning of the drainage was also carried out. The majority of the below ground drainage is formed of cast iron pipes in good to fair condition. An allowance for replacement drainage should be allowed for where the drainage is disturbed near the nursery; at least 20m run is suggested. A number of manhole covers and manhole connections require replacement where they have corroded or been disturbed. Within the sports complex ventilation to waist drains is required, as well as replacement of the corroded drain covers.

Registered in England No. 2727193

THE MORTON PARTNERSHIP LTD.

CONSULTING CIVIL & STRUCTURAL ENGINEERS,
HISTORIC BUILDING SPECIALISTS

Old Timber Yard House, 55 The Timber Yard
Drysdale Street, London N1 6ND

Tel: 020 7324 7270 Fax: 020 7729 1196

email: london@themortonpartnership.co.uk

www.themortonpartnership.co.uk

**STAGE 3
STRUCTURAL SCHEME REPORT
FOR
MARBLE HILL HOUSE – STABLES CAFÉ
LONDON**



Client: English Heritage
Brooklands
24 Brooklands Ave
Cambridge, CB2 8BU

Prepared by: The Morton Partnership Ltd
Old Timber Yard House
55 The Timber Yard
Drysdale Street
London N1 6ND

Date: January 2017

Ref: JC/17549~srep Stage 3

CONTENTS:

- 1.0 Introduction**
- 2.0 Café Structure**
- 3.0 Brick Boundary Wall to Stables**
- 4.0 Junction of New Café and Existing Stables**
- 5.0 Below Ground Drainage**
- 6.0 Ground Investigations**

APPENDICES:

- A Structural Drawings**

1.0 Introduction

- 1.1 We have worked closely with the design team to develop our structural designs to RIBA Stage 3 for the proposed works to the Stables at Marble Hill House. The following report describes the design principles for the proposed café.
- 1.2 Provisions are subject to design development and further investigations. In particular, the decision on the boundary wall and its retention will affect the design of the café structure. As our designs develop, we will work closely with the design team to ensure the structural layouts and details are coordinated.
- 1.3 The structural proposals will be developed in accordance with Part A of the Building Regulations, and the structural design developed according to the relevant Eurocode design codes (EC1 Loading, EC3 Steel, EC5 Timber, EC2 Reinforced Concrete, EC6 Masonry).
- 1.4 The followings drawings produced by van Heyningen and Haward Architects have been referenced to produce this report:
- 533-L-100 Proposed-Ground Floor Plan
 - 533-L-200 Proposed-Section AA
 - 533-L-210 Proposed-Section BB
 - 533-L-220 Proposed-Section CC
 - 533-L-230 Proposed-Section DD
 - 533-L-240 Proposed-Section EE
- 1.5 The following reports were also used to inform this report:
- “HLF parks for people, First Round Application, Appendix 2, Feasibility Document”, prepared by vHH Architects, dated August 2015
- 1.6 We have prepared the following drawings to accompany this stage 3 report:
- 17549-01C Foundation and Ground Floor Level General Arrangement
 - 17549-02A Roof Level Arrangement
 - 17549-03A Sections

2.0 Café Structure

- 2.1 The main structure to the new café building roof will be supported by a softwood timber bow truss with steel circular hollow sections and steel tie bars forming the bottom chord of the truss. The steel tie bars will be connected with proprietary tension connectors by Ancon.
- 2.2 The top chord of the truss will extend past the post support and form a canopy over the external eating area. A surface applied preservative is suggested for the timber as it will be exposed externally. The softwood must be kiln dried to a moisture content of 12-16%.
- 2.3 Where the top chord of the truss is greater than 7.2m in length we have allowed for structural finger jointing to form a continuous length of timber to the specified length (7.5-8.4m). It may be possible to source kiln dried softwood in lengths greater than 7m from a supplier, but at this time we have allowed for finger jointing to be conservative with the pricing scheme.
- 2.4 Timber posts will support the truss adjacent to the glazed elevation. At the other end of the truss the new inner leaf of the brick boundary wall will support the truss with brick piers below each bearing point; we suggest steel spreader plates over the masonry.
- 2.5 Bracing for the framed structure will be provided by eaves beams, the roof diaphragm, and possibly steel cross bracing bars within selected bays of the timber frame.
- 2.6 The roof structure over the kitchen will be supported on steel beams, with intermediate softwood timber rafters forming the pitched plane of the roof. Intermediate steels will brace the principal steel beams. The steels will be supported on the adjacent load bearing masonry walls. A small steel moment frame is also required within the kitchen masonry wall, this will provide lateral restraint to the adjacent masonry wall.

