

MIPA PAINTS
WAREHOUSE, HAVANT

Structural & Civil Engineering Employers Requirements

Prepared for
MIPA PAINTS

September 2018

Job No: S158024-01



Registered in England No. 5433208
Registered Office One West Smithfield London EC1A 9JL

116 High Street The French Quarter
Southampton SO14 2AA
Tel: 02380 235340 Fax: 02380 634294
consult@aksward.com www.aksward.com

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Revision	Amendments	Prepared By	Checked	Date
--	Draft	A Craig		19/02/16
A	For tender	A Craig	TF	24/03/16
B	Updated and Issued for Tender	RJS	RJS	05/09/18

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1.0 Introduction

AKS Ward has been appointed to provide structural and civil engineering consultancy services for the construction of a new warehouse building for MIPA Paint in Havant, Hampshire.

This document provides a description of the existing site and proposed structural and civil engineering works. The aim of the report is to:

- o Advise potential Design and Build Contractors of the Employer's Requirements for the new warehouse building.

This document is to be read in conjunction with the structural and civil engineering drawings and design information produced by the rest of the design team.

2.0 The Site

Appendix A contains a copy of the topographic survey and lists reports and documents that provide information regarding the site.

2.1 Location

The site is located within Leigh Park, approximately 2km north of Havant. The site is approximately 60 by 90 metres (1.3 hectares) in area and approximately rectangular on plan.



The site is within an existing industrial estate and is bounded by a river to the south and industrial units to the north, east and west. The industrial estate is set within a primarily residential area. Access to the site is via Fulflood Road in the north west corner of the site.

2.2 Historic Development

Refer to interpretive reports by Structural Soils Interpretive Report on Ground Investigation (Report No: 730438) and Soiltechnics Ground Investigation Report No: STN3739B-G01 for a more detailed consideration of the sites historical development.

In summary the Leigh Park area of Havant appears to have been an area of sparsely wooded grassland before being developed predominately for housing shortly after World War II. Construction started in the late 1940's and was fully completed in the early 1970's, although most construction was completed by 1960. Historic maps suggest the site had a sewage disposal works located on its western side during the 1950's before being developed for industrial use in the early 1960's. The factory and industrial units appear to have been demolished in the early to mid-1990's.

The site has remained without substantial development since this time. The planning records suggest the site has been more recently used for a coach storage and repair depot.

2.3 Existing Structures

The site has been cleared of substantial existing structures to ground level.

2.4 Topography

Refer to the topographic survey included in appendix A. The area of the development is generally flat. The southern edge of the site slopes sharply to the river approximately 4m lower.

2.5 Existing infrastructure

Refer to interpretive reports by Structural Soils Interpretive Report on Ground Investigation (Report No: 730438) and Soiltechnics Ground Investigation Report No: STN3739B-G01 for a more detailed consideration of the existing infrastructure on the site.

In summary the following infrastructure was noted

A tributary of the river Hermitage is immediately to the south.

The railway line, between Portsmouth and Chichester stations, is approximately 1750m to the south.

The railway line between Portsmouth and Petersfield is approximately 1750m to the east

A utilities search identifies the following buried services close to the site.

A 300mm diameter foul sewer passes east-west across the site close to the southern boundary.

A 200mm diameter surface water sewer passes north-south across the site, discharging into the river immediately to the south.

At this stage there is no evidence of other significant infrastructure on the site.

2.6 Geotechnical Conditions

Refer to interpretive reports by Structural Soils Interpretive Report on Ground Investigation (Report No: 730438) and Soiltechnics Ground Investigation Report No: STN3739B-G01 for a more detailed consideration of the geotechnical conditions.

The British Geological Survey maps for the area indicate the following ground conditions.

Bedrock geology is recorded as London Clay (described as silty clay) to the east and west of the site with Bognor Sand Member (described as sands) over the majority of the site.

No superficial deposits are recorded on the site, but Head deposits (described as variable gravel, sand and clay) are recorded close to the south west boundary

This is broadly supported by the ground investigation that is summarised as follows.

The ground investigation determined that the site has a substantial depth of made ground overlaying the anticipated geology. The made ground was recorded as being between approximately 0.5 and 4.7m deep. The made ground is variable in nature generally comprising clayey sandy gravel with demolition waste.

Head deposits were located on the site beneath the made ground, recorded as being between approximately 3.0m and 6.5m deep towards the southwest of the site. The head deposits comprised of gravel and flint grading to gravelly silty clay.

The Bognor sand was encountered beneath the made ground and recorded as being between approximately 0.8m and 5.5m deep and comprised clayey silty fine sands.

The London Clay Formation underlying the head deposits and Bognor Sands Member was proven to a depth 20.5m.

Monitoring suggests ground gas is present.

Groundwater was encountered on the site and monitoring indicated it was found at an approximate depth of between 1.2 and 3.0m

The ground investigation was able to show that contamination levels in the soil were below the assessment criteria indicating that no risk to human health, or plants, have been identified. Additionally investigations were able to show that the soil can be treated as non hazardous waste. However, given the existence of made ground and the historic industrial use of the site a number of recommendations have been made with respect to further testing and maintaining vigilance during construction in the ground investigation report.

2.7 Structural Investigations

No structural investigations have been carried out at the existing site.

2.8 Flood Risk

The site is located within Flood Zone 1, described by the Environment Agency as having less than a 1 in 1000 chance of flooding occurring each year from the rivers and sea. A Flood Risk Assessment has not been carried for the site.

2.9 Unexploded Ordnance

Given the site's location and the historic development the risk of unexploded ordnance being present is considered low and has not been investigated further.

2.10 Archaeology

The risk of Archaeology existing on the site has not been considered.

3.0 Structural Engineering Scheme

Appendix B contains drawings of the proposed structure.

3.1 Overview

The new warehouse is approximately rectangular on plan providing approximately 2050m² of single storey warehouse space. In addition, approximately 700m² of office space is provided over two storeys. A single storey 200m² workshop area is also provided, with the potential for a future fit out space over. The site allows for the movement of lorries and parking for staff.

3.2 Substructure

Given the thickness of the made ground and the variable nature of the underlying head deposits and Bognor sand member a piled foundation arrangement bearing in the London Clay is considered the most appropriate solution.

The superstructure will be founded on pile caps and a piled suspended ground floor slab is also provided. Refer to Appendix F for the Ground Floor Specification

Based on the soil testing results the Design Sulphate Class for the site is DS-1. Where concrete is in contact with the ground the concrete should be designed to accommodate an ACEC class AC-1.

The ground has been identified as having a medium volume change potential and consequently heave protection is provided below the suspended ground floor slab. Further testing of the soil may be able to demonstrate that the risk of heave is negligible and the need for heave protection could be shown to be unnecessary.

3.3 Superstructure

The superstructure is steel framed.

The main warehouse comprises of three twenty metre span portal frames arranged in 'multi-bays'. The portal frames are spaced at 5m centres. Each portal frame has a duo-pitch roof profile, with valleys formed between adjacent frames. At the perimeter of the warehouse additional columns are provided at 5m centres to better accommodate the cladding and parapets.

The majority of the office area is located within the portal frame structure with a steel 'mezzanine' structure providing the second floor. This area adopts a 5m grid for the spacing of the columns associated with the mezzanine.

The workshop area is provided by a traditional steel frame at the west side of the warehouse structures and is double height over the majority of its footprint. A second floor accommodates meeting rooms and the stair core towards the north of this area. A 5m grid is also used in this area. A flat roof profile is adopted.

The majority of the structure is clad in lightweight cladding supported on pressed metal purlins. The only exception is an area of plant located on the flat roof above the workshop area. This adopts an in-situ concrete roof deck cast on profiled metal permanent formwork.

The second floor areas also adopt an in-situ concrete floor decks cast on profiled metal permanent formwork.

Pre-cast reinforced concrete staircases are anticipated.

3.4 Stability

Stability is provided by a combination of portal action with the frame design and the addition of horizontal and vertical bracing. The horizontal load will be transfer through the portal frames and bracing members down to the pile foundation where the forces will in transfer into the surrounding soil.

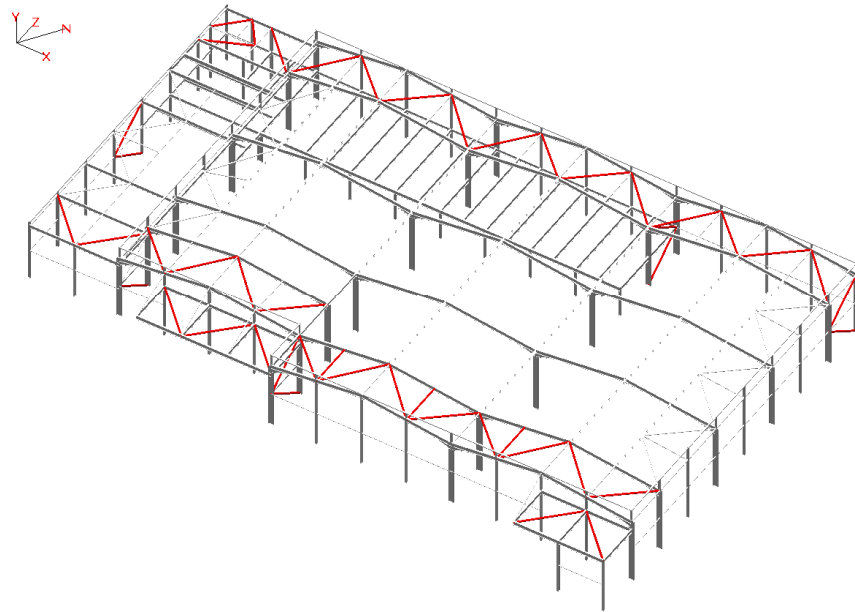


Image showing vertical and horizontal bracing

3.5 Robustness and Disproportionate Collapse

The proposed building is a single storey industrial building with a proportion of two storey office space and is consequently classified as class 2A with respect to Building Regulations Approved Document A3 Disproportionate Collapse.

For class 2A buildings, effective horizontal ties should be provided. The construction techniques described in section 3.3, with appropriate detailing, will meet the requirements inherently.

3.6 Fire Protection

New finishes or fire retardants will be specified to provide the required level of fire protection to the building.

The portal frames behaviour in fire should be designed such that it does not collapse in a way that allows fire to spread to adjacent properties.

3.7 Waterproofing Strategy

No elements of the waterproofing are integrated into the structure. The damp proof membrane should be designed to manage the risks posed by ground gas.

4.0 Civil Engineering Scheme

Appendix C contains drawings of the proposed civil engineering scheme.

It is assumed that the local Southern Water foul and surface water drainage systems have capacity to cater for flows from the new development.

Southern Water offer a capacity check service which can confirm the capacity of local sewers prior to detailed design, it is recommended this is carried out prior to detailed design to reduce the risk of abortive costs.

Further investigation into the existing drainage, in the form of CCTV a survey, have been carried.

The results of the CCTV have confirmed the location of a Southern Water foul sewer that currently runs across the south side of the site. Due to the requirements of the dock loading facility this sewer will need to be diverted. This will require agreement with Southern Water under a Section 185 application. Approval of this diversion will take 3 to 6 months

There are a number of private sewers on the site, two of which would appear to be disused and should be grubbed up prior to construction when this has been confirmed by the appointed contractor.

A private surface water sewer has been located within the area proposed to be the car park and service area. To the south of the site this runs below the footprint of the proposed building. This discharges in the watercourse to the south of the site. This sewer is to be diverted and upon EA approval, may be used as an outfall from the site for surface run off. Ownership of this sewer is currently not known but it is not adopted by Southern Water

4.1 Foul Water

Levels from the Southern water sewer records indicate a gravity fed system from the building can discharge into the sewer running across the site. MH 3202, a short distance southwest of the development site is indicated to be at a depth of around 3m below existing ground level.

The existing foul water sewer route currently runs under the foundations of the proposed building. The remainder of the onsite sewer runs within 3 m of the proposed building footprint.

As part of the construction works this foul sewer is to be diverted.

A proposed route of the diverted sewer is shown in Appendix C of this document along with indicative connections for internal building drainage (SK900).

Based on the sanitary facilities shown in PDP architecture drawing 27974-PD101 rev A, the foul network will require minimum capacity of 2 l/s. Allowance should be made for moderate increases during design development.

4.2 Surface Water

Surface water design is to be carried out to ensure the following criteria are achieved:

- No surcharging for 1 in 1 year probability storm event
- No flooding for 1 in 30 year probability storm event
- No flooding for 1 in 100 year probability storm event

Where a development is expected to have a design life of up to 80 years, 20% increase in rainfall should be accounted for in all designs.

Sustainable Urban Drainage Systems (SUDS), such as infiltration and permeable paving should be adopted as a first course of design of new developments surface water management strategy.

The new development must not have a negative effect on the surrounding area, it is required that surface water rates are restricted to, or improve upon, the existing situation in line with the local plan. Much of the site is Greenfield, a rate of 5 l/s/ha should be achieved for these areas.

The existing development site within the red line boundary is 8000m² (0.8 Ha), 2500m² (2.5 Ha) road with the remaining site being soft landscaping (0.55 Ha).

A typical 50mm/hr design storm would result in approximately 33 l/s run off from a macadam road surface without attenuation. It is assumed the existing drainage within the existing road will not be affected by this development and should not be accounted for within the design calculations.

Design run off from the Greenfield development site will be 2.75 l/s, surface flows from the new development will be restricted to this rate.

Ground investigations of this site have indicated there may be shallow groundwater across the site and possibility of contamination within the soil. Infiltration cannot be used where there is risk of contamination or it would occur within 1m depth of known groundwater.

Initial modelling suggests around 220m³ of storage will be required if a vortex flow controls system (such as a hydrobrake) is used to control flow from the site (SK901). The selected hydrobrake should be chosen to minimise the risk of blocking.

Provisional storm water design sizing has been carried out to ensure 1 in 30 year design storm events are maintained within the storm water network below ground. Detailed designs will require careful consideration when assessing the management of any flooding occurring within a 1 in 100 year design event as this storm water will need to be managed within the boundary of the site. Levels will be designed to ensure no flooding occurs within the building during a 1 in 100 year storm event.

External areas will be subject to manoeuvring goods vehicles, in line with pollution prevention guidance, a Class 1 Full Retention separator will be provided. All drainage from areas subject to vehicular movement will be required to pass through this separator which will be of sufficient capacity. This is to be installed with monitoring and alarm system as per manufacturer's guidance.

At present two outfall options are available. The private surface water drainage inside the site boundary that is to be diverted around the proposed building could be used with agreement of the owner and Environment Agency approval to discharge via this sewer into watercourse running to the southwest of the site. Alternatively, the Southern Water sewer to the northwest of the site in Fulford Road could be used upon agreement with Southern Water.

Structural Soils ground investigation report recommends further site investigation to establish whether surface water infiltration into the ground will be feasible for this development. This may be carried out and alternative storm water strategy adopted utilizing infiltration if ground contamination and ground water levels can be demonstrated to allow this without excess risk to the scheme.

4.3 External Works

The service yard is to be constructed of concrete to an external specification with light brush finish, with falls away from building at a max gradient of 1 in 40 and minimum gradient of 1 in 80. The access is also to be constructed of concrete, to the same specification as the service yard and laid to falls. Concrete pavements within the service yard should be designed to accommodate 42 tonne HGV and all slot drains, gullies and manholes should be of sufficient specification to accommodate this level of loading.

Parking bays are to be of permeable block paving. If ground conditions allow, paving will infiltrate into the sub-grade. If further investigation indicates groundwater or ground contamination proves a risk to the design, paving will be wrapped with an impermeable membrane and discharge into the site drainage network via a perforated collector pipe.

Dwyer PCL flood risk assessment from 2004 indicates part of the site sits within Flood Zone 3. The Environment Agency must be consulted in order to establish current modelled flood levels. If there is existing flood storage volume within the site for a 1 in 100 year flood, it should be expected that they will require proposed site levels to be designed to ensure that no loss of flood storage occurs.

Appendix A: Existing Site

Documents available relating to the existing site

Havant Redevelopment, Flood Risk Assessment by DWYER PLC prepared in October 2004

Ground Investigation in Support of Planning Submission by DWYER PLC prepared in October 2004

Proctor and Gamble Phase 1 Desk Study by Entec UK Ltd prepared in July 2003

Proctor and Gamble Phase 2 Desk Study by Entec UK Ltd prepared in August 2003

Interpretative Report on Ground Investigation at proposed MIPA Paints Site by Structural Soils Ltd prepared in September 2015

Ground Investigation Report by Soiltechnics Environmental and Geotechnical Consultants prepared December 2016

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- All work by the contractor must be carried out in such a way that all requirements under the Health and Safety at Work Act are satisfied.
- All work is to be carried out in compliance with the requirements of all relevant statutory authorities and regulations.

This drawing is to be read in conjunction with the IBS Specification

- Structural Details and Elevations : Section D
 - Piling Details : Section D10
 - Concrete : Section E
 - Masonry : Section F
 - Steelwork : Section G



IDENTIFY RISKS DURING THE CONSTRUCTION PHASES ON THE DRAWINGS

NOTES: The locations and notes on the drawing identify risks which are deemed to be crucial, abnormal, unusual or unexpected in a competent contractor carrying out the works. These notes relate to risks which are deemed to be critical to design risk.

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T01 : Issued for Design and Build Tender : 04.02.16
 Rev : 01 : Issued : 04.02.16

Job Name : **Tender** : 02
 Client : **D2**

AKSWard

CONSTRUCTION CONSULTANTS

115 High Street
 The Pile Office
 Southampton
 SO14 2AA

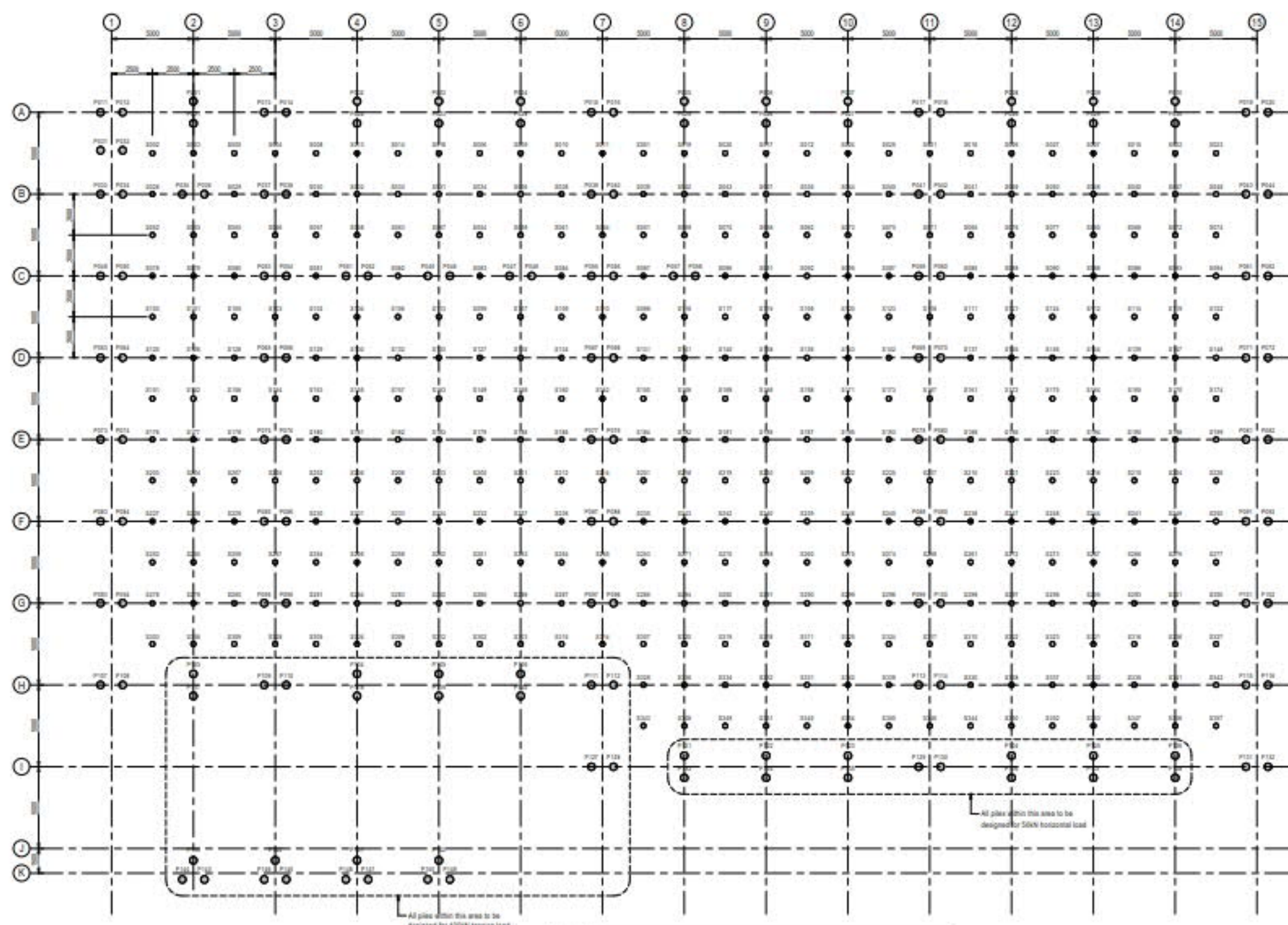
Tel: 02380 230040
 Fax: 02380 632916
 E-Mail: southampton@aksward.com
 Web: www.aksward.com

Client : **MIPA Paints**
 Project : **Warehouse, Havant**

Title : **Piling Layout**
 Date : 04.02.16

Revision Number : 01 : Date : 04.02.16
 Revision Detail :

Status of A1 : All Indicated : **S158024**
 Project/Ref : **WMP-AKSW-XX-F1-DR-S-20001-T01**



Indicative Pile loads:
Piles supporting the ground floor slab (Ref. S Piles 357No. Total) should accommodate a pile load of 300kN.
Piles to the pile caps supporting the super-structure (Ref. P Piles 150No. Total) should accommodate a pile load of 475kN. Refer to plan for additional loading requirements.

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5. All work is to be carried out in compliance with the requirements of the relevant statutory authorities and regulations.

This drawing is to be read in conjunction with the NBS Specification:

- Ground Works and Excavations	- Section D
- Piling Works	- Section E&H
- Concrete	- Section E
- Masonry	- Section F
- Steelwork	- Section G

Assumed Ground Floor slab loading = 30kN/m²



IDENTIFY RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS
NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These risks relate to risks which we have been unable to design out.

Reinforcement Estimate:	
Fixed Pile	= 140kg/m ²
Pile Caps	= 120kg/m ²
Perimeter Slab Thickening	= 230kg/m ²
Ramp Retaining Walls	= 110kg/m ²
Ramp Slab	= 100kg/m ²
Dock Level Area	= 150kg/m ²

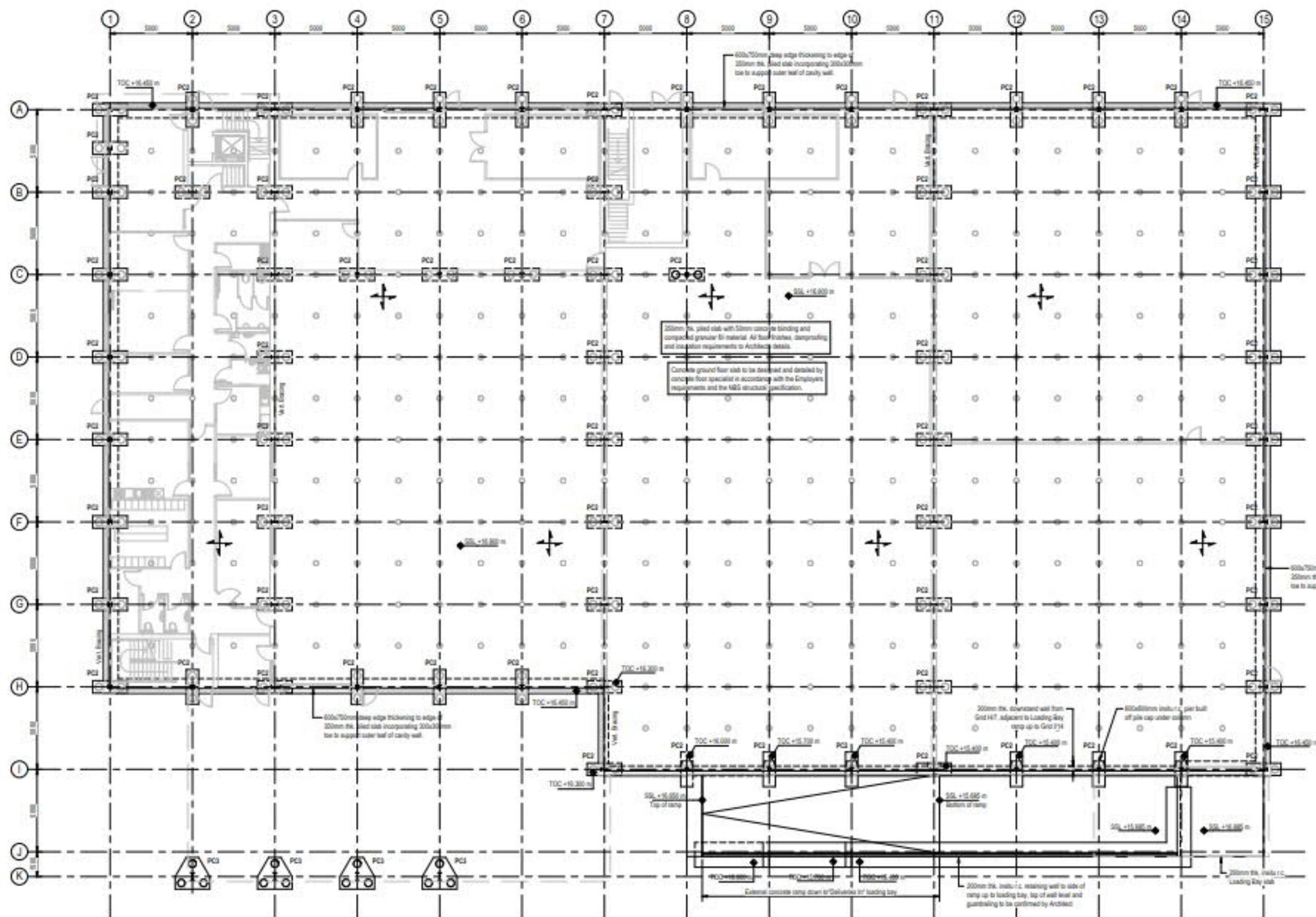
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T01 Issued for Design and Build Tender MDL RJS 07.06.16
Rev: 01
By: JRM
Date: 07.06.16
Tender D2
AKSward
CONSTRUCTION CONSULTANTS
116 High Street
The French Quarter
Southampton
SO14 2AA
Tel: 02380 230349
Fax: 02380 634294
E-Mail: southampton@aksward.com
Web: www.aksward.com
Client: **MIPA Paints**

Project: **Warehouse, Havant**

Title: **Foundation and Ground Floor Layout**

Revised Scheme	TF	Date	04.03.16				
Revised Final		Date					
Scale at A1	As Indicated	Project No.	S158024				
Project No.	Disposer	Zone	Level	Type	Rev	By	Rev
WMP AKSW XX F1 DR 5	21001	T01					



Foundation Layout
(1 : 150)

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This drawing is to be read in conjunction with the H&S Specification:

- Ground Works and Excavations : Section D
- Piling Works : Section C08
- Concrete : Section E
- Masonry : Section F
- Steelwork : Section G

Structural Column Schedule			
Mark	Type	Count	Comments
C1	C40/50 concrete	35	
C2	C40/50 concrete	1	
C3	C40/50 concrete	1	
C4	C40/50 concrete	35	
C5	RF2180x200	8	Door Frames

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T01 Issued for Design and Build Tender MDL RUS 07.08.19

Rev. Amendment Date

By Name Date

By Name Date

By Name Date

By Name Date

By Name Date

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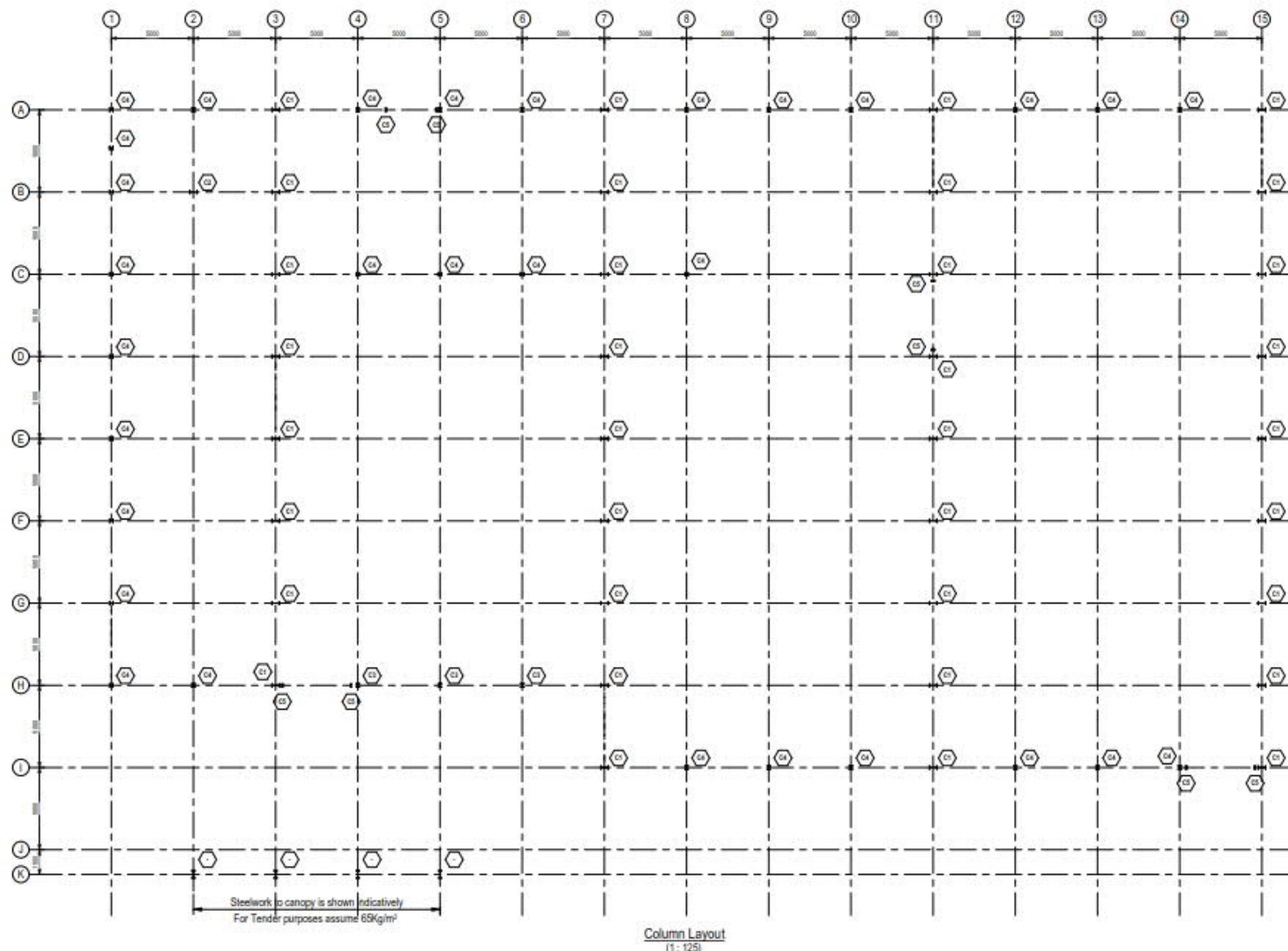
By Name Date

By Name Date

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By Name Date



Column Layout
(1 : 125)

Project Warehouse, Havant

Task Column Layout
General Arrangement

Revised Scheme TF Date 04.03.19

Revised Final Date

Scale at A1 As indicated Project No. S158024

Project/Ref. Drawing Date Level Type Role Day No. Rev.

WMP AKSW XX 01 DR 5 30005 T01

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This drawing is to be read in conjunction with the NBS Specification

- Ground Works and Excavations	Section D
- Piling Works	Section D18
- Concrete	Section E
- Masonry	Section F
- Steelwork	Section G



IDENTIFY RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:
NOTES: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These notes relate to risks which we have been unable to design out.

First Floor loading	
Workshop	= 5.0kN/m ² + 1.5kN/m ² partition allowance
Office/classrooms	= 3.0kN/m ² + 1.0kN/m ² partition allowance
Circulation	= 4.0kN/m ²
Plant Room	= 7.5kN/m ²

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T01 Issued for Design and Build Tender NDL R/S 07/06/16

Rev. Description Date

Qty. Rate

Tender D2

AKS Ward

CONSTRUCTION CONSULTANTS

116 High Street
The French Quarter
Southampton
SO14 2AA

☐ London
☐ Walsley
☐ Oxford
☐ Southampton

Tel: 02380 230340
Fax: 02380 632994
E-Mail: southampton@aksward.com
Web: www.aksward.com

Client: **MIPA Paints**

Project: **Warehouse, Havant**

Title: **First Floor Steelwork General Arrangement**

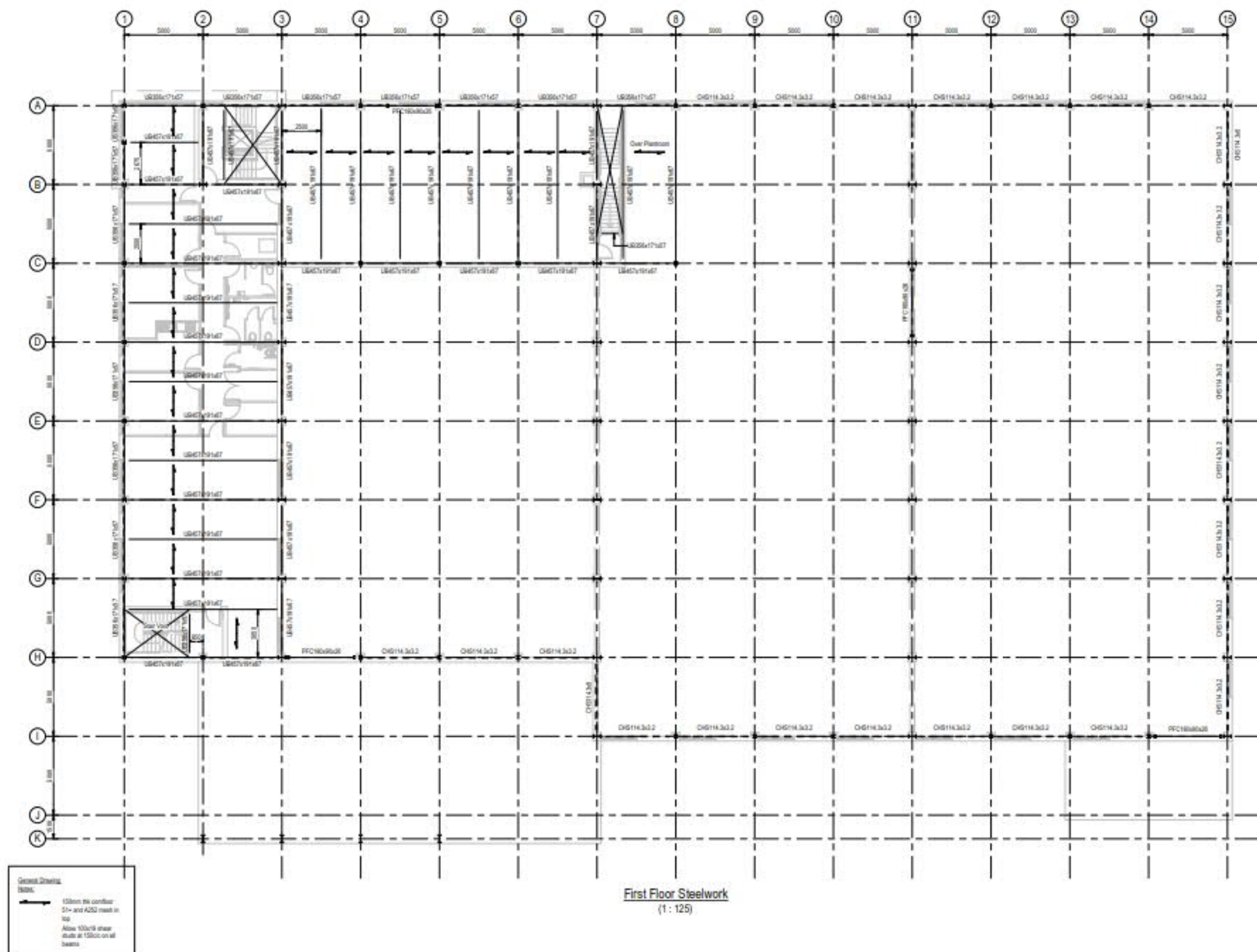
Reviewed Scheme: TF Date: 04.03.16

Reviewed Final: Date:

Scales at A1: As indicated Project No: **S158024**

Project Ref: Designer: Date: Level: Type: Rev: Qty: No: Rev:

WMP AKSW XX 01 DR S 30025 T01



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This drawing is to be read in conjunction with the NBS Specifications

Ground Works and Excavations	Section D
Piling Works	Section D&E
Concrete	Section E
Masonry	Section F
Steelwork	Section G



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T01 Issued for Design and Build Tender: MCL RJL 07.08.16

Rev: 1.00

By: [Signature] Date: [Date]

Tender D2

AKS Ward

CONSTRUCTION CONSULTANTS

116 High Street

the French Quarter

Southampton

SO14 3AA

Tel: 02380 229340

Fax: 02380 524294

E-Mail: southampton@aksward.com

Web: www.aksward.com

Client: MIPA Paints

Project: Warehouse, Havant

Title: Roof Steelwork

Reviewed Scheme: TP Date: 20.08.16

Reviewed Final: Date:

Scale at A1: As indicated

Project No: S158024

Project/Ref: [Project/Ref]

Zone: [Zone]

Level: [Level]

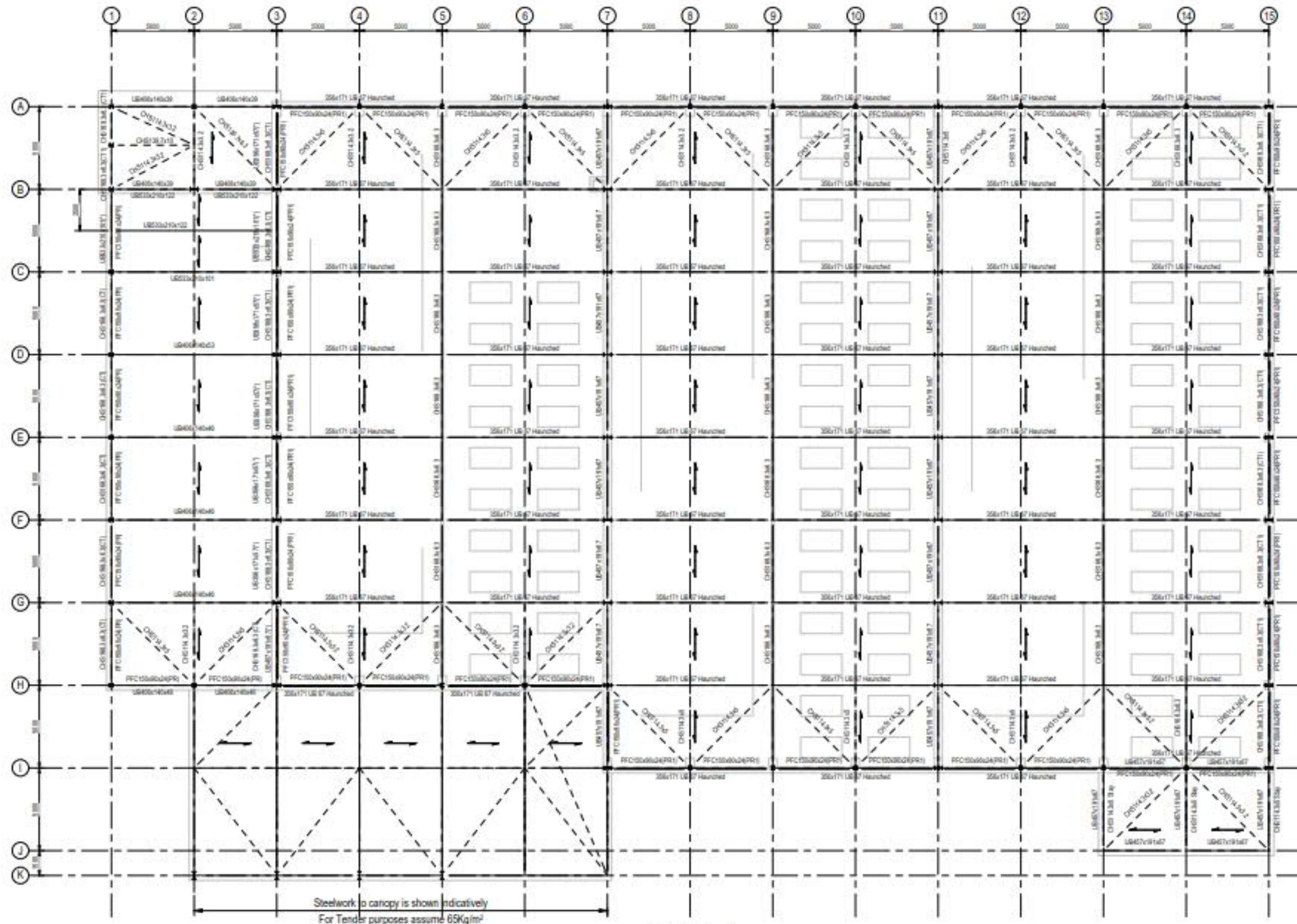
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Day No: [Day No]

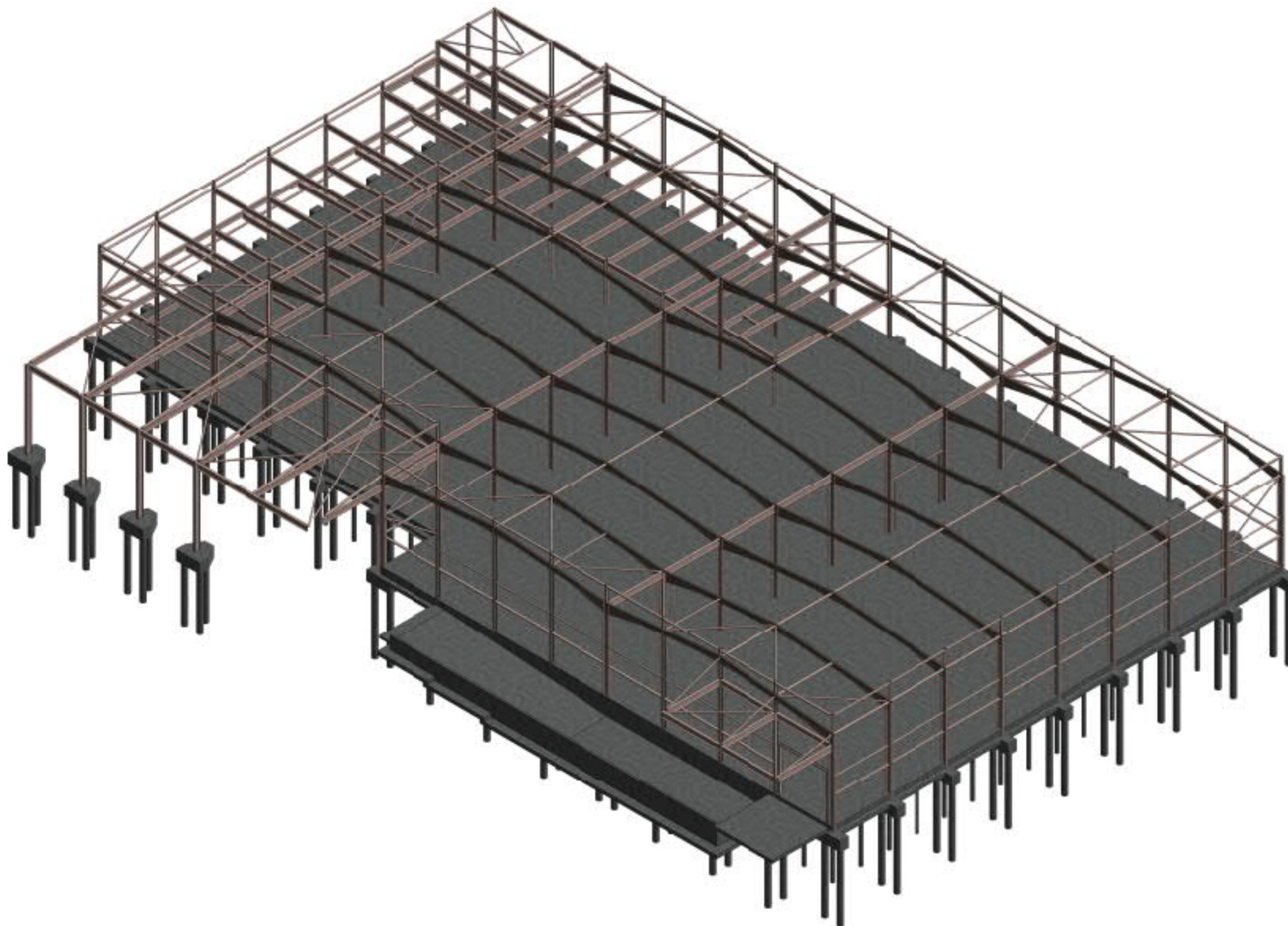
Rev: [Rev]

WMP AKSW XX RF DR 5 30045 T01



General Drawing Notes:
 - Direction of wind
 - 2022 cold rolled purlins

Roof Steelwork
 (1:125)



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5. All work is to be carried out in compliance with the requirements of the relevant statutory authorities and regulations.

This drawing is to be read in conjunction with the NBS Specification:

- Structural Steelwork and Connections	- Section 5
- Piling Works	- Section 22
- Concrete	- Section 6
- Masonry	- Section 7
- Groundwork	- Section 8



IDENTIFY RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS

NOTE: The text below and notes on the drawing identify risks which are deemed to be unusual, abnormal, unusual or unexpected in a competent contractor carrying out the works. These notes relate to risks which are listed below in the design risk register.

All information shown on this drawing is for Design and Build Tender purposes only and is subject to final design and co-ordination.