- 2.7 The new brick boundary wall will require steel windposts within the cavity to increase the lateral stability. Proprietary windposts can be specified but standard steel sections with a galvanised surface treatment may be more economical. If standard steel sections are selected for the windposts the cavity must be a minimum 115mm in width.

3.0 Brick boundary wall to Stables

- 3.1 In the current scheme presented in the structural markup within Appendix A, the brick boundary wall will be rebuilt using salvaged bricks from the original wall for the outer skin. The piled raft will form the foundation of the rebuilt brick wall.
- 3.2 If the wall is to be retained, localised rebuilding will be required where the wall is severely bowed (an area approximately 5m in length); extensive masonry repairs throughout the length of the wall will also be required. If the wall is retained it will have implications for the principal structure for the café: the support of the bow truss will be on posts set back from the brick wall, and a cantilevered ground bearing slab will be required. Without underpinning, any new loading on the existing brick wall must be limited.
- 3.3 If additional loading on the existing brick boundary wall is required, underpinning of the wall foundations will be required. The underpinning work will of course require sequencing and structural details.
- 3.4 Root protection zones of adjacent trees conflict with the line of the brick boundary wall footing. This area of the wall will require careful hand digging. If roots are discovered in the footing pit, they will be carefully wrapped, and the footing cast around the root. Anti-heave measures are also suggested in this area.
- 3.5 Ground investigations revealed several different formations of the brick footing to the boundary wall and several different footing depths. This may indicate several eras of construction. The trial pits also revealed poor consolidation of the brickwork in some areas. This would require repair if the wall was retained.

4.0 Junction of new café and existing stables

- 4.1 Where the new café building meets the existing stable building, a movement joint will be formed to allow minor differential movement between the two structures. This will consist of sleeves to the wall ties of the masonry starter bars. Within the new ground bearing slab the joint adjacent to the existing stable wall will be filled with compressible filler to illuminate any thermal expansive forces.