T01 Issues for Design and Build Tender B01, R01, S01, D01, H01

No. Revision Date

Day Date

Tender D2

AKSWard[®]

CONSTRUCTION CONSULTANTS

110 High Street
The PRISM Quarter
Southampton
SO14 2NA

TEL: 02380 200400
FAX: 02380 602910
e mail: southampton@aksward.com
web: www.aksward.com

Client: MIPA Paints

Project: Warehouse, Havant

Title: 3D Model Views

Whole Structure

Sheet 1

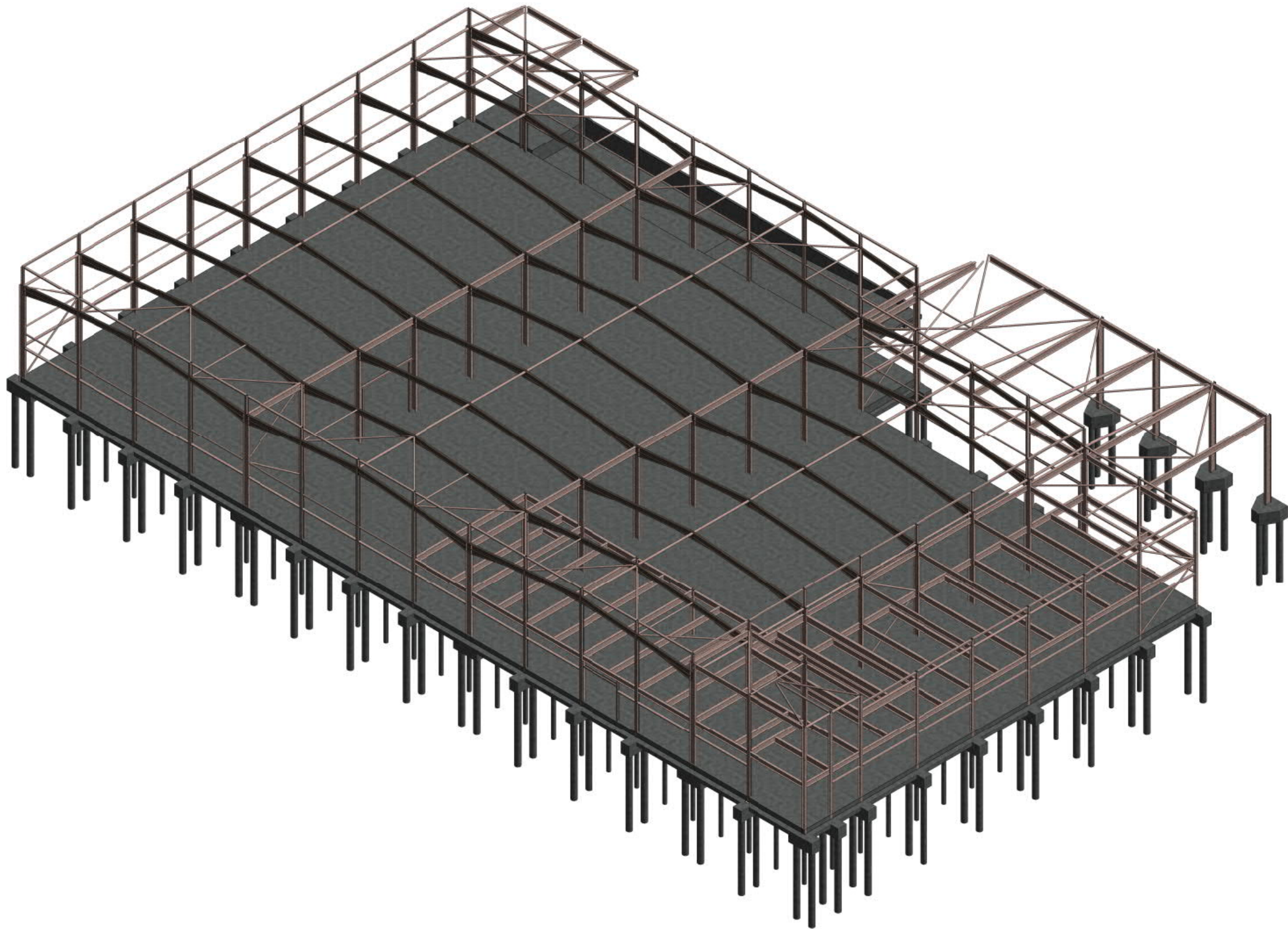
Revision Number TP Date 04.02.16

Revision Detail Date

Scale of A1: 1:1 Project No: 5158024

Project Ref: 5158024 Date: 04.02.16

WMP AKSW XK ZZ DR S 30060 T01



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This drawing is to be read in conjunction with the NBS Specification :

- Ground Works and Excavations : Section D
- Piling Works : Section D30
- Concrete : Section E
- Masonry : Section F
- Steelwork : Section G



IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

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T01 Issued for Design and Build Tender. MDL RJS 07.05.18

Rev.	Amendment	Des	Chkd	Date
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Orig. Status	Tender	Subsidiary	D2
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CONSTRUCTION CONSULTANTS

116 High Street
The French Quarter
Southampton
SO14 2AA

Tel: 02380 235340
Fax: 02380 634294
e-mail: southampton@aksward.com
web: www.aksward.com

Client **MIPA Paints**

Project **Warehouse, Havant**

Title **3D Model Views
Whole Structure
Sheet 2**

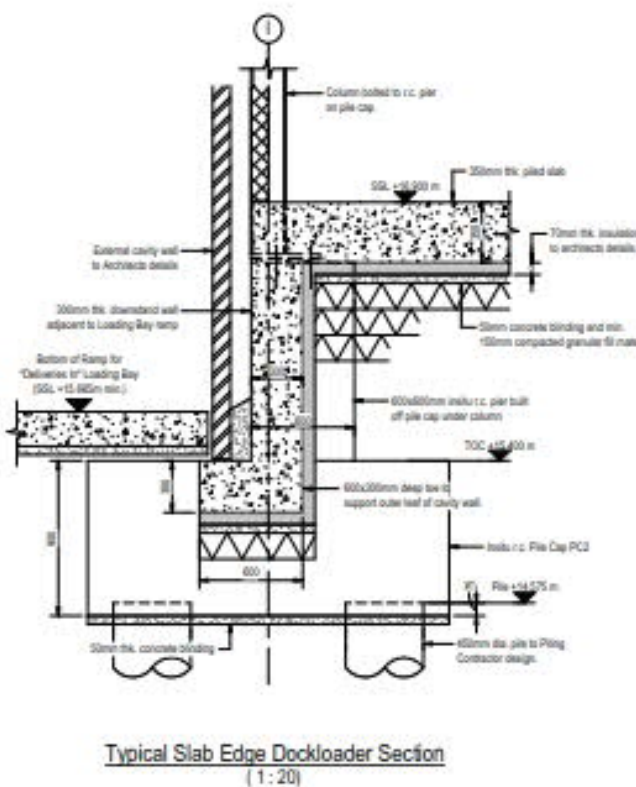
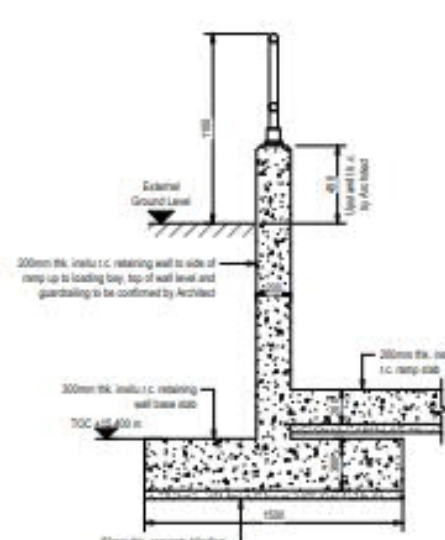
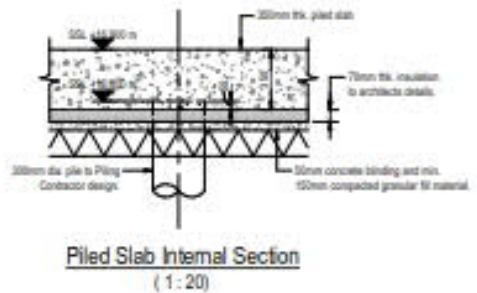
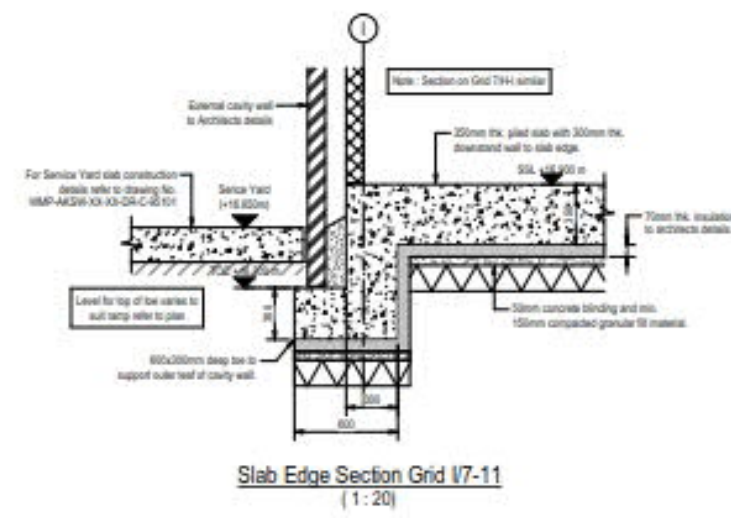
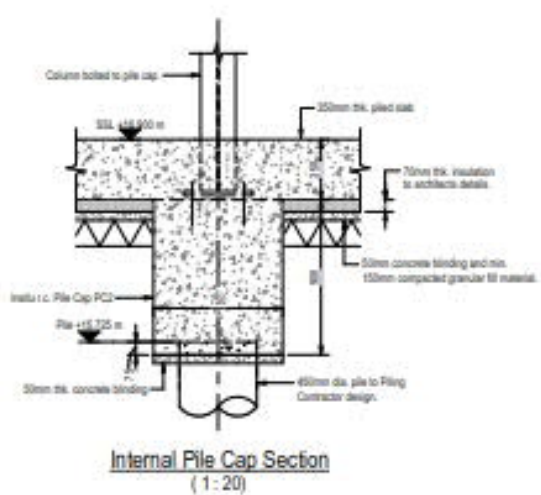
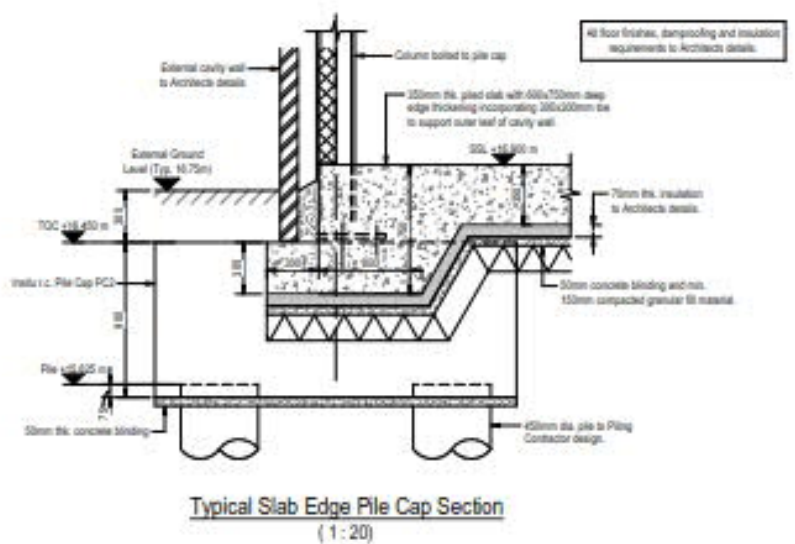
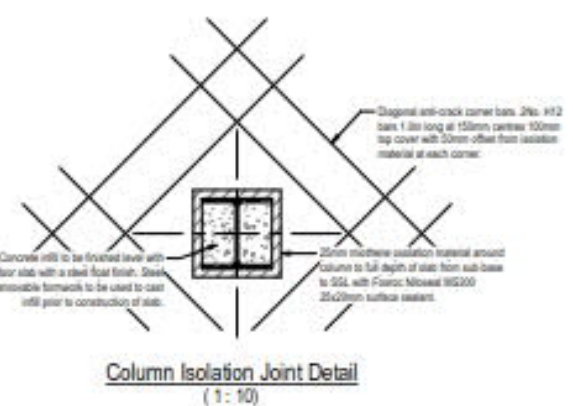
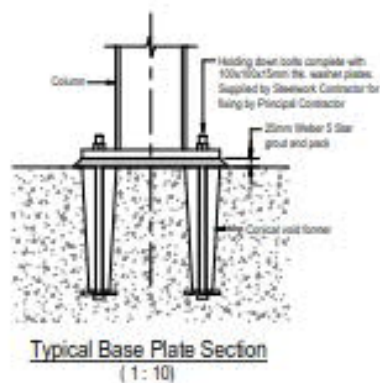
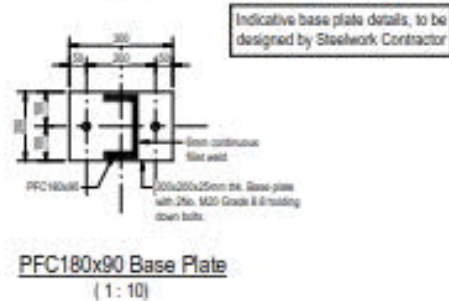
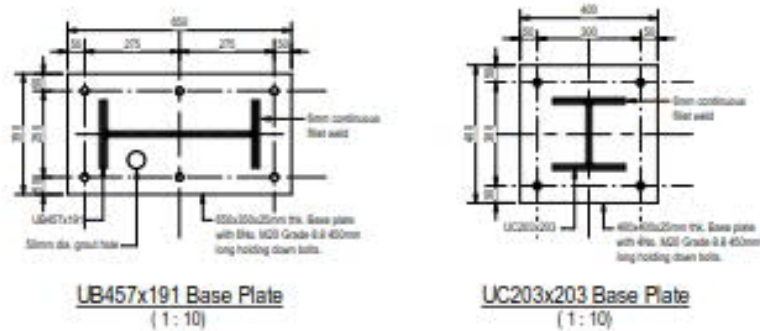
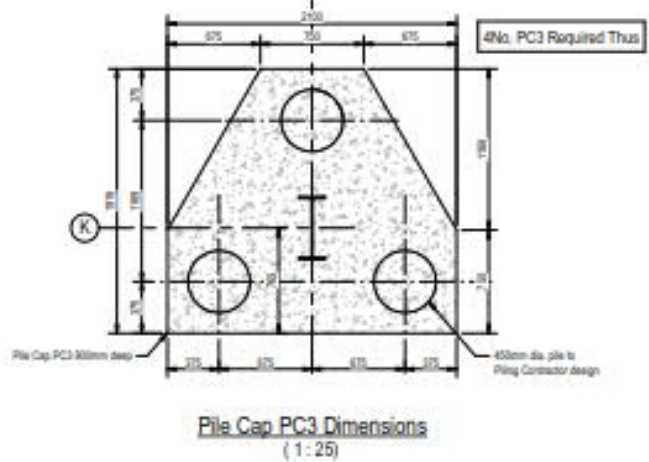
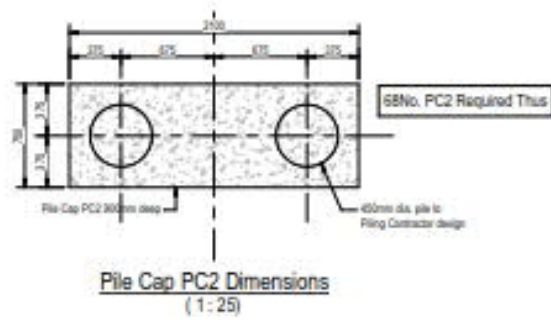
Reviewed Scheme	TF	Date	28.08.18
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Reviewed Final	Date
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Scales at A1	1 : 1	Project No.	S158024
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Project Ref.	Originator	Zone	Level	Type	Role	Orig. No.	Rev.
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WMP AKSW XX ZZ DR S 30061 T01



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- GENERAL NOTES**
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 - All work is to be carried out in compliance with the requirements of the relevant statutory authorities and regulations.
- This drawing is to be read in conjunction with the NBS Specification:
- | | |
|--------------------------------|-------------|
| - Ground Works and Excavations | Section D |
| - Piling Works | Section D08 |
| - Concrete | Section E |
| - Masonry | Section F |
| - Steelwork | Section G |

IDENTIFIED RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS

NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These risks relate to risks which we have been unable to design out.

All information shown on this drawing is for Design and Build Tender purposes only and is subject to final design and co-ordination.

T01 Issued for Design and Build Tender MDL RUS 01/08/18

Rev	Amendment	On	Class	Date
01				

By: **Tender** Date: **D2**

AKS Ward
CONSTRUCTION CONSULTANTS

115 High Street
The Project Counter
Southampton
SO14 2AA

Tel: 02380 230248
Fax: 02380 642914
E-mail: southampton@aksward.com
Web: www.aksward.com

City: **Southampton**

MIPA Paints

Project: **Warehouse, Havant**

Title: **Ground Floor Sections & Details**

Revised Scheme	RUS	Date
		30.08.18
Revised Final		Date

Scales as At: As indicated Project No: **S158024**

Project/Rev: Original Date: Last Type: Date: Day: Rev: Rev:

WMP AKSW XX GF DR S 31011 T01

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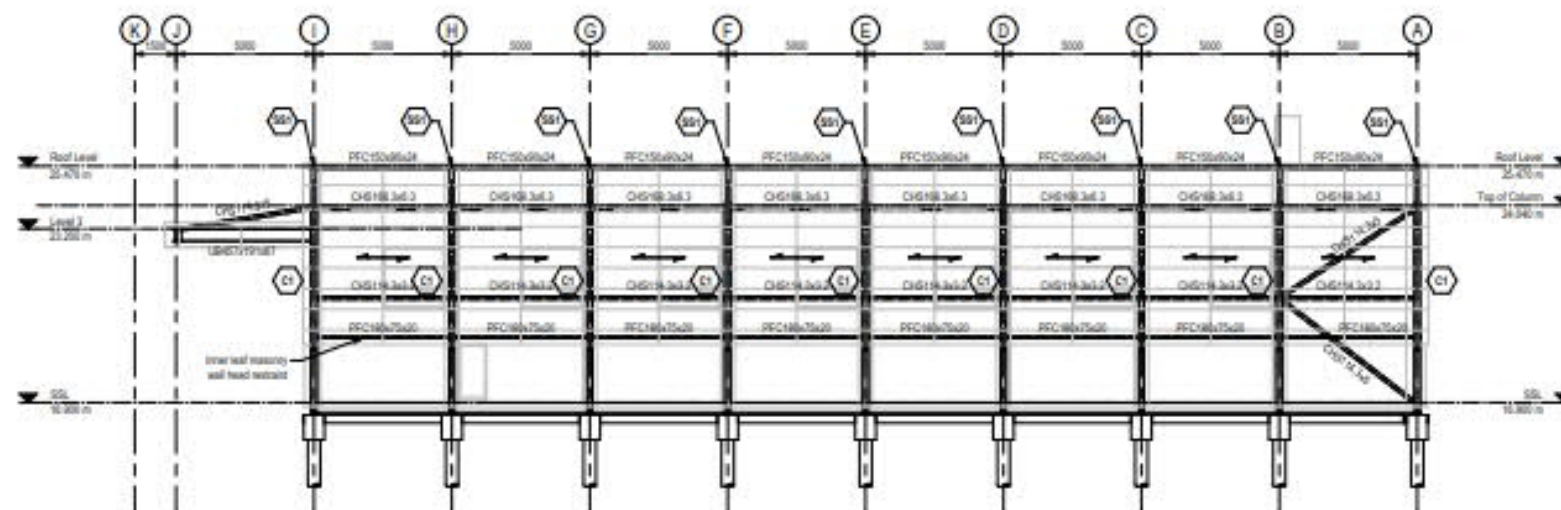
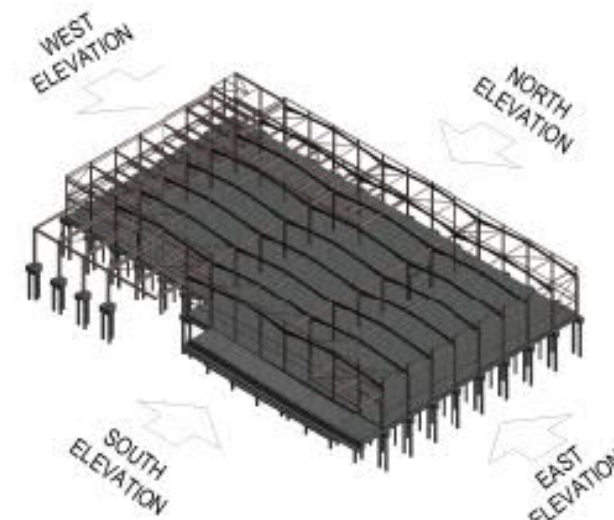
This drawing is to be read in conjunction with the NBS Specification

- Ground Works and Excavations	Section D
- Piling Works	Section D30
- Concrete	Section E
- Masonry	Section F
- Steelwork	Section G



IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS

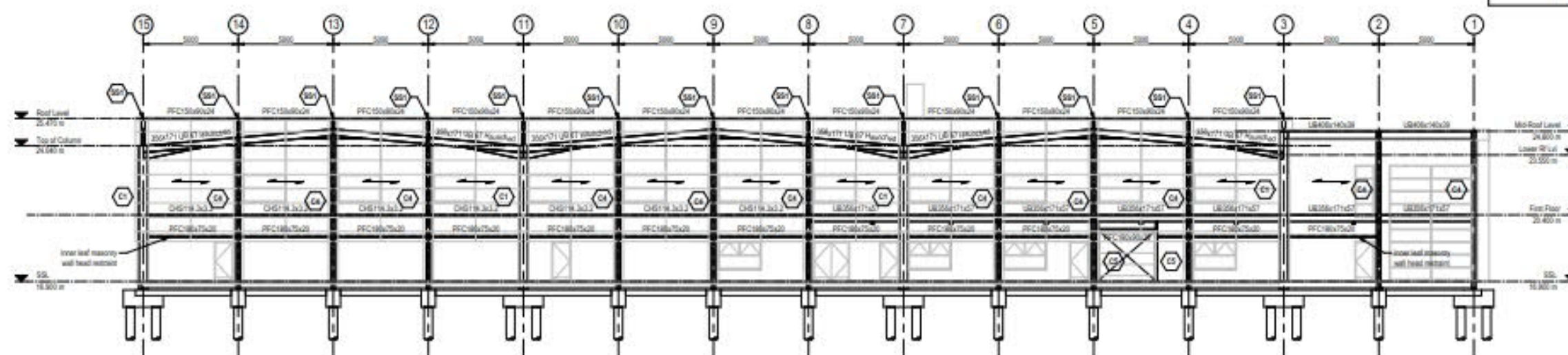
NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, unusual or unexpected to a competent contractor carrying out the works. These risks relate to risks which we have been unable to design out.



East Elevation - Grid 15
(1:125)

General Drawing Notes

→ denotes direction of side with 200C cold rolled section



North Elevation - Grid A
(1:125)

Secondary Steel Column Schedule

Mark	Type	Count	Comments
S01	UB457x191x25	48	Perimeter Sub

Structural Column Schedule

Mark	Type	Count	Comments
C1	UB457x191x25	36	
C2	UB457x191x25	1	
C3	UC203x203x46	3	
C4	UC203x203x46	36	
C5	PF2180x90x25	8	Door Timers

All information shown on this drawing is for Design and Build Tender purposes only and is subject to final design and co-ordination.