5.0 Below Ground Drainage

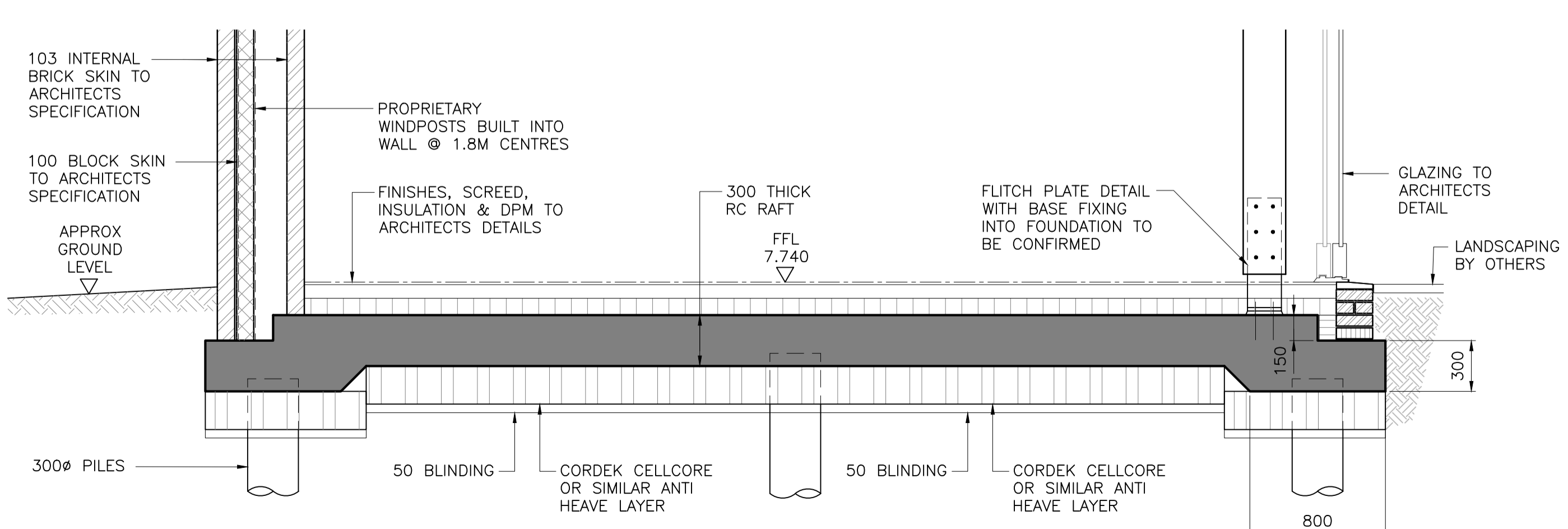
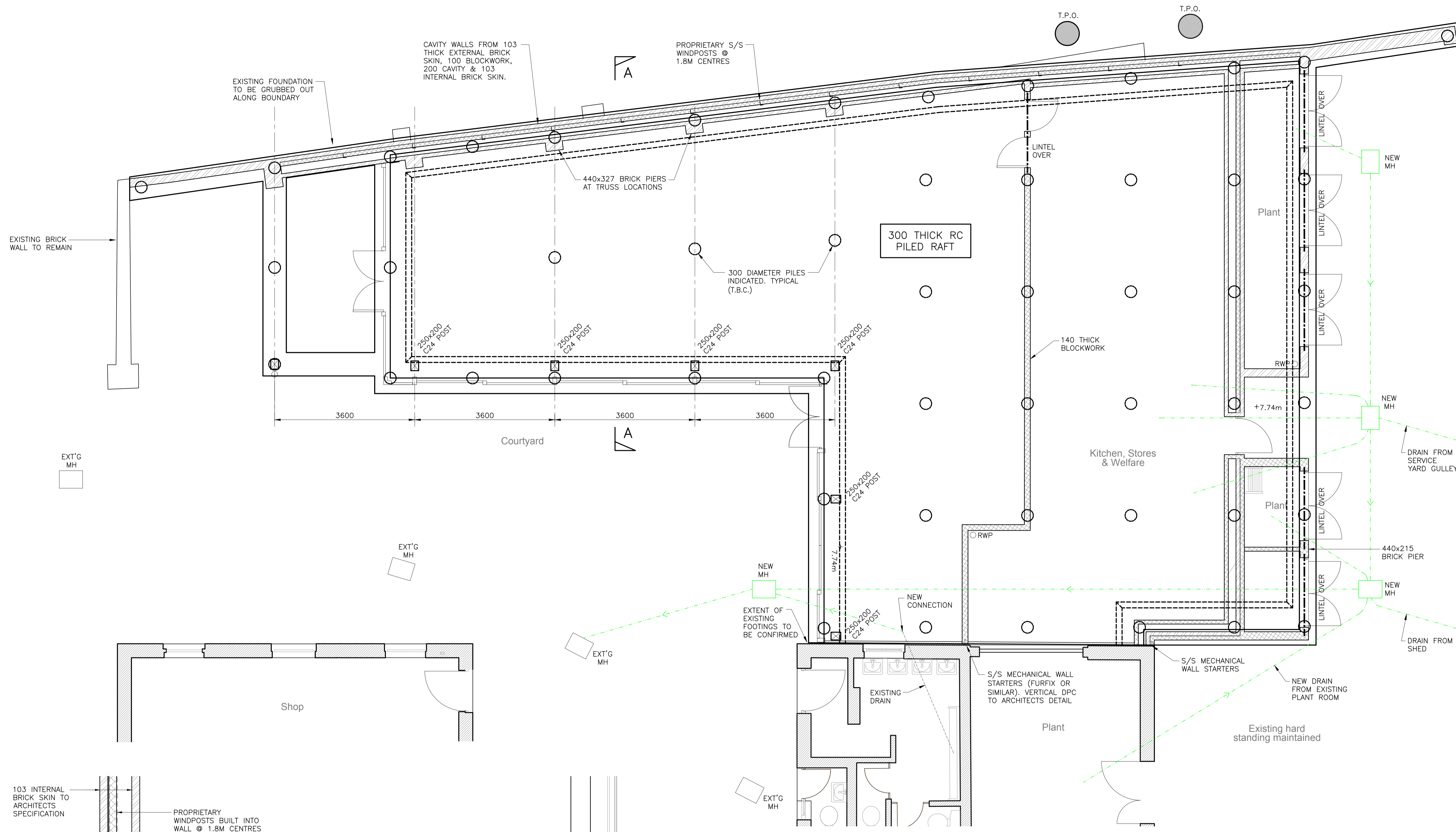
- 5.1 In mid-October, a CCTV survey and pressure jetting was carried out on the below ground drainage at the stables.
- 5.2 To the drainage runs within the courtyard, replacement is recommended as there are minor leaks and corrosion within the pipes and also excavation of this area is expected for works to replace the hardstanding.
- 5.3 Other recommended repairs of note include, replacement of a manhole cap within the ladies cloakroom (condition of the manhole itself was not investigated), improved ventilation to the system, and replacement of several manhole connection joints.
- 5.4 The replacement of 2No. manholes will be required as they fall within the footprint of the proposed café and internal chambers should be avoided.
- 5.5 A preliminary drawing for the new drainage runs has been prepared. The proposals call for a new drain run to serve the café, a new connection to the plant room and the men's WC, and a new run to serve a gulley within the service yard.