T01 Issued for Design and Build Tender MDL RJS 07.08.18

Rev. Revisions Rev. Date

Qty Status Tender Quantity D2

AKS Ward

CONSTRUCTION CONSULTANTS

116 High Street
The French Quarter
Southampton
SO14 3AA

London
Widch
Oxford
Southampton

Tel: 02380 231310
Fax: 02380 542294
E-mail: southampton@aksward.com
Web: www.aksward.com

Client MIPA Paints

Project Warehouse, Havant

Title Building Elevations
Sheet 1

Reviewed Scheme TF Date 04.03.16

Reviewed Final Date

Scale at A1 As indicated Project No S158024

Project Ref. Designer Date Level Type Size Qty Rev Rev

WMP AKSW XX ZZ DR S 40001 T01

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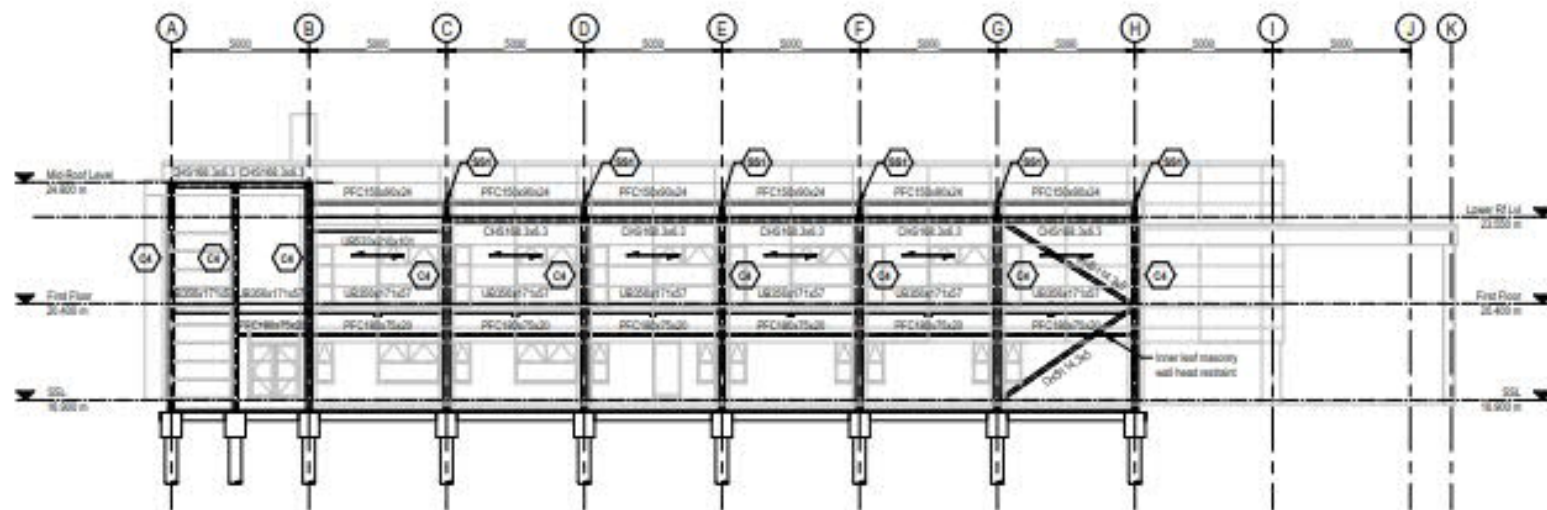
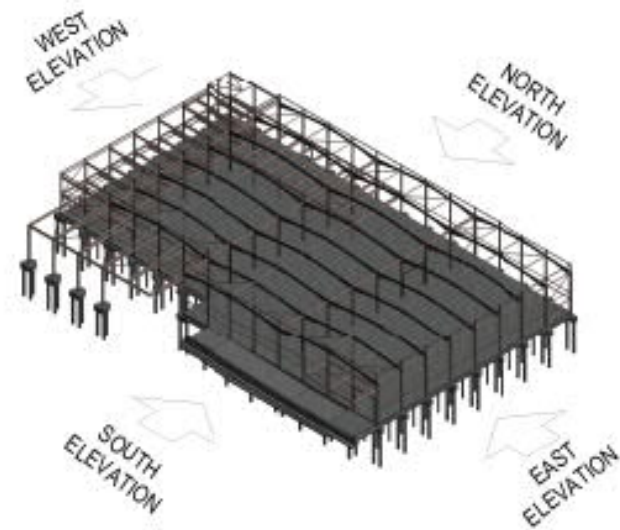
This drawing is to be read in conjunction with the HBS Specifications

Ground Works and Excavations	Section D
Piling Works	Section D10
Concrete	Section E
Masonry	Section F
Steelwork	Section G



IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS

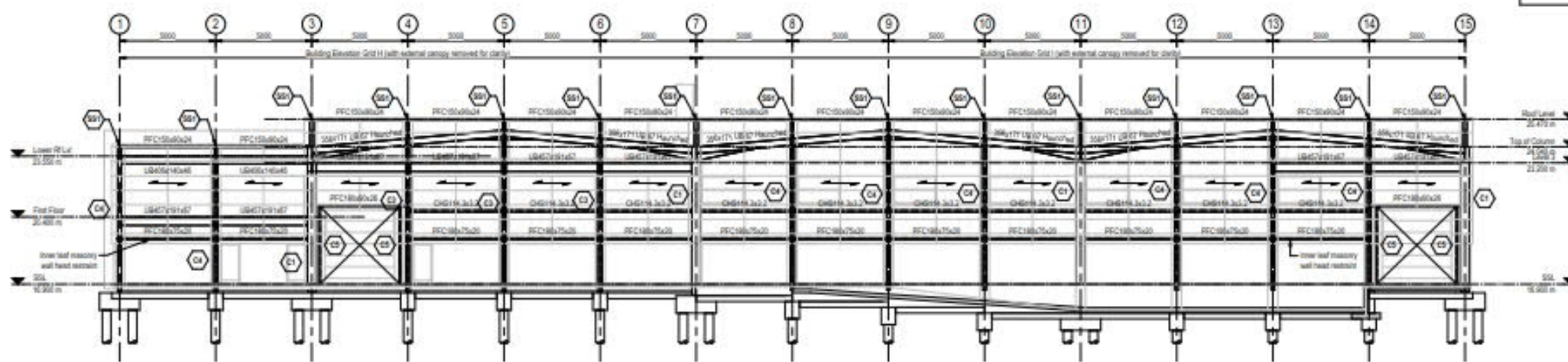
NOTE: The following notes on the drawing identify risks which are deemed to be unusual, abnormal, neglected or unexpected to a competent contractor carrying out the works. These notes relate to risks which we have been unable to design out.



West Elevation - Grid 1
(1:125)

General Drawing Notes:

Denotes direction of side walls 200C cold rolled section



South Elevation - Grid H and I
(1:125)

Secondary Steel Column Schedule			
Mark	Type	Count	Comments
SS1	UB203x133x25	48	Perimeter Stub

Structural Column Schedule			
Mark	Type	Count	Comments
C1	UB457x191x74	35	
C2	UB457x191x67	1	
C3	UC203x203x46	3	
C4	UC203x203x46	30	
C5	RF188x69x28	8	Door Timers

All information shown on this drawing is for Design and Build Tender purposes only and is subject to final design and co-ordination.

T01 Issued for Design and Build Tender: MEL 4/25 07.28.19

Rev: 1.00

By: [Signature] Tender D2

AKS Ward

CONSTRUCTION CONSULTANTS

116 High Street, 1st Floor, Southampton, SO14 2AA

Tel: 02380 236000 Fax: 02380 632294

E-Mail: southampton@aksward.com

Web: www.aksward.com

Client: MIPA Paints

Project: Warehouse, Havant

Title: Building Elevations Sheet 2

Reviewed Scheme: TP Date: 04.03.19

Reviewed Final: Date:

Scales at A1: As indicated Project No: S158024

Project/Ref: Designer: Date: Level: Type: Rev: Dwg No: Rev:

WMP AKSW XX ZZ DR S 40002 T01

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- All work is to be carried out in compliance with the requirements of the relevant statutory authorities and regulations.
- Refer to General Notes Drawing WMP-AKSW-XX-XX-DR-C-0000

Architects Drawings:

This drawing has been created based on the following
pdp architecture lip Architects Drawings:

27974-TD200-208 Tender Drawings [Preliminary]

IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

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T01 Issued for Design and Build Tender MDL RJS 07.09.18

Rev. Amendment Dm Chld Date

Drg. Status Tender Sublity D2

AKSWard²

CONSTRUCTION CONSULTANTS

116 High Street
The French Quarter
Southampton
SO14 2AA

Tel: 02380 235340

Fax: 02380 634294

e-mail: southampton@aksward.com

web: www.aksward.com

Client

MIPA Paints

Project **Proposed Development
Fulford Road
Leigh Park**

Title **Drainage Layout**

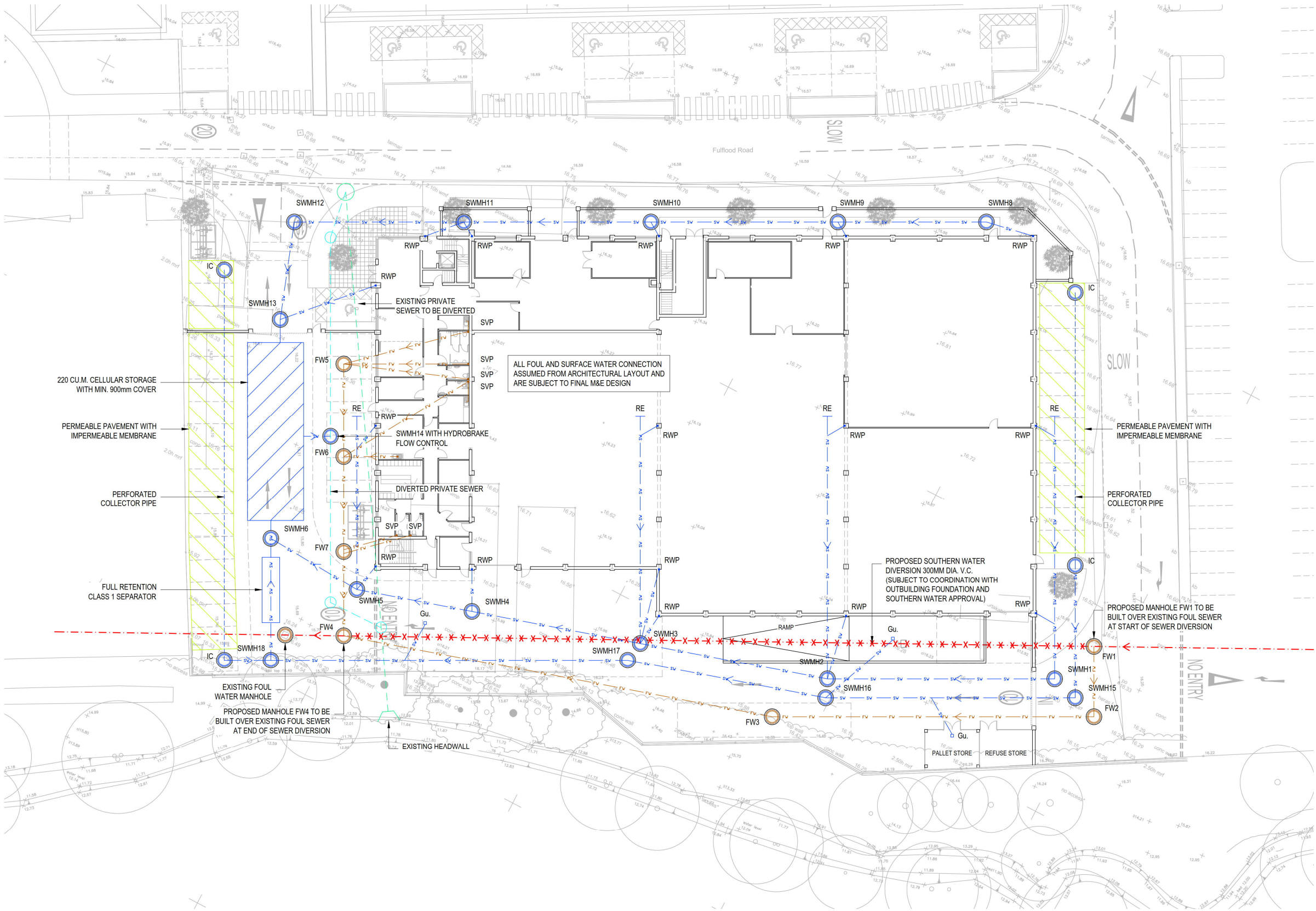
Reviewed Scheme RJS Date 30.08.18

Reviewed Final Date

Scales at A1 1:200 Project No. **S158024**

Project Ref. Originator Zone Level Type Role Drg No. Rev.

WMP AKSW XX-XX-DR C 92005 T01



S158024-01 MIPA PAINTS

06 September 2018

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B

Complete buildings/ structures/ units

B50 General structural requirements

To be read with Preliminaries/General conditions.

GENERAL

110 EUROCODES

- National Annexes: Reference to a Eurocode, or to an execution or a material standard referenced therein, is deemed to include the appropriate United Kingdom National Annex, to the Eurocode or referenced standard. Nationally determined parameters shall apply. Non-contradictory complementary information: Applies when referenced in the National Annex.
- Substitution of alternative design rules for Eurocode Application Rules: Submit proposals

120 STRUCTURAL WORK

- Designated codes of practice: To the Eurocodes appropriate to the nature of the structure.
- Design working life: Category 4 to BS EN 1990.
- Completed structure generally: To comply with the requirements of the designated codes of practice and the standards referenced therein. Deflections and other structural movements at serviceability limit state to be compatible with requirements of the building fabric, movement joints and weathertightness.
- Special requirements: None.

130 CONTRACTOR'S DESIGN

- Engineer responsible for overall stability of structure: The person named as Structural Engineer in Preliminaries.
- Design supervision/ checking level: To BS EN 1990, table B4, level DSL2.
- Design requirements: None additional.
- Design quality control: To BS EN ISO 9001.
- Maintenance: Make provision for and submit details of requirements to ensure the safety and serviceability of the structure, including:
 - Critical parts that should be regularly inspected, with recommendations for the frequency of inspection.
 - Elements susceptible to corrosion, mechanical wear or fatigue that may need to be reconstructed or replaced during the design working life of the structure.
 - Means of safe access for maintenance and repair.

150 GROUND INVESTIGATION REPORT

- Requirement: Consider adequacy of data provided and submit proposals if additional investigation will be necessary to justify design.
- Datum for borehole logs: Ordnance (Newlyn) datum.
- Obstructions and voids: None known.

PERFORMANCE

230 PERFORMANCE CRITERIA FOR STRUCTURE TO BE SUPPORTED ON PILES.

- Permitted settlement at serviceability limit state (maximum): Submit proposals

410 DATA FOR CLIMATIC LOADS/ ACTIONS

- Site Ordnance Survey grid reference: SU712082.
- Site altitude to Ordnance Datum: 23m.

430 SNOW LOADS - CONTRACTOR DETERMINED

- Standard: To BS EN 1991-1-3.

- Features affecting loads: None in addition to those shown on drawings.

470 WIND LOADS/ ACTIONS - CONTRACTOR DETERMINED FOR WALL AND ROOF CLADDING.

- Standard: To BS EN 1991-1-4.
 - Factors and coefficients: Appropriate to location, exposure, altitude, building shape and size, and taking account of existing and known future adjacent and/ or attached buildings.
- Shelter from upwind obstacles: Do not consider.
- Normal design condition of doors and windows: Closed.
- Features affecting loads: None other than those shown on drawings.
- Special requirements: None.

EXECUTION

700 EXECUTION GENERALLY

- Standard: Report conflict between specification and the designated codes of practice and the standards referenced therein before ordering affected materials or executing affected work.
- Inspection levels: To BS EN 1990, table B5, level IL2.
 - Special requirements: None.
- Quality control: Submit proposals if not certified as compliant with BS EN ISO 9001.
- Tolerances: Notwithstanding tolerances specified elsewhere, do not exceed requirements for compliance with the designated code.

705 CONNECTIONS AND ANCHORAGES

- End and edge distances and spacing (minimum): Unless otherwise specified or detailed, as required by the designated code of practice for fixings/ anchorages carrying maximum load.
- Report locations where:
 - Type and number of fixings cannot be accommodated.
 - Size or position of members prevents correct positioning.

710 GEOTECHNICAL WORK

- Geotechnical design report: Keep a copy on site during the execution of the geotechnical work.
- Requirements for testing and monitoring: As geotechnical design report.
- Assumed ground conditions: As geotechnical design report.

720 STABILITY DURING EXECUTION

- Permanent bracing system: Refer to AKS Ward drawings.
 - Vertical: Longitudinal stability provided by steel cross bracing as detailed and transverse stability provided by moment connections between beams and columns.
 - Horizontal: Composite action floors.
- Temporary bracing/ restraints: Provide as necessary until permanent bracing system is complete and sufficiently mature to carry loads and all connections have been made to the permanent system.
 - Special requirements: None.
- Design loads: Structure has been designed for the completed state.
 - Magnitude: Request details as necessary.
- Before loading structure: Take into account:
 - Reduction in strength due to immaturity of elements.
 - Reduction in loadbearing capacity due to partial completion of continuous elements.

- Extent of restriction: As geotechnical design report.

750 MONITORING OF GROUND CONDITIONS DURING CONSTRUCTION

- Purpose: To identify differences between actual ground conditions and those assumed in the design.
- Requirements: As detailed in the geotechnical design report.
 - Sampling and testing: Not required.
- Inspect and record: Sequence, nature and soil types revealed in excavations and formations.
- Immediately notify: Variations from the assumed ground conditions or shortfall in test requirements.
- Special requirements: None.

730 RESTRICTIONS ON USE OF GROUND SURFACE BEHIND EARTH RETAINING STRUCTURES

- Surcharge loading (maximum): Restrict loading on upper ground surface behind structure as geotechnical design report.

C

Demolition/ Alteration/ Renovation

C20 Demolition

To be read with Preliminaries/ General conditions

GENERAL REQUIREMENTS

120 EXTENT OF DECONSTRUCTION/ DEMOLITION

- General: Subject to retention requirements specified elsewhere, deconstruct/ demolish structures down to foundation level: Break up and dig out foundations.

130 GROUNDWORKS

- Old foundations, slabs and the like: Break out in locations and to the extents stated.
- Contaminated material: Remove, and carry out remediation required by the Enforcing Authority.

140 BENCH MARKS

- Unrecorded bench marks and other survey information: Give notice when found. Do not remove marks or destroy the fabric on which they are found.

SERVICES AFFECTED BY DECONSTRUCTION/ DEMOLITION

210 SERVICES REGULATIONS

- Work carried out to or affecting new and/ or existing services: Carry out in accordance with the byelaws and/ or regulations of the relevant Statutory Authority.

220 LOCATION OF SERVICES

- Services affected by deconstruction/ demolition work: Locate and mark positions.
- Mains services marking: Arrange with the appropriate authorities for services to be located and marked.
 - Marking standard: In accordance with National Joint Utilities Group 'Guidelines on the positioning and colour coding of underground utilities' apparatus'.

240 DISCONNECTION OF DRAINS

- General: Locate, disconnect and seal disused foul and surface water drains.
- Sealing: Permanent, and within the site.

250 LIVE FOUL AND SURFACE WATER DRAINS

- Drains and associated manholes, inspection chambers, gullies, vent pipes and fittings:
 - Protect; maintain normal flow during deconstruction/ demolition.
 - Make good any damage arising from deconstruction/ demolition work.
 - Leave clean and in working order at completion of deconstruction/ demolition work.
- Other requirements: None.

260 SERVICE BYPASS CONNECTIONS

- General: Provide as necessary to maintain continuity of services to occupied areas of the site on which the deconstruction/ demolition is taking place and to adjoining sites/ properties.
- Minimum notice to adjoining owners and all affected occupiers: 72 hours, if shutdown is necessary during changeover.

270 SERVICES TO BE RETAINED

- Damage to services: Give notice, and notify relevant service authorities and/ or owner/ occupier regarding damage arising from deconstruction/ demolition.
- Repairs to services: Complete as directed, and to the satisfaction of the service authority or owner.

D

Groundwork

DECONSTRUCTION/ DEMOLITION WORK

- 310 WORKMANSHIP
- Standard: Demolish structures in accordance with BS 6187.
 - Operatives:
 - Appropriately skilled and experienced for the type of work.
 - Holding, or in training to obtain, relevant CITB Certificates of Competence.
 - Site staff responsible for supervision and control of work: Experienced in the assessment of risks involved and methods of deconstruction/ demolition to be used.
- 320 GAS OR VAPOUR RISKS
- Precautions: Prevent fire and/ or explosion caused by gas and/ or vapour from tanks, pipes, etc.
- 330 DUST CONTROL
- General: Reduce airborne dust by periodically spraying deconstruction/ demolition works with an appropriate wetting agent. Keep public roadways and footpaths clear of mud and debris.
 - Lead dust: Submit method statement for control, containment and clean-up regimes.
- 340 HEALTH HAZARDS
- Precautions: Protect site operatives and general public from hazards associated with vibration, dangerous fumes and dust arising during the course of the Works.
- 380 DANGEROUS OPENINGS
- General: Provide guarding at all times, including outside of working hours. Illuminate during hours of darkness.
 - Access: Prevent access by unauthorized persons.
- 391 ASBESTOS-CONTAINING MATERIALS – UNKNOWN OCCURRENCES
- Discovery: Give notice immediately of suspected asbestos-containing materials when discovered during deconstruction/ demolition work. Avoid disturbing such materials.
 - Removal: Submit statutory risk assessments and details of proposed methods for safe removal.
- 410 UNFORESEEN HAZARDS
- Discovery: Give notice immediately when hazards such as unrecorded voids, tanks, chemicals are discovered during deconstruction/ demolition.
 - Removal: Submit details of proposed methods for filling, removal, etc.

MATERIALS ARISING

- 510 CONTRACTOR'S PROPERTY
- Components and materials arising from the deconstruction/ demolition work: Property of the Contractor except where otherwise provided.
 - Action: Remove from site as work proceeds where not to be reused or recycled for site use.
- 520 RECYCLED MATERIALS
- Materials arising from deconstruction/ demolition work: Can be recycled or reused elsewhere in the project, subject to compliance with the appropriate specification and in accordance with any site waste management plan.
 - Evidence of compliance: Submit full details and supporting documentation.
 - Verification: Allow adequate time in programme for verification of compliance.

D20 Excavating and filling

To be read with Preliminaries/General conditions

GENERALLY/THE SITE

112 SITE INVESTIGATION REPORT

- Structural Soils Limited - Interpretive Report on Ground Investigation at Proposed MIPA Paints Site, Fulflood Road, Havant - September 2015
- Soiltechnics Environmental and Geotechnical Consultants – Ground Investigation Report STN3739B-G01 – December 2016

150 EXISTING SERVICES, FEATURES AND STRUCTURES

- Services: See section A12 for locations.
- Site features to be retained: See section A12 for details.
- Structures: See section A34 for details of protection.

CLEARANCE/EXCAVATING

164 TREE ROOTS

- Protected area: Do not cut roots within precautionary protection area.
 - Size of area: Refer to Arborocultralist Report (CBA10529 V1).
- Excavation in protected area:
 - Method: Contractor's choice.
 - Backfill as soon as possible or temporarily line with polyethylene sheet to reduce evaporation.
- Outside protected area: Give notice of roots exceeding 25 mm and do not cut without approval.
- Cutting:
 - Make clean smooth cuts with no ragged edges.
 - Pare cut surfaces smooth with a sharp knife.
 - Treatment of cut roots: Not required.
- Backfill: As dug material, enriched with phosphate fertilizer.

168 SITE CLEARANCE

- Timing: Before topsoil stripping, if any.
- General: Clear site of rubbish, debris and vegetation. Do not compact topsoil.
- Treatment: Apply a suitable non-residual herbicide to areas to receive planting.

170 REMOVING SMALL TREES, SHRUBS, HEDGES AND ROOTS

- Identification: Clearly mark trees to be removed.
- Small trees, shrubs and hedges:
 - Cut down.
 - Roots: Grub up and dispose of without undue disturbance of soil and adjacent areas.
- Safety: Comply with HSE/ Arboriculture and Forestry Advisory Group safety leaflets.

175 FELLING LARGE TREES

- Definition: Girth over 600 mm.
- Identification: Clearly mark trees to be removed.
- Safety: Comply with HSE/ Arboriculture and Forestry Advisory Group safety leaflets.
- Felling: As close to the ground as possible.
- Stumps: Obtain approval before removing by winching. Do not use other trees as supports or anchors.
- Work near retained trees: Take down trees carefully in small sections to avoid damage to adjacent trees that are to be retained, where tree canopies overlap and in confined spaces generally.

180 CHIPPING AND SHREDDING

- Generally: Permitted, remove arisings from site.

221 TREATING TOPSOIL

- Treatment: Apply a suitable translocated non-residual herbicide.
- Timing: Not less than two weeks before excavating topsoil.

225 HANDLING TOPSOIL

- Standard: To BS 3882.
- Aggressive weeds:
 - Species: Included in the Weeds Act, section 2 or the appropriate Wildlife and Countryside Act for the relevant jurisdiction.
 - Give notice: Obtain instructions before moving topsoil.
- Contamination: Do not mix topsoil with:
 - Subsoil, stone, hardcore, rubbish or material from demolition work.
 - Other soil or material containing aggressive weeds, sharps, plastics and non soil forming materials and notifiable animal or plant diseases.
 - Oil, fuel, cement or other substances harmful to plant growth.
 - Other classifications of topsoil.
- Multiple handling: Keep to a minimum. Use topsoil immediately after stripping.

242 EXCAVATIONS ADJACENT TO EXISTING BACKFILLED TRENCHES

- Proximity: When width of undisturbed ground between the two excavations will be less than 900 mm.
- Action: Assume that the ground between the trenches is unstable and provide side support accordingly.

245 EXCAVATIONS ADJACENT TO EXISTING FOUNDATIONS - CONTRACTOR'S DESIGN

- Prior to commencing excavation: Excavate trial pits adjacent to existing foundations to determine extent and formation levels.
- Submit proposals: For ensuring the safety of the existing foundations if the formation level for the new excavation will be below the formation level of the existing foundation.
- Backfill material to new excavation: As clause 710.

246 EXCAVATIONS ADJACENT TO PILE SUPPORTED STRUCTURES

- Proximity: When the formation level of an excavation will be lower than the pile cut off level and the distance between the near faces of the pile cap/ ground beam and the excavation is less than the difference in depth between the pile cap and the excavation formations.
 - Complete all work within the excavation and backfilling before casting the pile cap/ ground beam, or Delay the adjacent excavation until 3 days after casting the pile cap / ground beam.

248 BACKFILL TO EXCAVATIONS LOWER THAN FOUNDATION FORMATION LEVEL

- Critical level:
 - Distance between near faces of foundation and lower excavation less than 1 m: 150 mm above foundation formation level.
 - Otherwise: 150 mm above the level at which a line drawn from the corner of the foundation formation nearest the excavation at an angle below the horizontal of 30° cuts the near face of the lower excavation.
- Backfill material:
 - Below critical level: Lean mix concrete.
 - Above critical level: Hardcore filling as clause 710.

250 PERMISSIBLE DEVIATIONS FROM FORMATION LEVELS

- Beneath mass concrete foundations: ±25 mm.
- Beneath ground bearing slabs and RC. foundations: ±15 mm.
- Embankments and cuttings: ±50 mm.
- Ground abutting external walls: ±50 mm, but such as to ensure that finished level is not

less than 150 mm below dpc.

260 INSPECTING FORMATIONS

- Give notice: Make advance arrangements for inspection of formations for foundations and filling formations.
 - Notice (minimum): 5 days.
- Preparation: Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels and remove.
 - Loose material: Remove.
- Seal: Within 4 hours of inspection, seal formations with blinding concrete.

265 INSPECTING FORMATIONS IN SAND AND GRAVEL

- Notice for inspection (minimum): 5 days.
- Preparation: Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels and mechanically compact formation.
- Seal: Within 4 hours of inspection, seal formations with lean mix concrete.

267 INSPECTION OF FORMATIONS IN SHRINKABLE SOILS

- Inspect formation: For signs of conducting and fine moisture absorbing roots.
- Give notice: If significant quantities of roots are visible in the formation or in the bottom 75 mm of the walls of the excavation.

290 FOUNDATIONS IN MADE UP GROUND

- Depth: Excavate down to a natural formation of undisturbed subsoil.
- Discrepancy: Give notice if this is greater or lesser than depth given.

310 UNSTABLE GROUND

- Generally: Ensure that the excavation remains stable at all times.
- Give notice: Without delay if any newly excavated faces are too unstable to allow earthwork support to be inserted.
- Take action: If instability is likely to affect adjacent structures or roadways, take appropriate emergency action.

320 RECORDED FEATURES

- Recorded foundations, beds, drains, manholes, etc: Treat as clause 335.
- Contaminated earth: Remove and disinfect as required by local authority.

330 UNRECORDED FEATURES

- Give notice: If unrecorded foundations, beds, voids, basements, filling, tanks, pipes, cables, drains, manholes, watercourses, ditches, etc. not shown on the drawings are encountered.

337 OLD FOUNDATIONS OR WALLS BENEATH NEW GROUND SUPPORTED SLAB

- Break out: The old foundation/ wall to a depth below the slab formation level of at least 300 mm.
 - Excavate: Soil that has softened on either side of the old wall/ foundation.
- Backfill: Obtain instructions if depth of fill will be greater than 600 mm, otherwise backfill with compacted hardcore.

350 EXISTING WATERCOURSES

- Diverted watercourses which are to be filled: Before filling, remove vegetable growths and soft deposits.

360 EXCESS EXCAVATION

- Excavation taken wider than required:
 - Backfill: With hardcore as clause 710.
- Excavation taken deeper than required:
 - Backfill: With well graded granular material or lean mix concrete.

DISPOSAL OF MATERIALS

415 EXCAVATED TOPSOIL REMOVAL

- General: Remove from site.

441 SURPLUS SUBSOIL

- Excavated material: Stockpile in temporary storage heaps.
- Retained material: Spread and level surplus subsoil on site.
 - Locations: Submit proposals.
 - Protected areas: Do not raise soil level within root spread of trees that are to be retained.
- Remaining material: Remove from site.

450 WATER

- Generally: Keep all excavations free from water until:
 - Formations are covered.
 - Below ground constructions are completed.
 - Basement structures and retaining walls are able to resist leakage, water pressure and flotation.
- Drainage: Form surfaces of excavations and fill to provide adequate falls.
- Removal of water: Provide temporary drains, sumps and pumping as necessary. Do not pollute watercourses with silt laden water.

454 GROUND WATER LEVEL, SPRINGS OR RUNNING WATER

- Give notice: If it is considered that the excavations are below the water table.
- Springs/ Running water: Give notice immediately if encountered.

457 PUMPING

- General: Do not disturb excavated faces or stability of adjacent ground or structures.
- Pumped water: Discharge without flooding the site or adjoining property.
- Sumps: Construct clear of excavations. Fill on completion.
 - Locations: Submit proposals.

FILLING

500 PROPOSED FILL MATERIALS

- Details: Submit full details of proposed fill materials to demonstrate compliance with specification, including:
 - Type and source of imported fill.
 - Proposals for processing and reuse of material excavated on site.
 - Test reports as required elsewhere.
- Timing: At least 21 days before starting filling.

510 HAZARDOUS, AGGRESSIVE OR UNSTABLE MATERIALS

- General: Do not use fill materials which would, either in themselves or in combination with other materials or ground water give rise to a health hazard, damage to building structures or instability in the filling, including material that is:
 - Frozen or containing ice.
 - Organic.
 - Contaminated or noxious.
 - Susceptible to spontaneous combustion.
 - Likely to erode or decay and cause voids.
 - With excessive moisture content, slurry, mud or from marshes or bogs.
 - Clay of liquid limit exceeding 80 and/or plasticity index exceeding 55.
 - Unacceptable, class U2 as defined in the Highways Agency 'Specification for highway works', clause 601.

520 FROST SUSCEPTIBILITY

- General: Except as allowed below, fill must be non-frost-susceptible as defined in Highways Agency 'Specification for highway works', clause 801.8.

- Test reports: If the following fill materials are proposed, submit a laboratory report confirming they are non-frost-susceptible:
 - Fine grained soil with a plasticity index less than 20%.
 - Coarse grained soil or crushed granite with more than 10% retained on a 0.063 mm sieve.
 - Crushed chalk.
 - Crushed limestone fill with average saturation moisture content in excess of 3%.
 - Burnt colliery shale.
- Frost-susceptible fill: May only be used:
 - At depths below the finished ground surface greater than 450 mm.
 - Within the external walls of buildings below spaces that will be heated. Protect from frost during construction.
 - Where frost heave will not affect structural elements.

525 TESTING OF SUITABILITY OF FILL MATERIALS BEFORE START OF FILLING

- Laboratory: UKAS accredited laboratory.
- Submit report to: Structural engineer (two copies).
 - Timing: 21 days before starting filling.
- Samples: Deliver to laboratory as required.
 - Additional requirements: Also deliver 25 kg samples to offices of structural engineer. On request collect and dispose.
- Tests: As directed.
- Frequency: Submit with tender proposed rate and frequency of testing to demonstrate continuing compliance of imported or reprocessed fill with specified properties.

530 PLACING FILL

- Surfaces of excavations and areas to be filled: Free from loose soil, topsoil, organic material, rubbish and standing water.
- Freezing conditions: Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
- Adjacent structures, membranes and buried services:
 - Do not overload, destabilise or damage.
 - Submit proposals for temporary support necessary to ensure stability during filling.
 - Allow 14 days (minimum) before backfilling against in situ concrete structures.
- Layers: Place so that only one type of material occurs in each layer.
- Earthmoving equipment: Vary route to avoid rutting.

610 COMPACTED FILLING FOR LANDSCAPE AREAS

- Fill: Material capable of compaction by light earthmoving plant.
- Filling: Layers not more than 200 mm thick. Lightly compact each layer to produce a stable soil structure.

617 HIGHWAYS AGENCY TYPE 1 UNBOUND MIXTURE

- Fill: To Highways Agency 'Specification for highway works', clauses 801 and 803:
 - Crushed rock (other than argillaceous rock).
 - Crushed concrete.
 - Recycled aggregates.
 - Crushed non-expansive slag to clause 801.2.
 - Well-burned non-plastic colliery shale.
- Amendments to requirements in Highways Agency 'Specification for highway works': None.
- Filling: To Highways Agency 'Specification for highway works', clause 802.

618 HIGHWAYS AGENCY TYPE 2 UNBOUND MIXTURE

- Fill: To Highways Agency 'Specification for highway works', clauses 801 and 804:
 - Crushed rock (other than argillaceous rock).
 - Crushed concrete.
 - Crushed non-expansive slag to clause 801.2.
 - Well-burned non-plastic colliery shale.
 - Natural gravel.
 - Natural sand.

- Amendments to requirements in Highways Agency 'Specification for highway works': None.
- Filling: To Highways Agency 'Specification for highway works', clause 802.

700 BACKFILLING AROUND FOUNDATIONS

- Under oversite concrete and pavings: Hardcore.
- Under grassed or soil areas: Material excavated from the trench, laid and compacted in 300 mm maximum layers.

710 HARDCORE FILLING

- Fill: Granular material, free from excessive dust, well graded, all pieces less than 75 mm in any direction:
 - Test requirements:
 - Minimum 10% fines value tested in a soaked condition to BS 812-111 Not required.
 - Impact value SZ tested to BS EN 1097-2 Not required.
- Material:
 - In any one layer only one of the following:
 - Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
 - Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - Crushed non-expansive slag.
 - Gravel or hoggins with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - Well-burned non-plastic colliery shale.
 - Natural gravel.
 - Natural sand.
- Filling: Spread and level in 150 mm maximum layers. Thoroughly compact each layer.

715 VENTING HARDCORE LAYER

- Fill: Clean granular material, well graded, passing a 75 mm BS sieve but retained on a 20 mm BS sieve. In each layer only one of the following:
 - Crushed hard rock.
 - Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - Gravel.
- Filling: Spread and level in 150 mm maximum layers. Thoroughly compact each layer whilst maintaining enough voids to allow efficient venting.

730 BLINDING

- Surfaces to receive sheet overlays or concrete:
 - Blind with:
 - Concrete where shown on drawings; or
 - Sand, fine gravel, or other approved fine material applied to fill interstices. Moisten as necessary before final rolling to provide a flat, closed, smooth surface.
- Sand for blinding: To BS EN 12620, grade 0/4 or 0/2 (MP).
- Permissible deviations on surface level: +0 -25 mm.

D30 Piling

To be read with Preliminaries/ General conditions.

TENDERING

GENERAL

- 110 PILING SPECIFICATION
- Standard: Comply with the current edition of 'Specification for piling and embedded retaining walls' (SPERW).
 - Substitution of British Standard for SPERW requirements: None.
 - References to Engineer in SPERW: For the purpose of this contract, interpret such references as being to the person named in section A10 as administering the contract on behalf of the Employer.
- 130 PILES
- Standard: To SPERW, sections B2-B6, as appropriate to the pile type.
 - Permitted types: Continuous Flight Auger (CFA).
 - Project specification: Submit proposals to cover the SPERW requirements in clause B1.2 and listed under this heading for the chosen pile type.
 - Other requirements: None.
- 180 AUGERED CAST-IN-PLACE PILES
- Standard: To SPERW, sections B4.
 - Method of construction: Continuous flight auger.
 - Splitting of auger: Permitted.
 - Filling:
 - Material: Submit proposals.
 - Placing: Inject through hollow stem of auger.
 - Control of concreting/ grouting: Contractors choice.
 - Pile group designation: All.
 - Diameter: Submit proposals.
 - Length: Submit proposals.
 - Reinforcement:
 - Quantity: Submit proposals.
 - Extent: For full length of pile and projecting 75 mm above cut-off level.
 - Other requirements: None.
- 199 SYSTEM PERFORMANCE
- 210 CONTRACTOR DESIGN
- Structural requirements:
 - Generally: As section B50.
 - Modifications: None.
 - Design responsibility:
 - Piles: Complete design of piles in accordance with SPERW, clause B1.4, option 2.
 - Other: None.
 - Pile layout: Submit proposals to suit foundation layout and loads.
 - Performance criteria for piles: As clauses 130 and 280.
 - Other requirements: None.
 - Submission of information: As required by SPERW, table B1.1 and elsewhere, as appropriate for the pile type, materials and tests specified.
 - Amendments to requirements specified in SPERW for information required:
 - Prior to commencing design: None.
 - Prior to commencing the works:
 - Confirmation that installation of piles will not damage adjacent structures/ services
 - Confirmation that proposed rig/auger configuration is not susceptible to fighting for pile

diameters and soil conditions under consideration

- Details of size and weight of plant to be used
- Details of special equipment to be used to determine the depth and verticality of bore
- Method of controlling piling operations to ensure compliance with design, including setting out
- Method of stabilizing excavations in event of delay in concreting

260 SPECIFIED WORKING LOADS FOR PILES

- Design factor of safety (minimum): 3.0.
- Pile group designation: All.
 - Load magnitude: As drawings.

300 COMMENCING SURFACE

- Level: Top of piling mat as designed by piling contractor.

310 PILE LENGTH – PENETRATION

- Pile group designation: All.
- Pile cut-off level: 75 mm above underside of pile cap.
 - Stratum: Refer to soil investigation.
 - Penetration of pile into stratum (minimum): Refer to soil investigation.
 - Other requirements: To be confirmed during preliminary pile tests.

PRODUCTS

470 CONCRETE GENERALLY

- Standards: To BS 8500-2 and SPERW, section B19.
- Project compressive strength testing of concrete: Required as SPERW, clause B19.8.
- Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

530 REINFORCEMENT GENERALLY

- Steel reinforcement: To BS 4449.
 - Type/ strength grade: Ribbed bar, grade B500B.
- Supplier: Firm holding a valid certificate of approval issued under a product certification scheme operated by a third-party certification body with appropriate Category 2 accreditation from the United Kingdom Accreditation Service (UKAS).
- Other requirements: De-bond reinforcement that is above cut-off level and clean off debonding agent when pile has been trimmed.

540 COVER TO REINFORCEMENT

- Cover (nominal): Submit proposals.
- Method of ensuring correct cover: Submit details.

550 LAPS IN REINFORCEMENT

- Length (minimum): Laps are to be calculated in accordance with BS EN 1992-1-1.

EXECUTION

610 METHOD STATEMENT

- Requirement: Submit proposed method of installation to achieve the design parameters, including:
 - Details of equipment.
 - Programme showing sequence and resources.
- Confirmation that performance requirements for load and settlement will be achieved.

650 PERFORMANCE OF WORKING PILES

- Substandard performance: Give notice if the performance of any pile will be less than that of a similar pile whose test behaviour has been accepted.

696 METHOD OF PLACING PILE FILLING

- Designation: All.
 - Requirement: Through auger stem.

745 TESTING MORTAR AND CEMENT GROUT

- Standard: BS EN 445.
 - Exceptions: Strength test using 100 mm cubes.
- Preliminary tests: Not required.
- Frequency of compliance testing: As BS EN 446, clause 8.4.

755 PREPARATION OF PILE HEADS FOR INTEGRITY TESTING

- Preparation: To suit test method.
- Inconsistencies: Submit report on inconsistencies which could inhibit execution or interpretation of test.

760 PILE INTEGRITY TESTING - GENERAL

- Method: Submit proposals.
 - Satisfactory evidence in support of proposals: Submit.
- Period between casting and testing (minimum): 7 days.
- Pile group designation: All.
 - Number of piles to be tested: All.
 - Locations: All.
- Programme: Submit proposals.
- Other requirements: None.

825 WORK TO PILE HEADS AFTER TESTING

- Preliminary/ anchor piles: Not applicable.
- Working piles:
 - Cut out damaged concrete
 - Cut back concrete to expose reinforcement to provide full lap between pile reinforcement and pile cap starter bars; or
 - Cut back concrete to expose reinforcement, and fix pile cap starter bars to pile reinforcement using mechanical couplers.

COMPLETION

920 PILING GUARANTEE

- Type: Insurance backed. Administered by an independent insurance protection company.
 - Guarantee period (minimum): 12 years from completion.
 - Documentation: Provide certificates/ guarantees at completion of piling works.

D41 Crib walls, gabions and other gravity retaining walls

To be read with Preliminaries/ General conditions.

105 DESIGN AND CONSTRUCTION OF EARTH RETAINING STRUCTURE

- Requirement: Obtain from the structure manufacturer:
 - A design and details for the retention structure.
 - A stability check for the earth mass containing the structure.
- Type of structure: Contractor's choice.
- Structural requirements:
 - Generally: As section B50 or B51.
 - Modifications: None.
 - Design: Complete in accordance with the designated code of practice to satisfy specified performance criteria.
- Other requirements: None.
- Fill/ Backfill:
 - Material: Hardcore filling as section D20.
 - Compaction: As retaining structure manufacturer's instructions.
- Monitoring of ground conditions during construction: As section B50 or B51.

E

In situ concrete/Large precast concrete

E05 In situ concrete construction generally

To be read with Preliminaries/General conditions.

210 CONTRACTOR'S STRUCTURAL DESIGN

- Design responsibility: Suspended ground floor slab.
- Requirement:
 - Generally: As section B50.
 - Modifications: None.
 - Structure: Complete the design and prepare reinforcement drawings and schedules in accordance with the designated code of practice and to satisfy the specified performance criteria.
 - Additional requirements: None.
- Member sizes and locations: Submit proposals.
- Design and production information: As preliminaries.
- Timing of submissions: As Preliminaries section A31.

223 STRUCTURAL DRAWINGS AND SCHEDULES

- Standards:
 - Drawings: To 'Standard method of detailing structural concrete' published by the Institution of Structural Engineers.
 - Reinforcement schedules: To BS 8666.

290 ACCURACY OF CONSTRUCTION

- Setting out: To BS 5964-1.
- Geometrical tolerances: To BS EN 13670, Tolerance Class 1.
 - Conflicts: Notwithstanding tolerances specified elsewhere, do not exceed requirements for compliance with the designated code of practice.
 - Substitution of alternative requirements: None.

300 LEVELS OF STRUCTURAL CONCRETE FLOORS

- Tolerances (maximum):
- Level of floor: As Preliminaries section A33.
- Steps in floor level: ± 5 mm.

310 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - GENERAL

- Standard: To BS 8204-1 or -2.
- Measurement: From underside of a 2 m straightedge (between points of contact) placed anywhere on surface and using a slip gauge.

315 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - TOLERANCE CLASS S R1

- Location: Warehouse.
- Abrupt changes: Not permitted.

410 IN SITU CONCRETE CONSTRUCTION - SUPERVISION/ CHECKING

- Standard: To BS EN 13670, Execution Class 1.

E10 Mixing/casting/curing in situ concrete

To be read with Preliminaries/General conditions.

CONCRETE MIXES

- 101 SPECIFICATION
- Concrete generally: To BS 8500-2.
 - Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.
- 105 DESIGNATED CONCRETE FOR REINFORCED GROUND GENERALLY
- Designation: Minimum RC32/40.
 - Fibres: Not required.
 - Aggregates:
 - Size (maximum): 20 mm.
 - Coarse recycled aggregates: Contractor's choice.
 - Additional aggregate requirements: None.
 - Special requirements for cement/ combinations: None.
 - Consistence class: Contractor's choice.
 - Chloride class: Normal.
 - Admixtures: Concrete producer's choice.
 - Additional mix requirements: None.
- 110 BASIC DESIGNATED CONCRETE FOR BLINDING AND NON-STRUCTURAL USES
- Designation: GEN1.
 - Coarse recycled aggregates: Not permitted.
 - Consistence class: Contractor's choice.
 - Additional requirements: Submit proposals.
- 125 SUBSTITUTION OF STANDARDIZED PRESCRIBED CONCRETE FOR DESIGNATED CONCRETE
- General: Conform to BS 8500-2, clause 9.
 - Substitution: In accordance with BS 8500-1, Table A.14.
 - Proposals: Submit for each substitution, stating reasons.
 - Site mixing: Not permitted.
- MATERIALS, BATCHING AND MIXING**
- 215 READY-MIXED CONCRETE
- Production plant: Currently certified by a body accredited by UKAS to BS EN ISO/IEC 17065 for product conformity certification of ready-mixed concrete.
 - Source of ready-mixed concrete: Obtain from one source if possible. Otherwise, submit proposals.
 - Name and address of depot: Submit before any concrete is delivered.
 - Delivery notes: Retain for inspection.
 - Declarations of nonconformity from concrete producer: Notify immediately.
- 225 CHANGES TO SPECIFICATION
- Changes to specification of fresh concrete (outside concrete producer's responsibility): Prohibited
- 415 ADMIXTURES
- Calcium chloride and admixtures containing calcium chloride: Do not use.
- PROJECT TESTING/ CERTIFICATION**
- 505 PROJECT TESTING OF CONCRETE - GENERAL
- Testing: To BS EN 206, Annex B.
 - Nonconformity: Obtain instructions immediately.

- Recording: Maintain complete correlated records including:
 - Concrete designation.
 - Sampling, site tests, and identification numbers of specimens tested in the laboratory.
 - Location of the parts of the structure represented by each sample.
- Location in the structure of the batch from which each sample is taken.

508 REGULAR PROJECT TESTING OF CONCRETE

- Tests: Compressive strength and Early age compressive strength testing at 7 days.
- Tests for consistence class of self-compacting concrete: None.
- Consistence testing period: None.
- Sampling:
 - Point: At point of discharge from delivery truck.
 - Rate: One sample per 60 m³.
- Other requirements: Cubes for early age strength testing to be stored under same conditions as concrete in members.

530 TESTS RESULTS

- Submission of reports: Within one day of completion of each test.
 - Number of copies: Three.
- Reports on site: A complete set, available for inspection.

PLACING/ COMPACTION/ CURING AND PROTECTION

630 PREMATURE WATER LOSS

- Requirement: Prevent water loss from concrete laid on absorbent substrates.
 - Underlay: Select from:
 - Polyethylene sheet: 250 micrometres thick.
 - Building paper: To BS 1521, grade B1F.
 - Installation: Lap edges 150 mm.

640 CONSTRUCTION JOINTS

- Location of joints: Submit proposals when not shown on drawings.
- Preparation of joint surfaces: As section E40.

650 SURFACES TO RECEIVE CONCRETE

- Cleanliness of surfaces immediately before placing concrete: Clean with no debris, tying wire clippings, fastenings or free water.

680 PLACING

- Records: Maintain for time, date and location of all pours.
- Timing: Place as soon as practicable after mixing and while sufficiently plastic for full compaction.
- Temperature limitations for concrete: 30°C (maximum) and 5°C (minimum), unless otherwise specified. Do not place against frozen or frost covered surfaces.
- Continuity of pours: Place in final position in one continuous operation up to construction joints. Avoid formation of cold joints.
- Discharging concrete: Prevent uneven dispersal, segregation or loss of ingredients or any adverse effect on the formwork or formed finishes.
- Thickness of layers: To suit methods of compaction and achieve efficient amalgamation during compaction.
- Poker vibrators: Do not use to make concrete flow horizontally into position, except where necessary to achieve full compaction under void formers and cast-in accessories and at vertical joints.

690 COMPACTING

- General: Fully compact concrete to full depth to remove entrapped air. Continue until air bubbles cease to appear on the top surface.
 - Areas for particular attention: Around reinforcement, under void formers, cast-in accessories, into corners of formwork and at joints.
- Consecutive batches of concrete: Amalgamate without damaging adjacent partly hardened

- concrete.
 - Methods of compaction: To suit consistence class and use of concrete.
- 810 CURING GENERALLY
- Evaporation from surfaces of concrete: Prevent, including from perimeters and abutments, throughout curing period.
 - Surfaces covered by formwork: Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.
 - Top surfaces: Cover immediately after placing and compacting. If covering is removed for finishing operations, replace it immediately afterwards.
 - Surface temperature: Maintain above 5°C throughout the specified curing period or four days, whichever is longer.
 - Records: Maintain details of location and timing of casting of individual batches, removal of formwork and removal of coverings. Keep records on site, available for inspection.
- 811 COVERINGS FOR CURING
- Sheet coverings: Suitable impervious material.
 - Curing compounds: Selection criteria:
 - Curing efficiency: Not less than 75% or for surfaces exposed to abrasion 90%.
 - Colouring: Fugitive dye.
 - Application to concrete exposed in the finished work: Readily removable without disfiguring the surface.
 - Application to concrete to receive bonded construction/ finish: No impediment to subsequent bonding.
 - Interim covering to top surfaces of concrete: Until surfaces are in a suitable state to receive coverings in direct contact, cover with impervious sheeting held clear of the surface and sealed against draughts at perimeters and junctions.
- 817 CURING CLASS
- Standard: To BS EN 13670 Curing class 1.
- 818 CURING PERIODS GENERALLY
- Minimum periods: When not otherwise indicated, to BS EN 13670, Annex F.8.5.
- 840 PROTECTION
- Prevent damage to concrete, including:
 - Surfaces generally: From rain, indentation and other physical damage.
 - Surfaces to exposed visual concrete: From dirt, staining, rust marks and other disfiguration.
 - Immature concrete: From thermal shock, physical shock, overloading, movement and vibration
 - In cold weather: From entrapment and freezing expansion of water in pockets, etc.