6.0 Ground Investigations

- 6.1 The ground investigations were carried out in the mid-November. The results of these investigations revealed London clay at a depth of 1.25m-1.5m. Tree roots were encountered in the borehole samples up to a depth of 2.5m. The geotechnical report suggests increasing the depth of the footings to a minimum of 2.5m to avoid disturbance from the large trees to be retained. A scheme with varying foundation depths is not recommended as there is a change in soil strata at different depths and this could lead to differential settlement. Thus a piled raft is suggested to support the boundary wall and the new café building.
- 6.2 The existing foundation to the rear of the stables was confirmed to be a shallow stepped brick footing 650-700mm in depth. This depth will allow sufficient depth for excavations adjacent to the footing to form the new café slab without undermining the stables footing.
- 6.3 The footing to the brick boundary wall varied in depth from 800-1000mm. All of the pits revealed a stepped brick footing but the width of the stepped footing varied.

APPENDIX A

Drawings



SECTION A-A

- NOTES
1. ALL DIMENSIONS TO BE CHECKED ON SITE AND NO MEASUREMENTS TO BE SCALED OFF THIS DRAWING.
 2. IN CASE OF ANY DISCREPANCY THE ENGINEERS ARE TO BE NOTIFIED IMMEDIATELY.
 3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND SERVICES ENGINEER'S DETAIL, DRAWINGS AND SPECIFICATIONS.

REV	AMENDMENT	CHK	DATE
C	DRAINAGE ADDED	JC	13.01.17
B	BUILDING REDUCED. REDRAWN	JC	12.01.17
A	FOUNDATIONS UPDATED	JC	09.01.17
-	PRELIMINARY ISSUE	JC	19.12.16
REV	AMENDMENT	CHK	DATE

THE MORTON PARTNERSHIP LTD.
CONSULTING CIVIL & STRUCTURAL ENGINEERS,
HISTORIC BUILDING SPECIALISTS.