E20 Formwork for in situ concrete

To be read with Preliminaries/ General conditions.

GENERALLY/ PREPARATION

- 110 LOADINGS
- Requirement: Design and construct formwork to withstand the worst combination of the following:
 - Total weight of formwork, reinforcement and concrete.
 - Construction loads including dynamic effects of placing, compacting and construction traffic.
 Wind and snow loads.
- 170 WORK BELOW GROUNDPILE CAPS
- Casting vertical faces against faces of excavation: Permitted provided face of excavation is stable.
 - Requirements: Increase nominal cover to reinforcement to 75mm.
- 178 FORMATION OF OPENINGS IN COMPOSITE ACTION SLABS
- Generally: Except as otherwise agreed, box out for openings in concrete.
 - Forming holes in profiled steel sheet:
 - Timing: For openings not trimmed by structural steelwork, do not cut sheet until concrete reaches 75% of its 28 day strength.
 - Method: Contractor's choice.
- 190 SUBSTRUCTURE FORMWORK FOR GROUND BEAMS AND PILE CAPS
- Manufacturer: Contractor's choice.
 - Product reference: Submit proposals.
 - Ground movement accommodation: None.

CONSTRUCTION

- 310 ACCURACY
- General requirement for formwork: Accurately and robustly constructed to produce finished concrete in the required positions and to the required dimensions.
 - Formed surfaces: Free from twist and bow (other than any required cambers).
 - Intersections, lines and angles: Square, plumb and true.
- 315 SUBSTRUCTURE FORMWORK AND UNDERSLAB INSULATION
- Cutting: Neat and accurate to edges, and around penetrations and downstands.
 - Laying: Tightly butted and fully supported on firm, even substrate.
 - Vertical faces: Stiffen as necessary to act as shutter.
 - Formwork/ insulation surfaces: Protect from indentation by spacers and other items.
 - Joints in formwork/ insulation and with edge structure and penetrations: Seal to prevent penetration of concrete.
 - Concrete placement: Restrain formwork/ insulation against movement.
- 320 JOINTS IN FORMS
- Requirements including joints in form linings and between forms and completed work:
 - Prevent loss of grout, using seals where necessary.
 Prevent formation of steps. Secure formwork tight against adjacent concrete.
- 330 INSERTS, HOLES AND CHASES
- Positions and details:
 - Dimensioned on drawings provided on behalf of the Employer: Do not change without consent.
 - Un-dimensioned or from other sources: Submit proposals.

- Positioning relative to reinforcement: Give notice of any conflicts well in advance of placing concrete.
- Method of forming: Fix inserts or box out as required. Do not cut hardened concrete without approval.

STRIKING

510 STRIKING FORMWORK

- Timing: Prevent any disturbance, damage or overloading of the permanent structure.

521 MINIMUM PERIOD FOR RETAINING FORMWORK/ TEMPORARY SUPPORTS IN POSITION

- Concrete strength at time of formwork removal (minimum):
To BS EN 13670, clauses 5.7 and 8.5, and Annex F.
- Assumptions: None.
 - Before removing formwork: Submit proposals if assumptions will not be realised.
- Method to be used in assessing early age strength of concrete: To BS EN 13670, Annex F.

FORMED FINISHES

610 BASIC FINISH

- Location: Faces below ground level.
- Finish: Faces fully compacted and cover to reinforcement provided.

E30 Reinforcement for in situ concrete

To be read with Preliminaries/ General conditions.

110 QUALITY ASSURANCE OF REINFORCEMENT

- Standards:
 - Reinforcement: To BS 4449, BS 4482, BS 4483 or BS 6744.
 - Cutting and bending: To BS 8666.
- Source of reinforcement: Companies holding valid certificates of approval for product conformity issued by the UK Certification Authority for Reinforcing Steels (CARES).

140 PLAIN BAR REINFORCEMENT

- Standard: To BS 4482.
- Strength grade: 250.

150 RIBBED BAR REINFORCEMENT

- Standard: To BS 4449.
- Strength grade: B500B.

210 STANDARD FABRIC REINFORCEMENT

- Standard: To BS 4483.
- Strength grade: B500B.

255 PREFABRICATED CONTINUITY REINFORCEMENT STRIPS

- Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

310 CUTTING AND BENDING REINFORCMENT

- General: To schedules and to BS 8666.
- Bending on site, including minor adjustments: Not permitted.

320 PROTECTION OF REINFORCEMENT

- Dropping from height, mechanical damage and shock loading: Prevent.
- Cleanliness of reinforcement at time of pouring concrete: Free from corrosive pitting, loose mill scale, loose rust and contaminants which may adversely affect the reinforcement, concrete, or bond between the two.

425 LAPS NOT DETAILED ON DRAWINGS

- Laps in bar reinforcement (minimum): Laps are to be calculated in accordance with BS EN 1992-1-1.
- Laps in fabric reinforcement (minimum): 300mm.
Laps at corners: Avoid four-layer build-up.

451 FIXING REINFORCEMENT

- Standard: To BS 7973-1 and -2.
- Installation: In addition to any spacers and chairs shown on drawings or schedules, provide adequate support, tie securely and maintain the specified cover.
- Tying:
 - Wire type: 16 gauge black annealed. Use stainless steel wire for stainless steel reinforcement.
 - Ends of tying wire: Prevent intrusion into the concrete cover. Remove loose ends.
- Compatibility of metals: Prevent contact between ordinary carbon steel and stainless or galvanized reinforcement.

480 NOMINAL COVER TO REINFORCEMENT

- Top face: 50 mm.
- Formed faces: Generally, 50 mm but 75 for surfaces cast against soil.

E40 Designed joints in in situ concrete

To be read with Preliminaries/General conditions.

120 CONSTRUCTION/MOVEMENT JOINTS GENERALLY

- Accuracy: Position and form joints accurately, straight, well-aligned and truly vertical or horizontal or parallel with setting out lines of the building.
 - Modifications to joint design or location: Submit proposals.
 - Placing concrete to form movement joints:
 - Maintain effectiveness of joints. Prevent concrete entering joints or penetrating or impregnating compressible joint fillers.
- Do not place concrete simultaneously on both sides of movement joints.

132 ADDITIONAL REQUIREMENTS FOR CONSTRUCTION JOINTS

- Limitations: Not permitted in concrete exposed to view.

210 FORMED JOINTS

- Forms/ stop ends generally: Rigid and grout-tight.
- Forms/ stop ends for projecting continuity reinforcement: To accommodate bars or fabric without temporary bending or displacement.

211 FORMED JOINTS IN CONCRETE WEARING SURFACES

- Temporary forms: Square edged with a steel top surface.
- Placing concrete: Compact thoroughly at edges to give level, closely abutted joints with no lipping.

230 PREPARATION OF CONSTRUCTION JOINTS

- Roughening of joint surfaces: Select from:
 - Brushing and spraying: Remove surface laitance and expose aggregate finish while concrete is still green.
 - Other methods: Submit proposals.
- Condition of joint surfaces immediately before placing fresh concrete: Clean and damp.

260 SAWN CRACK INDUCING GROOVES

- Groove dimensions:
 - Depth: Not less than one quarter the depth of the slab.
 - Width: As narrow as practicable.
- Sawing: Sufficiently early to prevent random cracking (within 24 hours of casting slab) and to produce strong, well defined arrises.
- Groove filling: Sheet joint filler and sealant.

430 CARBON STEEL DOWEL BARS

- Standard: To BS EN 10025-2.
 - Product form: Plain.
 - Strength grade: 250.
 - Properties: Perfectly straight, with sawn (not sheared) ends.
- Debonding: Achieve effective debonding of each bar
 - Material: Suitable proprietary debonding compound or Suitable plastics sleeve.
 - Extent: 50% of bar length.
- Position: At right angles to and centred on joint.
- Other requirements: None

520 SHEET JOINT FILLER FOR EXPANSION JOINTS AND ISOLATION JOINTS

- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
- Joints finished with sealant: Leave sufficient space for sealant by using temporary formers.

530 SEALANT FOR SAWN JOINTS IN WAREHOUSE FLOOR.

- Manufacturer: Submit proposals.
 - Product reference: Submit proposals.
 - Colour of surfaces exposed to view: Submit proposals.
 - Preparation and application: As section Z22.
 - Guarantee: Not Required.
 - Period: N/A.
- Requirements: Compatible with retained liquid and joint filler.

545 COMPRESSIBLE SEALING STRIP SYSTEM FOR SAWN JOINTS IN FLOOR SLABS

- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
 - Colour: To Architects Specification.

E41 Worked finishes to in situ concrete

- To be read with Preliminaries/ General conditions.
- 120

DIRECTLY FINISHED CONCRETE WEARING SURFACES FOR WAREHOUSE

- Abrasion resistance class to BS 8204-2: AR1/DF.
 - Tolerances:
 - Surface regularity: As clause E05/315.
 - Level: Permissible deviation of wearing surface from datum (maximum): ±10 mm.
 - Finish: Trowelled as clause 330.
 - Additional surface treatment: Surface sealer as clause 520.
 - Slip resistance testing: PTV 40.
 - Curing: As section E10.
- 150

FINISHING

- Timing: Carry out at optimum times in relation to setting and hardening of concrete.
 - Prohibited treatments to concrete surfaces:
 - Wetting to assist surface working.
 - Sprinkling cement.
- 230

BRUSHED FINISH

- Surface on completion: Light, even texture.
- 320

TROWELLED FINISH

- Surface on completion: Uniform, smooth but not polished, free from trowel marks and blemishes, and suitable to receive specified flooring material.
- 520

SURFACE SEALER

- Manufacturer: Contractor's choice.
 - Product reference: Submit proposals.
 - Substrate:
 - Moisture content: As recommended by sealer manufacturer. Test relative humidity to BS 8203, Annex A where required to verify suitability.
 - Condition prior to application: Cured, clean and free from contaminants.
 - Primer: To suit surface sealer.
 - Application: Evenly to dry surfaces to form an effective seal but without a glossy finish.
- 530

SLIP RESISTANCE TESTING OF WEARING SURFACES

- Test: To BS 7976-2 using a Transport Research Laboratory (TRL) Pendulum.
 - Timing: Give adequate notice.
 - Test results: Submit, inclusive of slip resistance values (pendulum test value [PTV]), in the wet and dry states.

E42 Accessories cast into in situ concrete

- To be read with Preliminaries/General conditions.
- GENERAL**
- 110

ACCESSORIES SPECIFIED ELSEWHERE

- Item/ location: Holding down systems as section G10 cast into foundation.
- PRODUCTS**
- EXECUTION**
- 610

HOLLOW ACCESSORIES

- Filling/ sealing: Temporally fill or seal accessory to prevent ingress of grout during concreting. Leave filling/ seals in position until accessory is used.
- 620

TEMPORARY SUPPORTS

- Location: Provide to hold accessories for casting into un-shuttered surface of concrete, set at a level that will not adversely affect finish of concrete surface remote from accessory.
 - Position: Hold securely to prevent lateral movement or rotation of accessory during concreting.
- 630

PROTECTIVE COATINGS

- Inspect: Immediately prior to casting concrete.
 - Damage to coatings:
 - Minor: Submit proposals for coating repair.
 - Significant: Replace accessory.
- 640

INSTALLATION

- Cleanliness: At time of casting, surfaces in contact with concrete to be free from contaminants which may adversely affect accessory, reinforcement, concrete, or bond between accessory and concrete.
 - Position: Hold accessory firmly in position, preventing displacement during concreting.
 - Other requirements: The day after casting, check that bolts in sockets are free to move.

F
Masonry

F10 Brick/ block walling

To be read with Preliminaries/ General conditions.

TYPES OF WALLING

- 110 CLAY FACING BRICKWORK EXTERNAL WALL
- Bricks: To BS EN 771-1.
 - Manufacturer: To Architects specification.
 - Product reference: To Architects specification.
 - Recycled content: To Architects specification.
 - Special shapes: To Architects specification.
 - Mortar: As section Z21.
 - Standard: To BS EN 998-2.
 - Mix: 1:3 masonry cement: sand 6 N/mm² (mortar class 6).
 - Additional requirements: None.
 - Bond: To Architects specification.
 - Joints: To Architects specification.
 - Features: To Architects specification.
- 255 CONCRETE FACING BLOCKWORK TO INTERNAL WALLS
- Blocks: To BS EN 771-3.
 - Manufacturer: To Architects specification.
 - Product reference: To Architects specification.
 - Configuration: To Architects specification.
 - Compressive strength:
 - Mean value: 7.3 N/mm².
 - Characteristic value: 7.3 N/mm².
 - Category: I.
 - Freeze/ Thaw resistance: Not applicable.
 - Recycled content: Submit proposals.
 - Work sizes (length x width x height): 440 x 100 x215 mm.
 - Tolerance category: D1.
 - Finish/ Colour: To Architects specification.
 - Special shapes: None.
 - Additional requirements: None.
 - Mortar: As section Z21.
 - Standard: To BS EN 998-2.
 - Mix: 1:2:9 cement:lime:sand 12 N/mm² (mortar class 2).
 - Additional requirements: None.
 - Bond: To Architects specification.
 - Joints: To Architects specification.
 - Features: To Architects specification.
- 355 CONCRETE COMMON BLOCKWORK FOR INTERNAL WALLS
- Blocks: To BS EN 771-3.
 - Manufacturer: To Architects specification.
 - Product reference: To Architects specification.
 - Configuration: To Architects specification.
 - Compressive strength:
 - Mean value: 7.3 N/mm².
 - Characteristic value: 7.3 N/mm².
 - Category: I.
 - Freeze/ Thaw resistance: Not applicable.
 - Thermal properties: To Architects specification.
 - Recycled content: Submit proposals
 - Work sizes (length x width x height): 440 x 100 x 215 mm.
 - Tolerance category: D1.
 - Special shapes: None.

- Additional requirements: None.
- Mortar: As section Z21.
 - Standard: To BS EN 998-2.
 - Mix: 1:3 masonry cement:sand 6 N/mm² (mortar class 6).
 - Additional requirements: None.
- Bond: To Architects specification.

385 ENGINEERING BRICKWORK IN MANHOLES

- Bricks: To BS EN 771-1.
 - Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
 - Type: HD.
 - Mean compressive strength: Greater than or equal to 75 N/mm².
 - Category: II.
 - Water absorption: Equal to or less than. 7.5%.
 - Freeze/ Thaw category: F2.
 - Active soluble salts content category: S2.
 - Additional requirements: None.
- Mortar: As section Z21.
 - Standard: To BS EN 998-2.
 - Mix: :0.25:3 cement:lime:sand, 12 N/mm² (mortar class 12).
 - Additional requirements: None.
- Bond: English.
- Joints: Flush.

WORKMANSHIP GENERALLY

430 CONDITIONING OF CLAY AND CALCIUM SILICATE BRICKS AND CLAY BLOCKS

- Bricks and blocks delivered warm from manufacturing process: Do not use until cold.
- Absorbent bricks in warm weather: Wet to reduce suction. Do not soak.

440 CONDITIONING OF CONCRETE BRICKS/ BLOCKS

- Autoclaved concrete bricks/ blocks delivered warm from manufacturing process: Do not use.
- Age of non-autoclaved concrete bricks/ blocks: Do not use until at least four weeks old.
- Avoidance of suction in concrete bricks/ blocks: Do not wet.
 - Use of water retaining mortar admixture: Submit details.

500 LAYING GENERALLY

- Mortar joints: Fill vertical joints. Lay bricks, solid and cellular blocks on a full bed.
- AAC block thin mortar adhesive and gypsum block adhesive joints: Fill vertical joints. Lay blocks on a full bed.
- Clay block joints:
 - Thin layer mortar: Lay blocks on a full bed.
 - Interlocking perpend: Butted.
- Bond where not specified: Half lap stretcher.
- Vertical joints in brick and concrete block facework: Even widths. Plumb at every fifth cross joint.

535 HEIGHT OF LIFTS IN WALLING USING CEMENT GAUGED OR HYDRAULIC LIME MORTAR

- Quoins and advance work: Rack back.
- Lift height (maximum): 1.2 m above any other part of work at any time.
- Daily lift height (maximum): 1.5 m for any one leaf.

545 LEVELLING OF SEPARATE LEAVES USING CEMENT GAUGED OR HYDRAULIC LIME MORTAR

- Locations for equal levelling of cavity wall leaves: As follows:
 - Every course containing vertical twist type ties or other rigid ties.
 - Every third tie course for double triangle/ butterfly ties.

- Courses in which lintels are to be bedded.

560 COURSING BRICKWORK

- Gauge: Four brick courses including bed joints to 300 mm.

580 LAYING FROGGED BRICKS

- Single frogged bricks: Frog uppermost.
- Double frogged bricks: Larger frog uppermost.
- Frog cavity: Fill with mortar.

635 JOINTING

- Profile: Consistent in appearance.

645 ACCESSIBLE JOINTS NOT EXPOSED TO VIEW

- Jointing: Struck flush as work proceeds.

665 POINTING TO BRICKWORK ABOVE DPC

- Joint preparation: Remove debris. Dampen surface.
- Mortar: As section Z21.
 - Standard: To BS EN 998-2.
 - Mix: 1:3 masonry cement:sand 6 N/mm² (mortar class 6).
 - Additional requirements: To Architects specification.
- Profile: To Architects specification.

671 FIRE STOPPING

- Avoidance of fire and smoke penetration: Fit tightly between cavity barriers and masonry. Leave no gaps.

690 ADVERSE WEATHER

- General: Do not use frozen materials or lay on frozen surfaces.
- Air temperature requirements: Do not lay bricks/ blocks:
 - In cement gauged mortars when at or below 3°C and falling or unless it is at least 1°C and rising.
 - In hydraulic lime:sand mortars when at or below 5°C and falling or below 3°C and rising.
 - In thin joint mortar glue when outside the limits set by the mortar manufacturer.
- Temperature of walling during curing: Above freezing until hardened.
- Newly erected walling: Protect at all times from:
 - Rain and snow.
- Drying out too rapidly in hot conditions and in drying winds.

ADDITIONAL REQUIREMENTS FOR FACEWORK

710 THE TERM FACEWORK

- Definition: Applicable in this specification to all brick/ block walling finished fair. Painted facework: The only requirement to be waived is that relating to colour.

750 COLOUR CONSISTENCY OF MASONRY UNITS

- Colour range: Submit proposals of methods taken to ensure that units are of consistent and even appearance within deliveries.
- Conformity: Check each delivery for consistency of appearance with previous deliveries and with approved reference panels; do not use if variation is excessive.
- Finished work: Free from patches, horizontal stripes and racking back marks.

760 APPEARANCE

- Brick/ block selection: Do not use units with damaged faces or arrises.
- Cut masonry units: Where cut faces or edges are exposed cut with table masonry saw.
- Quality control: Lay masonry units to match relevant reference panels.
 - Setting out: To produce satisfactory junctions and joints with built-in elements and components.
 - Coursing: Evenly spaced using gauge rods.

- Lifts: Complete in one operation.
 - Methods of protecting facework: Submit proposals.
- 780 GROUND LEVEL
- Commencement of facework: Not less than 150 mm below finished level of adjoining ground or external works level.
- 790 PUTLOG SCAFFOLDING
- Use: Not permitted in facework.
- 800 TOOTHED BOND
- New and existing facework in same plane: Bond together at every course to achieve continuity.
- 830 CLEANLINESS
- Facework: Keep clean.
 - Mortar on facework: Allow to dry before removing with stiff bristled brush.
 - Removal of marks and stains: Rubbing not permitted.

F22 Cast stone ashlar walling/dressings

To be read with Preliminaries/General conditions.

STRUCTURAL REQUIREMENTS

- 102 CONTRACTOR'S DESIGN
- Design responsibility: Design and detail reinforced masonry retaining walls.
 - Structural and fire requirements:
 - Generally: As section B50.
 - Modifications: None.
 - Design: Complete the design in accordance with the designated code of practice to satisfy specified performance criteria for masonry, reinforcement, wall ties, anchors, lintels
 - Workmanship supervision and control: Give notice of walling for which class 1 execution control is required.
 - Functional requirements: Not applicable.
 - Additional requirements: None.
 - Design and production information: As Preliminaries section A31.
 - Timing of submissions: As Preliminaries section A31.

TYPES OF WALLING

- 110 CAST STONEWALLING AND DRESSINGS
- Cast stone units:
 - Manufacturer: Submit proposals.
 - Product reference: Contractor's choice.
 - Absorption: To BS 1217 Capillary absorption test (CAT).
 - Compressive strength:
 - Average cube strength (minimum): 35MPa (35 N/mm²).
 - Single cube strength (minimum): 28MPa (28 N/mm²).
 - Finish: To architects' specification.
 - Colour: To architects' specification.
 - Mortar: As section Z21.
 - Mix: 1:3:12 cement:lime:sand.
 - Sand: To BS EN 13139; crushed stone with grading to approval.
 - Bond: As drawings.
 - Joints: Flush.
 - Width: 3-5mm.
 - Pointing: Not applicable.
 - Other requirements: None.

- 120 HARD LANDSCAPING MATERIALS SPECIFICATION
- Minimum BRE 'Green Guide to Specification Online' rating: Contractor's choice.

GENERAL REQUIREMENTS

- 255 COMPRESSIVE STRENGTH
- Cube strength: Sampling to BS 1217. Testing to BS EN 12390-1, 2 and 3 as appropriate, with compaction and curing representative of the methods used in production of the cast stone components.
- 300 REINFORCEMENT
- Non-structural reinforcement: Include to resist shrinkage and handling stresses.
 - Carbon steel reinforcement: To BS 4449 and BS 4483 as appropriate.
 - Cutting and bending: To BS 8666.
 - Galvanized reinforcement: Galvanizing to BS EN ISO 1461 after cutting.
 - Stainless steel reinforcement: To BS 6744, designation 1.4301.
 - Cutting and bending: To BS 8666.

- Condition at time of placement: Clean, free of corrosive pitting, loose materials and substances which adversely affect the reinforcement, mix, or bond between the two.
- Fixing: Accurate and secure. Prevent intrusion of wire or clips into the cover.

305 BED JOINT REINFORCEMENT

- Standard: To BS EN 845-3.

312 COVER TO REINFORCEMENT

- General: Minimum cover to reinforcement:
 - Carbon steel:
 - 40 mm: External faces (exposed to weather).
 - 30 mm: Internal faces (protected from weather).
 - Galvanized steel:
 - 30 mm: External faces (exposed to weather).
 - 20 mm: Internal faces (protected from weather).
 - Austenitic stainless steel:
 - 10 mm or 2 x bar diameter: All faces (select the greater of the two).
 - Other materials/ coatings: Submit proposals including minimum cover.

335 MANUFACTURING ACCURACY

- Standard: To BS 1217, section 8.
- Additional tolerances: None.

340 MIXES GENERALLY

- Constituent materials and mix design: Achieve constant colour and texture for each finish type.
- Aggregates for facing mixes: Free from particles which may cause 'popouts', or unsightly marking or staining.
- Total chloride ion content (maximum): Cl 0.40.
- Admixtures containing calcium chloride: Do not use.

350 SEPARATE FACING AND BACKING MIXES

- Thickness of facing mix at any point (minimum): 20 mm.
- Distance of reinforcement from the junction of the two mixes (minimum): 10 mm.
- Joining facing and backing mixes: Bond so that they are effectively monolithic.

360 CASTING AND CURING

- Compaction: Thorough.
- Protection: Prevent premature drying out during curing period.
- Immature components: Prevent distortion from movement, vibration, overloading, physical shock, rapid cooling and thermal shock.
- Delivery to site: Not until at least 14 days after casting.

370 QUALITY OF FINISHES

- Appearance standard: As established by samples.

LAYING AND JOINTING

430 ADVERSE WEATHER

- General: Do not use frozen materials and do not lay on frozen surfaces.
- Temperature: Do not lay blocks/ dressings:
 - In cement gauged mortars when the air temperature is at or below 3°C and falling or below 1°C and rising (unless mortar has a temperature of not less than 4°C when laid and walling is thoroughly protected).
 - In hydraulic lime:sand mortars when the air temperature is at or below 5°C and falling or below 3°C and rising.
- Freezing conditions: Maintain temperature of the work above freezing until mortar has fully set.
- Precipitation: Protect newly erected walling against rain and snow by covering when precipitation occurs and at all times when work is not proceeding.

- Hot and dry conditions: Prevent newly erected masonry from drying out too rapidly.
- Remedial work: Rake out and replace mortar damaged by frost and where instructed, rebuild damaged work.

450 WALLING/ DRESSINGS BELOW GROUND LEVEL

- Extent of facework below finished level of adjoining ground or external works level (minimum): 150 mm.

490 PUTLOG SCAFFOLDING

- Use: Not permitted.

500 ONE PIECE SILLS/ THRESHOLDS

- Bed joints: Leave open except under:
 - End bearings.
 - Masonry mullions.
- Pointing on completion: Mortar to match adjacent work.

535 POINTING

- Joint preparation: Rake out to depth of 7–10 mm as work proceeds. Remove debris. Dampen surface.
- Mortar application: Neat and consistent.

F31 Precast concrete sills/ lintels/ copings/ features

To be read with Preliminaries/ General conditions.

TYPES OF COMPONENT

- 105 PRECASTLINTELS
- Concrete: Components manufacturer's 'proprietary' concrete.
 - Identity: Submit labelled sample.
 - Conformity: To BS 8500-2 and the recommendations of BS 8500-1, Annex A.4 for the specified exposure class.
 - Evidence: Submit third party certification from a UKAS accredited laboratory.
 - Exposure class: XC1.
 - Reinforced components: Submit proposals for type of reinforcement and cover.
 - Matching sample for finish to visible faces: As reference sample.
 - Other requirements: None.

GENERAL REQUIREMENTS

- 210 MOULDS
- Permissible fabrication and operating tolerances: Length 0 to +6 mm, other dimensions ±3 mm.

- 220 CONCRETE GENERALLY
- Specification: To BS 8500-2 and BS EN 206-1.
 - Producer: Currently certified by a body accredited by UKAS to BS EN 45011 or BS EN ISO/IEC 17065 for product conformity certification of ready-mixed concrete.
 - Chloride class of concrete: Excluding SPRC: C 10.40
 - Using SRPC: C1 0.20.
 - Reinforced and heat cured: C1 0.10.
 - Prestressed: C1 0.10.
 - Admixtures containing calcium chloride: Not allowed.

- 250 REINFORCEMENT
- Carbon steel reinforcement: As appropriate to BS 4449, BS 4482 and BS 4483.
 - Cutting and bending: To BS 8666.
 - Galvanized reinforcement: Galvanized to BS EN ISO 1461 after cutting. Chromate treated.
 - Stainless steel reinforcement: To BS 6744.
 - Designation: 1.4301.
 - Cutting and bending: To BS 8666.
 - Non-structural reinforcement: Include to resist shrinkage and handling stresses.
 - Bimetallic corrosion and staining: Prevent by appropriate selection and use of materials.
 - Condition at time of placement: Clean, free of corrosive pitting, loose materials and substances that adversely affect reinforcement, concrete, or bond between the two.
 - Fixing: Accurate and secure.
 - Method: Wire tying, approved steel clips or tack welding if permitted.
 - Concrete cover: Maintain free of all tying wire or clips.

- 260 CASTING AND CURING
- Placing of concrete: Thoroughly compact.
 - Protection against drying out: Methods and duration to BS EN 13369 clause 4.2.1.3.
 - Immature components: Avoid movement, vibration, overloading, physical shock, rapid cooling and thermal shock.
 - Delivery to site: Minimum 14 days after casting.

INSTALLATION

- 420 LAYING

- Mortar for bedding and jointing: As section Z21.
 - Type: Site batched and mixed.
 - Mix: 1:3 masonry cement:sand 6 N/mm² (mortar class 6).
 - Packing: If required use slate.
- Bedding components: On full bed of mortar.
- Removal of marks, stains and extraneous mortar on visible faces: Rubbing not permitted.

G

Structural/Carcassing metal/timber

G10 Structural steel framing

To be read with Preliminaries/ General conditions.

GENERAL REQUIREMENTS/ INFORMATION

- 110 CONTRACTOR'S DESIGN OF JOINTS OF STEEL FRAME
- Design concept: Beams designed as simply supported under dead and imposed loads, but with rigid joints to the columns for lateral stability and wind loading.
 - Design responsibility: Design connections and detail steelwork and connections.
 - Other responsibilities: None.
 - Structural requirements:
 - Generally: As section B50.
 - Modifications: None.
 - Design: Complete in accordance with the designated code of practice to satisfy specified performance criteria.
 - Connections: Design and detail joints to designated code of practice.
 - Fixings to foundations and walls: To AKS Ward details.
 - Additional requirements: None.
 - Design and production information: As Preliminaries section A31 and clause 120.
- 115 DESIGN CONSTRAINTS - GENERAL
- Members forming bracing systems or girders of lattice construction: Unless detailed or instructed otherwise, position so that their lines of action intersect at a point.
 - Bolts:
 - Diameter (minimum): 20 mm.
 - Number per connection (minimum): Two, unless otherwise indicated.
 - Other requirements: Choose bolt dimensions to ensure that threads do not occur in shear plane of joint.
 - Punching of bolt holes: Not permitted.
 - Welds: At least 6 mm fillet.
 - Other constraints: None.
- 120 DRAWINGS AND CALCULATIONS
- Information required: As submission schedule.
 - Requirement: Before preparing detailed fabrication drawings, submit:
 - General arrangement drawings with individual steel members clearly identified.
 - Calculations/ selected standard joint detail for major connections.
- 125 SPECIFICATION STANDARD
- Standard: Comply with latest edition of National Structural Steelwork Specification CE Marking version.
 - Additional requirements: All connection design and fabrication to be in compliance with Eurocode.
 - Document availability: For the duration of the work, at fabrication shop and on site.
 - References to Engineer in NSSS CE Marking version: For the purpose of this contract, interpret such references as being to the person named in section A10 as Consulting Structural Engineer.
 - Exceptions: None.
- 130 GENERAL STEEL SECTIONS AND PLATES TO WAREHOUSE
- Standard: To BS EN 10025-2.
 - Grade: S355JR and S355J0.
 - Options: None.
 - Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
 - Other requirements: Steel to be galvanized to have a carbon equivalent value not exceeding 0.44.

135 HOLLOW STEEL SECTIONS TO WAREHOUSE

- Standard: To BS EN 10210-1.
- Grade: S355J2H.
 - Options: None.
- Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
- Other requirements: None.

COLD FORMED MATERIALS

176 PROFILED SHEET FOR COMPOSITE FLOOR SLABS

- Nature of permanent supports: Steel.
- Manufacturer: Comflor 51+ or equal .
 - Product reference: Submit proposals.
- Material: Galvanized steel sheet to BS EN 10346.
 - Thickness: 1.2 mm.
 - Designation: S250GD+Z275 N-A-C.
- Metal accessories: Provided by sheet manufacturer unless otherwise indicated: Provided by sheet manufacturer unless otherwise indicated:
 - Edge trims and restraint straps;
Side closure pieces
End closures; and
End diaphragms.
 - Finish: As for sheet.
- Seam stitching:
 - Fixings/ centres: 4.8 mm diameter self-drilling screws at 800mm centres.
 - Coating applied by manufacturer: Zinc plated.

178 FIXING PROFILED SHEET TO STEELWORK

- End supports:
 - Length of sheet bearing onto support (minimum): 50 mm.
 - Fasteners: 6.3 mm diameter self-drilling screws.
Coating applied by manufacturer: None.
Location: In trough of sheet.
 - Number/ centres of fixings: Every trough at end of sheet; alternate troughs at internal supports.
Distance from end of sheet (minimum): 20 mm.
Distance from edge of support (minimum): 50 mm.
- Side supports:
 - Width of sheet bearing onto support (minimum): 50 mm.
 - Fasteners: 6.3 mm diameter self-drilling screws.
Coating applied by manufacturer: None.
 - Centres of fixings (maximum): 600mm.
Distance from edge of sheet (minimum): 20 mm.
Distance from edge of support (minimum): 50 mm.
- Other requirements: None.

FABRICATION

180 NOTIFICATION OF COMMENCEMENT

- Notice: Give notice before fabrication is due to start.
 - Period of notice (minimum): Five working days.

WELDING

255 SITE WELDING

- Usage: Permitted only where indicated on drawings.
- Working conditions: Suitable and safe. Do not weld when surfaces are wet or when ambient temperature is below 0°C.

BOLT ASSEMBLIES

302 NON-PRELOADED BOLT/ SCREW ASSEMBLIES

- Designation: Black bolts to BS4190, grade 8.8.
 - Threading: To suit design criteria.
 - Nuts and washers: To suit grade of bolt, as NSSS CE Marking version, clause 2.4.3.
- Coating applied by manufacturer: Sherardized.
- Other requirements: None.

ERECTION

410 PRE-ERECTION CHECKS

- Scope: At least 7 days before proposed erection start date, check the following:
 - Foundations and other structures to which steelwork will be attached: Accuracy of setting out.
 - Holding down bolts: Position, protruding length, slackness and condition.
- Inaccuracies and defects: Report without delay.
- Permission to commence erection: Obtain.

425 MODIFICATIONS

- Steelwork: Do not modify without approval.
- Temporary fabrication/ erection attachments: May remain when they will not interfere with subsequent work, and will be completely hidden by finishes; otherwise, remove.

432 TEMPORARY SUPPORT

- Permanent bracing system:
 - Vertical: Steel wall bracing as detailed.
 - Horizontal: Composite action floors and Steel roof bracing as detailed.
- Temporary bracing/ restraints: Provide as necessary until permanent bracing system is complete and sufficiently mature to carry loads and all connections have been made to the permanent system.
- Elements to be supported: Columns and Frames.
- Bracing/ Restraints: Provide as necessary until permanent connection can be made to roof structure.
- Forces and moments in elements: Make an independent assessment.

440 COLUMN BASES

- Levels: Adjust using steel shims or folding wedges no larger than necessary.
- Location of shims/ wedges: Position symmetrically around perimeter of base plate. Do not use a single central pack.
- Give notice: If space beneath any column base is outside specified limits for bedding thickness.
- Accuracy of erection: Check, and correct errors before filling and bedding beneath bases and carrying out other adjacent work.

441 MORTAR FILLING/ BEDDING OF COLUMN BASES

- Bedding thickness range: 25-40mm.
- Bolt pockets: Completely filled with neat cement slurry.
- Spaces beneath base plates: Completely filled as follows:
 - Spaces 0-25 mm deep: Neat Portland cement, CEM 1.
 - Spaces 25-50 mm deep: 1:1 cement:fine aggregate mortar, just fluid enough to pour. Tamped well as filling proceeds.
 - Spaces 50 mm and above: 1:2 cement:fine aggregate mortar, just damp, tamped well against properly fixed supports as filling proceeds.
- Cement: Portland cement BS EN 197-1 - CEM I 42.5 or 52.5.
- Fine aggregate: To BS EN 12620, grade 0/4 or 0/2 (MP).
- Additives: None.

447 BONDED ANCHORS

- Holes: Clean and free from dust at time of installing anchor.

- Permeable sleeves: Use in conditions where otherwise the loss of bonding agent would be unacceptably high.
- Other requirements: None.

PROTECTIVE COATINGS

- 523 COMPATIBILITY OF SHOP PRIMER WITH SITE APPLIED INTUMESCENT COATING
- Intumescent coating: M61/ To Architects Specification.
 - Primer: Compatible with coating under general and fire conditions.
 - Manufacturer's recommendations and test evidence: Submit before priming. Include fire test data to BS 476-20 and -21, or BS EN 1363-1 and BS EN 1365-2, -3, and/or -4 as appropriate.

PROTECTIVE COATING SYSTEMS

- 640 SHOP PAINTING WITH EPOXY ZINC PHOSPHATE.
- Use/ location: Concealed Steelwork.
 - Paint manufacturer: Submit proposals.
 - Shop preparation:
 - Generally: Blast cleaning to BS EN ISO 8501-1, preparation grade Sa 2½.
 - Welds/ edges/ areas with surface imperfections: To BS EN ISO 8501-3, preparation grade To BS EN ISO 8501-3, preparation grade P1.
 - Shop primer: High build zinc phosphate epoxy primer.
 - Dry film thickness: 80 microns.
 - Shop intermediate coat: None.
 - Dry film thickness: N/A.
 - Shop top coat: Nona.
 - Dry film thickness: N/A.
 - Colour: N/A.
 - Special requirements: Stripe intermediate coat to external angles.

PREPARATION FOR PAINTING

- 710 OFFSITE PREPARATION AND PAINTING
- Working area: Covered and properly lit, heated and ventilated.
 - Sequence of working: Select from the following and submit proposals:
 - Fabricate, blast clean, prime.
 - Blast clean, fabricate, remove flash rust with a light overall sweep blast, prime.
 - Blast clean, apply weldable prefabrication primer, fabricate, prime.
 - Prefabrication primer (option 3): Type recommended by manufacturer of post fabrication primer.
 - Thickness of post fabrication primer coat: May be reduced if and as recommended by manufacturer.
 - Surfaces inaccessible after assembly: Apply full treatment and coating system including, if necessary, local application of site coatings.
- 725 MANUAL CLEANING OF NEW STEELWORK
- Preparation: Remove fins, burrs, sharp edges, weld spatter, loose rust and loose scale.
 - Surface finish: Clean but unpolished to BS EN ISO 8501-1, grade St 2.
 - Finishing: Thoroughly degrease and clean down. Remove any consequent rusting back to grade St 2. Prime without delay.
- 755 UNCOATED FASTENERS
- Treatment: After steelwork erection and before applying site coatings, thoroughly degrease and clean. Without delay, coat to match adjacent shop painted areas.
- 760 GALVANIZED FASTENERS
- Treatment: After steelwork erection and before applying site coatings, thoroughly degrease and clean. Etch prime.

PAINTING

- 810 ENVIRONMENTAL CONDITIONS
- General requirements prior to starting coating work:
 - Surfaces: unaffected by moisture or frost.
 - Steel temperature: At least 3°C above dew point, with conditions stable or improving, and not high enough to cause blistering or wrinkling of the coating.
 - Relative humidity: Below 85%;
- 815 COATINGS
- Surfaces to be coated: Clean, dust free and suitably dry. Previous coats to be adequately cured.
 - Multiple coats of same material: Use different tints to assist checking of complete coverage.
 - Penultimate coat: Colour recommended by paint manufacturer to suit top coat colour.
 - Finish required: Smooth and even, of uniform thickness and colour, free from defects.
- 825 STRIPE COAT
- External angles, nuts, bolt heads, rough weld seams, and areas difficult to coat: Apply an additional stripe coat of primer.
- 850 JUNCTIONS WITH CONCRETE
- Exposed steelwork partially embedded or encased in concrete: Apply two coats of bituminous coating locally to the steel/concrete junction.
 - Bituminous coating: To BS 6949, type 1, class A.

G30 Metal profiled sheet decking

M
Surface finishes

To be read with Preliminaries/General conditions.

PROPRIETARY SPECIFIED ROOF/ FLOOR DECKING

- 110
- METAL PROFILED SHEET DECKING
- Manufacturer: TATA or Equal.
 - Product reference: Comflor 51+.
 - Material: Steel, Grade S350 GD + Z275 to BS EN 10346.
 - Thickness (nominal): 1.2 mm.
 - Soffit finish: To Architects Specification.
 - End laps (minimum): 100 mm.
 - Configuration: Standard.
 - Supporting structure: Steel beams with a minimum 100mm bearing.
 - Accessories: None.

FIXING DECKING

- 230
- PREVENTION OF ELECTROLYTIC ACTION
- Isolating tape: Type recommended by decking manufacturer.
 - Location: To contact surfaces of supports and sheets of dissimilar metals.
- 240
- FIRE RESISTING PROFILE FILLERS
- Supplier: Decking manufacturer.
 - Type/ shape: To match decking profile void.
 - Location: To Architects Specification.
 - Fixing: Fit securely, as recommended by manufacturer, to form fire compartment.
- 260
- FIXING DECKING GENERALLY
- Cut sheets: Clean edges with true lines and no burrs.
 - Treatment of edges: As recommended by decking manufacturer.
 - Penetrations: Cut openings to the minimum size necessary.
 - Edge reinforcement: Trimming plates.
 - Fixings: Drill all holes.
 - Cleanliness: Remove debris from within decking construction.
 - Installation: Seams and ribs of deck must be parallel, with no damage to deck coating.

M61 Intumescent coatings for fire protection of steelwork

To be read with Preliminaries/General conditions

PROTECTIVE COATING SYSTEMS

110 ON SITE COATING TO PRIMED STEEL STEELWORK GENERALLY

- Use/ location: To Architects Specification.
- Fire resistance to BS 476-21: To Architects Specification.
- Preparation and priming: By steelwork contractor, as section G10.
- Intumescent coating system:
 - Manufacturer: Submit proposals.
 - Product reference: Submit proposals.
 - Intumescent coat:
 - Type: Submit proposals.
 - Finish: To Architects Specification.
 - Top sealer coat:
 - Type: Submit proposals.
 - Colour: To Architects Specification.
- Bolt head/ Nut protection: As main steelwork.

GENERAL REQUIREMENTS

205 VALIDATION OF MATERIALS

- Project specific evaluation of intumescent coating materials:
 - Standard: In accordance with BS 8202-2, clause 4.
 - Test results: Submit on request.

210 WORKING PROCEDURES

- Standard: In accordance with BS 8202-2.
- Give notice: Before commencing surface preparation and coating application.
- Quality control: Record project specific procedures for surface preparation and coating application.

215 WORKING CONDITIONS

- General: Maintain manufacturer's recommended temperature, humidity and air quality conditions during application and drying.
- Surface condition: Clean and dry at time of coating application.

270 INSPECTION

- Permit intumescent manufacturer to:
 - Inspect work in progress.
 - Inspect quality control records.
 - Take dry film thickness and other measurements.
 - Take samples of products.
- Intumescent manufacturer's inspection reports: Submit without delay.

APPLICATION OF CASTINGS

402 INTUMESCENT CASTING THICKNESS

- Required thickness: Determine for every steel member to give specified period of fire resistance. Use intumescent casting manufacturer's current published loading tables.
 - Special sections and partial fire exposure conditions: Obtain required thickness in writing from manufacturer.
- Schedule and drawings: Submit at least two weeks before starting work.
 - Schedule content: Member sizes, weights/ thicknesses, loading conditions, etc. showing, for each variant, the exposed perimeter/ sectional area (Hp/A) ratio and required casting thickness.
 - Drawing content: Steelwork drawings marked in colour to show required thickness for

each member.

404 INTUMESCENT CASTING INSTALLATION

- Assembly: Adhesive fix casting sections tight to steel substrate.
- Filling: Apply intumescent filler to all joints and deformations to produce a smooth and uniform finish.

APPLICATION OF COATINGS

410 INTUMESCENT COATING DRY FILM THICKNESS (DFT)

- Applicable coatings: To Architects Specification.
- Required dft: Determine for every steel member to give specified period of fire resistance. Use intumescent coating manufacturer's current published loading tables.
 - Special sections and partial fire exposure conditions: Obtain required dft in writing from manufacturer.
- Schedule and drawings: Submit at least two weeks before starting work.
 - Schedule content: Member sizes, weights/ thicknesses, loading conditions, etc. showing, for each variant, the exposed perimeter/ sectional area (Hp/A) ratio and required dft.
 - Drawing content: Steelwork drawings marked in colour to show required dft for each member.

420 MEASUREMENT OF INTUMESCENT DFT

- Primer dft: Determine average dft (for deduction from total dft after application of intumescent).
- Intumescent dft: Determine at:
 - 500 mm centres along each coated plane of universal sections (8 planes), and rectangular hollow sections (4 planes).
 - 125 mm centres along coated circular hollow sections, spread evenly around circumference.
- Acceptance standard:
 - Average intumescent dft: Not less than required dft (exclusive of primer and top sealer).
 - Local intumescent dft: Not less than 80% of required dft. Areas greater than 100 mm equivalent diameter with a dft of less than 80% of required dft must be brought up to thickness.

440 BASIC FINISH

- Definition: Reasonably smooth and even. Orange peel, other texture, minor runs and similar minor defects are acceptable.

450 NORMAL DECORATIVE FINISH

- Definition: Good standard of cosmetic finish generally, when viewed from a distance of 5 m or more. Minor orange peel or other texture is acceptable.

490 TOP SEALER COAT

- Application: To achieve dft recommended by manufacturer and to give an even, solid, opaque appearance, free from runs, sags and other visual defects.

COMPLETION

530 RECORDS OF INTUMESCENT APPLICATION

- On completion of intumescent work, submit:
 - Accurate surface preparation, coating and intumescent application records.
 - Fire resistance certificates.
 - Intumescent manufacturer's recommendations for maintenance and overcoating.

P
Building fabric sundries

P31 Holes, chases, covers and supports for services

To be read with Preliminaries/General conditions.

EXECUTION

620 HOLES, RECESSES AND CHASES IN IN SITU CONCRETE

- Cast in: Holes larger than 10 mm diameter, recesses and chases.
- Cutting and drilling:
 - Permitted for holes not larger than 10 mm diameter.
 - Not permitted for holes larger than 10 mm diameter except as indicated on drawings.

640 HOLES IN STRUCTURAL STEELWORK

- Cutting and drilling: Not permitted except as indicated on drawings.

650 HOLES, RECESSES AND CHASES IN MASONRY

- Locations: To maintain integrity of strength, stability and sound resistance of construction.
- Sizes: Minimum needed to accommodate services.
 - Holes (maximum): 300 mm².
- Walls of hollow or cellular blocks: Do not chase.
- Walls of other materials:
 - Vertical chases: No deeper than one third of single leaf thickness, excluding finishes.
 - Horizontal or raking chases: No longer than 1 m. No deeper than one sixth of the single leaf thickness, excluding finishes.
- Chases and recesses: Do not set back to back. Offset by a clear distance at least equal to the wall thickness.
- Cutting: Do not cut until mortar is fully set. Cut carefully and neatly. Avoid spalling, cracking and other damage to surrounding structure.

690 INSTALLING PIPE SLEEVES

- Sleeves: Fit to pipes passing through building fabric.
- Material: Match pipeline.
- Size: One or two sizes larger than pipe to allow clearance.
- Finish: Install sleeves flush with building finish. In areas where floors are washed down, install protruding 100 mm above floor finish.
- Masking plates: Fit at visible penetrations, including through false ceilings of occupied rooms.

Z Building fabric reference specification

Z21 Mortars

To be read with Preliminaries/ General conditions.

CEMENT GAUGED MORTARS

- 110 CEMENT GAUGED MORTAR MIXES
- Specification: Proportions and additional requirements for mortar materials are specified elsewhere.
- 120 SAND FOR SITE MADE CEMENT GAUGED MASONRY MORTARS
- Standard: To BS EN 13139.
 - Grading: 0/2 (FP or MP).
 - Fines content where the proportion of sand in a mortar mix is specified as a range (e.g. 1:1: 5-6):
Lower proportion of sand: Use category 3 fines.
Higher proportion of sand: Use category 2 fines.
 - Sand for facework mortar: Maintain consistent colour and texture. Obtain from one source.
- 131 READY-MIXED LIME:SAND FOR CEMENT GAUGED MASONRY MORTARS
- Standard: To BS EN 998-2.
 - Lime: Nonhydraulic to BS EN 459-1.
 - Type: CL 90S.
 - Pigments for coloured mortars: To BS EN 12878.
- 135 SITE MADE LIME:SAND FOR CEMENT GAUGED MASONRY MORTARS
- Permitted use: Where a special colour is not required and in lieu of factory made ready-mixed material.
 - Lime: Nonhydraulic to BS EN 459-1.
 - Type: CL 90S.
 - Mixing: Thoroughly mix lime with sand, in the dry state. Add water and mix again. Allow to stand, without drying out, for at least 16 hours before using.
- 160 CEMENTS FOR MORTARS
- Cement: To BS EN 197-1 and CE marked.
 - Types: Portland cement, CEM I.
Portland limestone cement, CEM II/A-L or CEM II/A-LL.
Portland slag cement, CEM II/B-S.
Portland fly ash cement, CEM II/B-V.
 - Strength class: 32.5, 42.5 or 52.5.
 - White cement: To BS EN 197-1 and CE marked.
 - Type: Portland cement, CEM I.
 - Strength class: 52.5.
 - Sulfate resisting Portland cement:
 - Types: To BS EN 197-1 Sulfate resisting Portland cement, CEM I/SR and CE Marked.
To BS EN 197-1 fly ash cement, CEM II/B-V and CE marked.
 - Strength class: 32.5, 42.5 or 52.5.
 - Masonry cement: To BS EN 413-1 and CE marked.
Class: MC 12.5.
- 180 ADMIXTURES FOR SITE MADE CEMENT GAUGED MORTARS
- Air entraining (plasticizing) admixtures: To BS EN 934-3 and compatible with other mortar constituents.
 - Other admixtures: Submit proposals.
 - Prohibited admixtures: Calcium chloride, ethylene glycol and any admixture containing calcium chloride.