OLD TIMBER YARD HOUSE
55 THE TIMBER YARD
DRYSDALE STREET
LONDON N1 6ND
TELEPHONE: 0207 324 7270 FAX: 0207 729 1196
EMAIL: london@themortonpartnership.co.uk

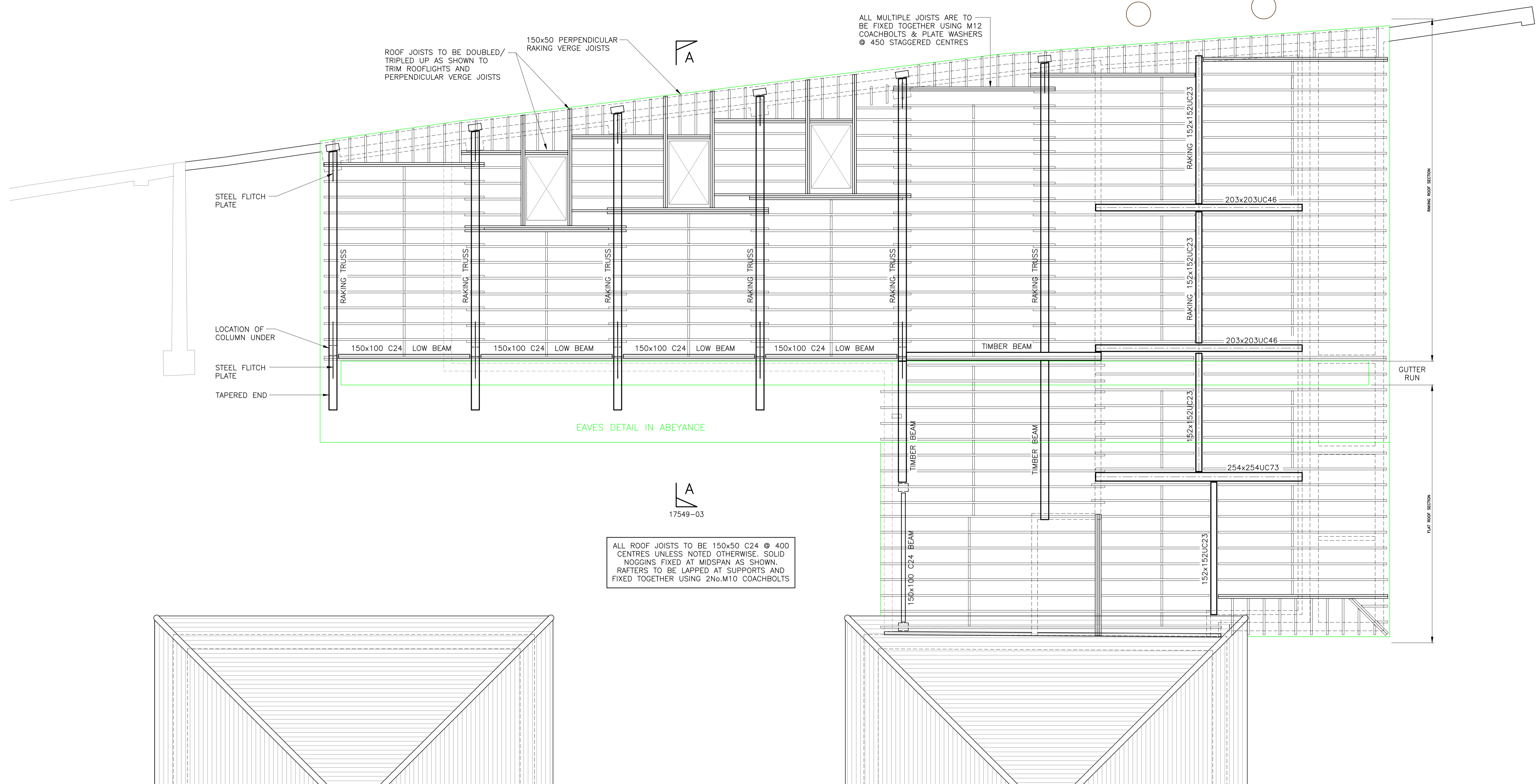
LEONARDO HOUSE
11 MARKET PLACE
HALESWORTH
SUFFOLK IP19 8BA
TELEPHONE: (01986) 875651 FAX: (01986) 875085
EMAIL: halesworth@themortonpartnership.co.uk

8 CHURCH STREET
COGGESHALL
ESSEX, COB 1TU
TELEPHONE: (01376) 563883 FAX: (01376) 563894
EMAIL: coggeshall@themortonpartnership.co.uk

**MARBLE HILL
STABLES CAFE
TWICKENHAM**

**FOUNDATION & GROUND
FLOOR LEVEL
GENERAL ARRANGEMENT**

SCALE: 1:50@A1 DRAWN BY: TC
DATE: DEC 16 CHECKED BY: JC
DRG No. 17549-01 C



A
17549-03

ALL ROOF JOISTS TO BE 150x50 C24 @ 400 CENTRES UNLESS NOTED OTHERWISE. SOLID NOGGINS FIXED AT MIDSPAN AS SHOWN. RAFTERS TO BE LAPPED AT SUPPORTS AND FIXED TOGETHER USING 2No.M10 COACHBOLTS

- NOTES
1. ALL DIMENSIONS TO BE CHECKED ON SITE AND NO MEASUREMENTS TO BE SCALED OFF THIS DRAWING.
 2. IN CASE OF ANY DISCREPANCY THE ENGINEERS ARE TO BE NOTIFIED IMMEDIATELY.
 3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND SERVICES ENGINEER'S DETAIL, DRAWINGS AND SPECIFICATIONS.

REV	AMENDMENT	CHK	DATE
A	UPDATED	JC	17.01.17
-	PRELIMINARY ISSUE	JC	19.12.16
REV	AMENDMENT	CHK	DATE

THE MORTON PARTNERSHIP LTD.

CONSULTING CIVIL & STRUCTURAL ENGINEERS.
HISTORIC BUILDING SPECIALISTS.
OLD TIMBER YARD HOUSE
55 THE TIMBER YARD
DRYSDALE STREET
LONDON N1 6ND
TELEPHONE: 0207 324 7270 FAX: 0207 729 1196
EMAIL: london@themortonpartnership.co.uk

LEONARDO HOUSE
11 MARKET PLACE
HALESWORTH
SUFFOLK IP19 8BA
TELEPHONE: (01986) 875651 FAX:(01986) 875085
EMAIL: halesworth@themortonpartnership.co.uk

8 CHURCH STREET
COGGESHALL
ESSEX COB 1TU
TELEPHONE: (01376) 563883 FAX:(01376) 563894
EMAIL: coggeshall@themortonpartnership.co.uk

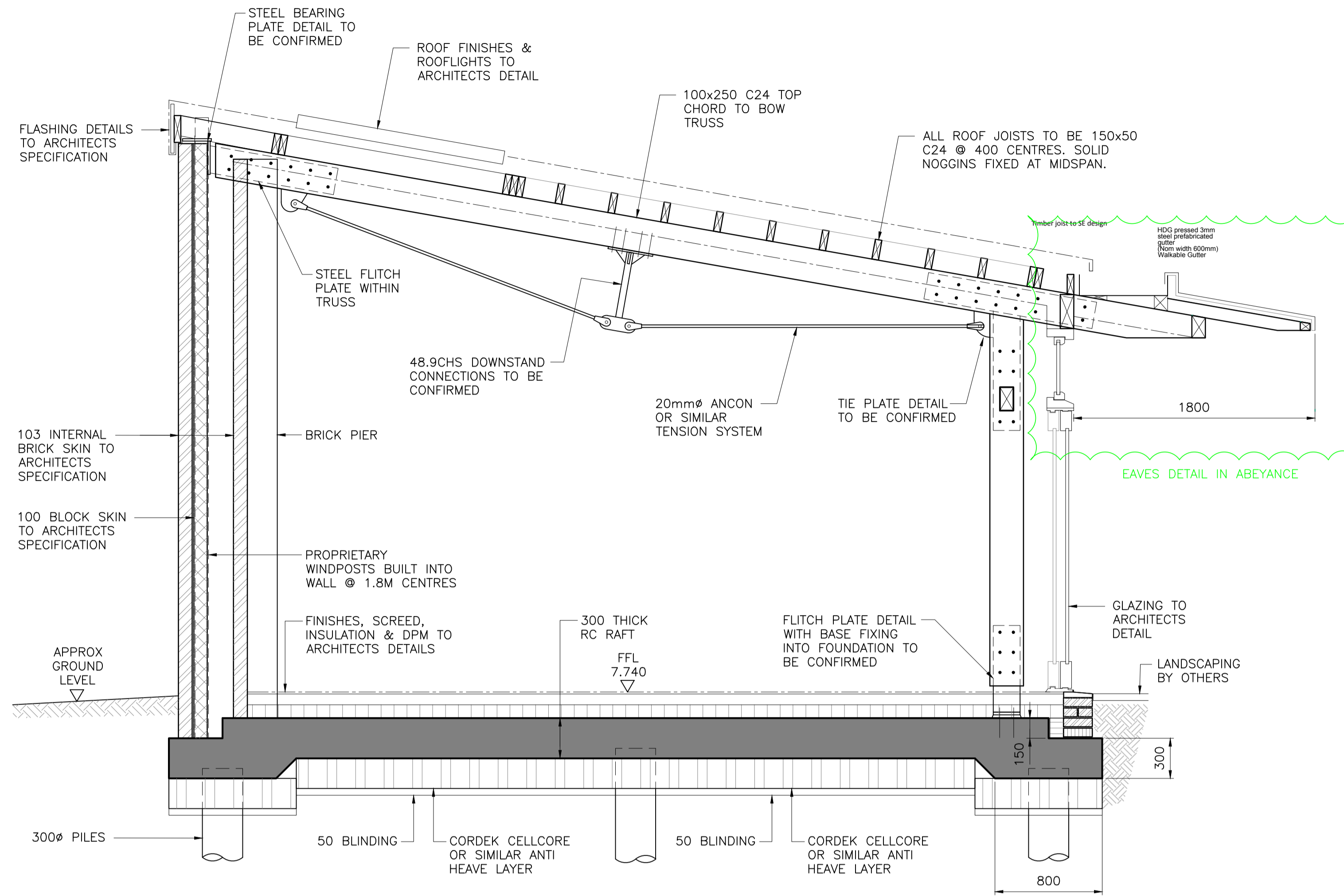
MARBLE HILL
STABLES CAFE
TWICKENHAM
ROOF LEVEL
GENERAL ARRANGEMENT

SCALE: 1:50@A1 DRAWN BY: TC

DATE: DEC 16 CHECKED BY: JC

DRG No.

17549-02 A



SECTION A-A

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE AND NO MEASUREMENTS TO BE SCALED OFF THIS DRAWING.
2. IN CASE OF ANY DISCREPANCY THE ENGINEERS ARE TO BE NOTIFIED IMMEDIATELY.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND SERVICES ENGINEER'S DETAIL, DRAWINGS AND SPECIFICATIONS.

REV	AMENDMENT	CHK	DATE
A	UPDATED	JC	17.01.17
-	PRELIMINARY ISSUE	JC	19.12.16
REV	AMENDMENT	CHK	DATE

THE MORTON PARTNERSHIP LTD.
CONSULTING CIVIL & STRUCTURAL ENGINEERS.
HISTORIC BUILDING SPECIALISTS.
OLD TIMBER YARD HOUSE
55 THE TIMBER YARD
DRYSDALE STREET
LONDON N1 6ND
TELEPHONE: 0207 324 7270 FAX: 0207 729 1196
EMAIL: london@themortonpartnership.co.uk

LEONARDO HOUSE
11 MARKET PLACE
HALESWORTH
SUFFOLK IP19 8BA
TELEPHONE: (01986) 875651 FAX:(01986) 875085
EMAIL: halesworth@themortonpartnership.co.uk

8 CHURCH STREET
COGGESHALL
ESSEX, COB 1TU
TELEPHONE: (01376) 563883 FAX:(01376) 563894
EMAIL: coggeshall@themortonpartnership.co.uk

**MARBLE HILL
STABLES CAFE
TWICKENHAM**

SECTIONS

SCALE: 1:25@A1 DRAWN BY: TC
DATE: DEC 16 CHECKED BY: JC
DRG No.
17549-03 A