- 190 RETARDED READY TO USE CEMENT GAUGED MASONRY MORTARS
- Standard: BS EN 998-2.
 - Lime for cement:lime:sand mortars: Nonhydraulic to BS EN 459-1.
 - Type: CL 90S.
 - Pigments for coloured mortars: To BS EN 12878.
 - Time and temperature limitations: Use within limits prescribed by mortar manufacturer.
 Re-tempering: Restore workability with water only within prescribed time limits.
- 210 MAKING CEMENT GAUGED MORTARS
- Batching: By volume. Use clean and accurate gauge boxes or buckets.
 - Mix proportions: Based on dry sand. Allow for bulking of damp sand.
 - Mixing: Mix materials thoroughly to uniform consistency, free from lumps.
 - Mortars containing air entraining admixtures: Mix mechanically. Do not overmix.
 - Working time (maximum): Two hours at normal temperatures.
 - Contamination: Prevent intermixing with other materials.

Z22 Sealants

To be read with Preliminaries/General conditions.

PRODUCTS

- 310 JOINTS.
- Primer, backing strip, bond breaker: Types recommended by sealant manufacturer.

EXECUTION

- 610 SUITABILITY OF JOINTS
- Pre-sealing checks:
 - Joint dimensions: Within limits specified for the sealant.
 - Substrate quality: Surfaces regular, undamaged and stable.
 - Joints not fit to receive sealant: Submit proposals for rectification.
- 620 PREPARING JOINTS
- Surfaces to which sealant must adhere:
 - Remove temporary coatings, tapes, loosely adhering material, dust, oil, grease, surface water and contaminants that may affect bond.
 - Clean using materials and methods recommended by sealant manufacturer.
 - Vulnerable surfaces adjacent to joints: Mask to prevent staining or smearing with primer or sealant.
 - Backing strip and/ or bond breaker installation: Insert into joint to correct depth, without stretching or twisting, leaving no gaps.
 - Protection: Keep joints clean and protect from damage until sealant is applied.
- 630 APPLYING SEALANTS
- Substrate: Dry (unless recommended otherwise) and unaffected by frost, ice or snow.
 - Environmental conditions: Do not dry or raise temperature of joints by heating.
 - Sealant application: Fill joints completely and neatly, ensuring firm adhesion to substrates.
 - Sealant profiles:
 - Butt and lap joints: Slightly concave.
 - Fillet joints: Flat or slightly convex.
 - Protection: Protect finished joints from contamination or damage until sealant has cured

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Paving/Planting/Fencing/Site furniture

Q10 Kerbs/ edgings/ channels/ paving accessories

TO BE READ WITH PRELIMINARIES/ GENERAL CONDITIONS.

TYPES OF KERBS/EDGINGS AND CHANNELS

110 PROPRIETARY PRECAST CONCRETE Edgings

- Standard: To BS EN 1340.
- Manufacturer: Contractor's choice
- - Product reference: Contractor's choice.
- Recycled content: Contractor's choice
- Designations:
 - EF Edging, flat top;
 - BN Kerb, bull-nosed;
 - HB1 Kerb, half battered; and
 - HB2 Kerb, half battered
- Size (width x height x length): 150 x 125 x 915 mm
- Special shapes: cut to suit shapes
- Finish: As cast
- Colour: Grey
- Bedding: Fresh concrete races
- Joints generally: Dry, 2-3 mm gap
- Sealant movement joints: Not required
- Accessories: None

112 PRECAST CONCRETE EDGINGS

- Standard: To BS EN 1340.
- Recycled content: Contractor's choice
- Designations:
 - EF Edging, flat top;
 - BN Kerb, bull-nosed;
 - HB1 Kerb, half battered; and
 - HB2 Kerb, half battered
- Size (width x height x length): 150 x 125 x 915 mm
- Special shapes: cut to suit shapes
- Finish: As cast
- Colour: Grey
- Bending strength: Class 1
- Weathering resistance: No requirement
- Abrasion resistance: No requirement
- Slip/ skid resistance: No requirement
- Bedding: Fresh concrete races
- Joints generally: Narrow mortar
- Sealant movement joints: Not required
- Accessories: Submit proposals

115 PRECAST CONCRETE SAFETY KERBS

- Manufacturer: Contractor's choice
 - Product reference: Contractor's choice
- Size: 390 x 400 x 1000 mm
- Special shapes: As required
- Finish: As cast
- Colour: Natural
- Bedding: Fresh concrete races
- Joints generally: Narrow mortar
- Sealant movement joints: Not required

170 LINEAR SLOT DRAINAGE CHANNEL SYSTEMS

- Manufacturer: ACO
 - Product reference: M100D F900 Cover
- Bore: 250mm
- Finish: As per LA Spec
- Colour: As per LA Spec
- Accessories: As per LA Spec
- Bedding: As drawing TBC.
- Joints generally: Drain unions as required

180 DRAINAGE CHANNEL SYSTEMS WITH GRATINGS

- Manufacturer: ACO
 - Product reference: M100D
- Size: 100mm
- Type of fall: Constant depth
- Finish: Standard
- Colour: Buff
- Accessories: Sump units
- Bedding: As drawing TBC
- Joints generally: Drain unions as required
- Cover gratings: Galvanized steel, slotted
 - Fixings: Hexagon head bolts with black moulded polypropylene protective cover caps
 - Loading grade to BS EN 124: E600
 - Finish/ Colour: Galvanized

312 FOOTWAY GRATINGS A

- Manufacturer: Submit proposals
 - Product reference: ACO
- Size: 100mm
- Material: Cast iron
 - Finish: Natural
 - Colour: Natural
- Pattern: Parallel bars
- Fixings: Lugs for casting in
- Loading grade to BS EN 124: C250

LAYING

510 LAYING KERBS, EDGINGS AND CHANNELS

- Cutting: Neat, accurate and without spalling. Form neat junctions.
 - Long units (450 mm and over) minimum length after cutting: 300 mm.
 - Short units minimum length after cutting: The lower of one third of their original length or 50 mm.
- Bedding of units: Positioned true to line and levelled along top and front faces, in a mortar bed on accurately cast foundations or on a race of fresh concrete.
- Securing of units: After bedding has set, secured with a continuous haunching of concrete or on a race of fresh concrete with backing concrete cast monolithically.

520 ADVERSE WEATHER

- Conditions: Do not construct if the temperature is below 3°C on a falling thermometer or 1°C on a rising thermometer. Adequately protect foundations, bedding and haunching against frost and rapid drying by sun and wind.

530A CONCRETE FOR FOUNDATIONS, RACES AND HAUNCHING

- Standard: To BS 8500-2.
- Designated mix: Not less than Standard mix ST2.
- Workability: Very low.

540 CEMENT MORTAR BEDDING

- General: To section Z21.
- Mix (Portland cement:sand): 1:3.
 - Portland cement: Class CEM I 42.5 to BS EN 197-1.

- Sand: to BS EN 12620, grade 0/4 or 0/2 (MP).
 - Bed thickness: 12-40 mm.
- 550 KERB DOWELS
- Dowels: Steel bar to BS 4482.
 - Size: 12 mm diameter, 150 mm long.
 - Installation of dowels: Vertically into foundation while concrete is plastic.
 - Centres: To suit holes in kerbs.
 - Projection: 75 mm.
 - Grouting of holes in kerbs: Filled with 1:3 cement:sand mortar finished flush.
- 560 HAUNCHING DOWELS
- Dowels: Steel bar to BS 4482.
 - Size: 12 mm diameter, 150 mm long.
 - Installation of dowels: Vertically into foundation while concrete is plastic.
 - Centres: 450 mm.
 - Distance from back face of kerb: 50 mm.
 - Projection: 75 mm.
 - Haunching: Rectangular cross section, cast against formwork, fully enclosing and protecting dowels.
- 570 CHANNELS
- Installation: To an even gradient, without ponding or backfall.
 - Lowest points of channels: 6 mm above drainage outlets.
- 580 DRAINAGE CHANNEL SYSTEMS
- Installation: To an even gradient, without ponding or backfall. Commence laying from outlets.
 - Silt and debris: Removed from entire system immediately before handover.
 - Washing and detritus: Safely disposed without discharging into sewers or watercourses.
- 620 ACCURACY
- Deviations (maximum):
 - Level: ± 6 mm.
 - Horizontal and vertical alignment: 3 mm in 3 m.
- 625 REGULARITY OF PAVED SURFACES
- Maximum undulation of (non-tactile) paving surface: 3 mm.
 - Method of measurement: Under a 1 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface).
 - Difference in level between adjacent units (maximum):
 - Joints flush with the surface: Twice the joint width (with 5 mm max difference in level).
 - Recessed, filled joints: 2 mm.
 - Recess depth (maximum): 5 mm.
 - Unfilled joints: 2 mm.
 - Sudden irregularities: Not permitted.

Q20 Granular sub-bases to roads/ pavings

To be read with Preliminaries/ General conditions.

110 THICKNESSES OF SUB-BASE/ SUBGRADE IMPROVEMENT LAYERS

- Thicknesses: See sections:
 - Q21 In-situ concrete roads/pavings/bases;
 - Q22 Coated macadam/asphalt roads/pavings; and
 - Q24 Interlocking brick/block roads/pavings

120 CHECKING OF SUBGRADES

- Anticipated subgrade conditions:
 - Soil type: Head Deposits.
 - Plasticity index: 25% av.
 - CBR (minimum): 10%.
 - Depth below formation level to groundwater table: unknown
- Subgrade variation: If material appears to vary from anticipated conditions, or if there are extensive soft spots, test subgrade CBR to BS 1377-4
- Submit: Results and obtain instructions before proceeding.

130 HERBICIDES

- Type: Translocated, non-selective.
- Application: To subgrade of footpath.

140 EXCAVATION OF SUBGRADES

- Final excavation to formation or sub-formation level: Carry out immediately before compaction of subgrade.
- Soft spots and voids: Give notice.
- Old drainage and service trenches: Excavate to remove soft or damaged material, then backfill with specified granular sub-base material and compact.
- Wet conditions: Do not excavate or compact when the subgrade may be damaged or destabilized.

145 PREPARATION AND COMPACTION OF SUBGRADES

- Timing: Immediately before placing sub-base.
- Soft or damaged areas: Obtain instructions
- Compaction: Thoroughly, by roller or other suitable means, adequate to resist subsidence or deformation of the subgrade during construction and of the completed roads/ pavings when in use. Take particular care to compact fully at intrusions, perimeters and where local excavation and backfilling has taken place.

150 SUBGRADES FOR VEHICULAR AREAS

- Preparation and treatment: To Highways Agency 'Specification for highway works', clauses 616 and 617.

170 GEOTEXTILE FILTER/ SEPARATOR MEMBRANE At Formation level for footpath and grass grid area

- Manufacturer: Fibre web geosynthetics
 - Product reference: Terram 1000 minimum
- Jointing: 300 mm overlap min
- Protect from:
 - Exposure to light, except during laying (maximum five hours).
 - Contaminants.
 - Materials listed as potentially deleterious by geotextile manufacturer.
 - Damage, until fully covered by fill.
 - Wind uplift, by laying not more than 15 m before covering with fill.
- Preparation: Remove humps and sharp projections and fill hollows before laying.

175 IMPERMEABLE MEMBRANE BELOW SUB-BASE

- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Jointing: 300 mm overlap

- Protect from: all of the below
 - Exposure to light, except during laying (maximum five hours).
 - Contaminants.
 - Materials listed as potentially deleterious by geotextile manufacturer.
 - Damage, until fully covered by fill.
 - Wind uplift, by laying not more than 15 m before covering with fill.
 - Preparation: Remove humps and sharp projections and fill hollows before laying.
 - Other requirements: Membrane details as drawing S108059-410
- 200 SUBGRADE IMPROVEMENT LAYER (CAPPING)
- Material: To Highways Agency 'Specification for highway works', table 6/1, Class 6F5
 - Standard: Placed and compacted to Highways Agency 'Specification for highway works', table 6/1, clauses 612 and 613.3, 613.8, 613.9, 613.10 and 613.13.
- 205 HIGHWAYS AGENCY TYPE 2 UNBOUND MIXTURE FOR SUB-BASE
- Material: Type 2 unbound mixture to Highways Agency 'Specification for highway works', clauses 801 and 804.
 - Recycled aggregate: Permitted.
 - CBR (minimum): 30%
- 210 HIGHWAYS AGENCY TYPE 1 UNBOUND MIXTURE FOR SUB-BASE
- Material: Type 1 unbound mixture to Highways Agency 'Specification for highway works', clauses 801 and 803.
 - Recycled aggregate: Permitted as crushed concrete not general recycled material.
- 210A HIGHWAYS AGENCY TYPE 3 UNBOUND MIXTURE FOR POROUS SUB-BASE TO GRASSGRID AREA FOR FIRE TENDER ACCESS
- Material: Type 3 unbound mixture to Highways Agency 'Specification for highway works', clauses 801 and 803.
 - Recycled aggregate: Permitted.
- 211 GRANULAR MATERIAL
- Quality: Of a known suitability for use in sub-bases, free from excessive dust, well graded, all pieces less than 75 mm in any direction, minimum 10% fines value of 50 kN when tested in a soaked condition to BS 812-111 or a resistance to fragmentation of LA50 for the Los Angeles test to BS EN 1097-2, and in any one layer only one of the following:
 - Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
 - Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - Gravel or hoggins with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - Natural gravel.
 - Natural sand.
 - Filling: Spread and levelled in 150 mm maximum layers, each layer thoroughly compacted.
- 213 BLINDING PROTECTION FOR MEMBRANES
- Location: On sub-base to receive impermeable membrane.
 - Material: Approved fine material.
 - Thickness (minimum): Sufficient to fill interstices and cover all stones.
 - Compaction: Moisten as necessary before final rolling to provide a flat, closed, smooth surface.
 - Permissible deviations on surface level: +0 -25 mm
- 220 FROST SUSCEPTIBLE GRANULAR MATERIAL
- Definition (non-frost susceptible material): To Highways Agency 'Specification for highway works' clause 801.8.
 - Depth of frost susceptible material below final surface of paving (minimum): 450 mm
 - Testing: Test materials used if required and supply certificates.
- 225 PLACING OF MATERIAL WITH HIGH SULFATE CONTENT
- Standard: To Highways Agency 'Specification for highway works', clauses 801.2 and 801.3.

- Separation distance (minimum): Increased to 1000 mm
- 230 PLACING GRANULAR MATERIAL GENERALLY
- Preparation: Loose soil, rubbish and standing water removed.
 - Structures, membranes and buried services: Ensure stability and avoid damage.
- 240 LAYING GRANULAR SUB-BASES FOR VEHICULAR AREAS
- General: Spread and levelled in layers. As soon as possible thereafter compact each layer.
 - Standard: To Highways Agency 'Specification for highway works' clause 802.
 - At drainage fittings, inspection covers, perimeters and where local excavation and backfilling has taken place: Take particular care to compact fully.
- 250 LAYING GRANULAR SUB-BASES FOR VEHICULAR AREAS and PEDESTRIAN AREAS
- General: Spread and levelled.
 - Compaction:
 - Timing: As soon as possible after laying.
 - Method: By roller or other suitable means, adequate to resist subsidence or deformation of the sub-base during construction and of the completed paving when in use. Take particular care to compact fully at intrusions, perimeters and where local excavation and backfilling has taken place.
- 310 ACCURACY
- Permissible deviation from required levels, falls and cambers (maximum):
 - Subgrades:
 - Roads and parking areas: +20 -30 mm.
 - Footways and recreation areas: $\pm$ 20 mm.
 - Sub-bases:
 - Roads and parking areas: $\pm$ 20 mm
 - Footways and recreation areas: $\pm$ 12 mm
- 330 COLD WEATHER WORKING
- Frozen materials: Do not use.
 - Freezing conditions: Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
- 340 PROTECTION
- Sub-bases: As soon as practicable, cover with subsequent layers, specified elsewhere.
 - Subgrades and sub-bases: Prevent degradation by construction traffic, construction operations and inclement weather.

Q21 In-situ concrete roads/ pavings/ bases

To be read with Preliminaries/ General conditions.

TYPES OF PAVING

- 115 PAVING WITH EMBEDDED METAL (DESIGNATED CONCRETE) PAV 2
- Subgrade improvement layer: As section Q20
 - Compacted thickness: Submit proposals
 - Geotextile filter: As section Q20
 - Granular sub-base: Highways Agency Type 1 unbound mixture, as section Q20
 - Compacted thickness: Submit proposals
 - Separation membrane: Polyethylene sheet 125 micrometres thick, edges lapped 300 mm.
 - Embedded metal: Bonded dowel bars
 - Concrete: To BS 8500-2.
 - Designation: PAV2
 - Fibres: As section E10
 - Aggregate:
 - Size (maximum): Contractor's choice
 - Coarse recycled concrete aggregate: Not permitted.
 - Additional aggregate requirements: None
 - Consistence class: Contractor's choice
 - Additional mix requirements: None
 - Slab thickness (minimum): 200 mm
 - Finish: Brush-textured as Highway Agency 'Specification for Highway Works' clause 1026

GENERAL/ PREPARATION

- 140 READY-MIXED CONCRETE
- Production plant: Currently certified by a body accredited by UKAS to BS EN ISO/IEC 17065 for product conformity certification.
 - Source of ready-mixed concrete: Obtain from one source if possible. Otherwise, submit proposals.
 - Name and address of depot: Submit before any concrete is delivered.
 - Delivery notes: Retain for inspection.
 - Declarations of nonconformity from concrete producer: Notify immediately.

- 150 REINFORCEMENT Mesh
- Standard: To BS 4483
 - Product form/ designation: Plain and Ribbed
 - Strength grade: 250
 - Cutting and bending: To BS 8666.
 - Supplier: A firm currently approved by the UK Certification Authority for Reinforcing Steels (CARES).
 - Nominal cover: 50mm
 - Cleanliness: Free from corrosive pitting, loose material and contaminants which may adversely affect reinforcement, concrete, or bond between the two.

- 155 PROJECT TESTING OF CONCRETE - GENERAL
- Testing: To BS EN 206-1, annex B and BS 8500-1, annex B.
 - Recording: Maintain complete correlated records including:
 - Concrete designation.
 - Sampling, site tests, and identification numbers of specimens tested in the laboratory.
 - Location of the parts of the structure represented by each sample.
 - Location in the structure of the batch from which each sample is taken.
 - Testing laboratory: Accredited by UKAS or other national equivalent.
 - Tests results:
 - Submission of reports: Within one day of completion of each test.
 - Number of copies: 1
 - Reports on site: A complete set, available for inspection.
 - Nonconformity: Obtain instructions immediately

- 240 SUB-BASE PREPARATION
- Surface: Sound, free of debris, mud and soft spots, and suitably close textured.
 - Levels and falls: Within specified tolerances:
 - Vehicular areas: ± 20 mm.
 - Pedestrian areas: ± 12 mm.
 - Drainage outlets: +0 to -10 mm of required finished level.
 - Kerbs and edgings: Complete, adequately bedded and haunched, and to required levels.

- 250 LAYING FABRIC REINFORCEMENT
- Flatness: Lay in flat sheets, straight and out of winding.
 - Main reinforcement: Parallel to long axis of slab.
 - Temporary support: Securely fix and support fabric during construction of slab.
 - Lapping at joints (minimum):
 - Longitudinal bars: 450 mm
 - Transverse bars: 450 mm
 - Extent of fabric: Fully within slab.
 - Stopping short of slab edges by: 60 ± 20 mm
 - Stopping short of centre line of transverse joints by: 60 ± 20 mm
 - Stopping short of centre line of longitudinal joints: 60 ± 20 mm
 - Alternative placing method: Fabric may be placed on top of first compacted layer of concrete, followed by top layer of concrete, placed within two hours of the first layer.

LAYING CONCRETE

- 310 TRANSPORTING CONCRETE
- General: Avoid contamination, segregation, loss of ingredients, excessive evaporation and loss of workability. Protect from heavy rain.
 - Entrained air: Anticipate effects of transport and placing methods in order to achieve specified air content.
 - Placing: Use suitable walkways and barrow runs for traffic over reinforcement and freshly placed concrete.

- 320 LAYING CONCRETE GENERALLY
- Timing: Place as soon as practicable after mixing and while sufficiently plastic for full compaction. After discharge from the mixer do not add water or re-temper.
 - Temperature of concrete at point of delivery:
 - In hot weather (maximum): 30°C .
 - In cold weather (minimum): 5°C .
 - Cold weather:
 - Do not use frozen materials.
 - Do not place concrete against frozen or frost covered surfaces.
 - Do not place concrete when air temperature is below 3°C on a falling thermometer. Do not resume placing until rising air temperature has reached 3°C .
 - Surfaces on which concrete is to be placed: Free from debris and standing water.
 - Placing in final position: Place in one continuous operation up to construction joints.
 - Do not place concrete simultaneously on both sides of movement joints.
 - Spreading: Spread and strike off with surcharge sufficient to obtain required compacted thickness.
 - Adjacent work: Form neat junctions and prevent damage. Keep clean all channels, kerbs, inspection covers, etc.

- 330 COMPACTING
- General: Fully compact concrete to full depth (until air bubbles cease to appear on the surface) especially around reinforcement, cast-in accessories, into corners and at joints.
 - Poker vibrators: Do not use to make concrete flow into position. Do not allow to come into contact with fabric reinforcement.
 - Wet formed joint grooves: Rectify any irregularities by means of a vibrating float.
 - Finish: A dense, even textured surface free from laitance or excessive water.
 - Excess concrete: Remove from top of groove formers.

- 340 MANHOLE COVER AND GULLY GRATING FRAMES
- General: Set frames in independent concrete slabs placed over, but slightly larger than, exterior of manhole shaft or gully pot and any concrete surround.

- Positioning of joints in main slab: Set out so that manhole/ gully slabs are adjacent to a main transverse joint, wherever possible.
- Joints: Separate the independent slabs from main slabs with 25 mm thick joint filler board. Set board 20 mm below top of slab to form a sealing groove.

350 LEVELS

- Lines and levels of finished surface: Smooth and even, with regular falls to prevent ponding.
- Finished surfaces: Within ± 6 mm of required levels (+6 or -0 mm adjacent to gullies and manholes).

360 SURFACE REGULARITY

- General: Where appropriate in relation to the geometry of the surface, the variation in gap under a 3 m straightedge (with feet) placed anywhere on the surface to be not more than 5 mm.
- Sudden irregularities: Not permitted.

JOINTS

410 JOINTS GENERALLY

- Layout: All joints to be accurately located, straight and well aligned.
- Construction joints made at end of working day: Form as contraction joints.
- Modifications to joint design or location: Submit proposals.
- Temporary support: Prior to concreting, set formwork, dowel bars, tie bars, joint filler boards, sealing groove fillets and the like rigidly in position and support to prevent displacement. Maintain support until concrete has set.
- Keep clean:
 - Do not allow concrete to enter gaps or voids in formwork or to render movement joints ineffective.
 - Do not allow concrete to impregnate or penetrate materials used as compressible joint fillers.

430 DOWEL BARS

- Standard: Material to BS 6744, other requirements to BS EN 13877-3
 - Material/ Designation: Stainless steel, contractor's choice
 - Strength: 250
 - Profile: Plain, round.
 - Condition: Free from oil, dirt, loose rust and scale.
- Bar dimensions: 20 mm diameter x var mm long
- Location: Place dowel bars in movement joints at mid depth of the slab ± 20 mm, centred on joint and at 300 mm centres. Bars to be parallel to longitudinal axis and top surface of the slab.
 - Misalignment tolerance per 300 mm length of dowel bar: Maximum of ± 3 mm with two thirds of bars within ± 2 mm
- Debonding of bars: Flexible plastics sleeve covering, not less than 0.6 mm thick
- Bars in expansion joints: Provide 100 mm long plastics caps for free bar movement. Before placing concrete, ensure there is a space between the end of the cap and the end of the dowel bar 10 mm greater than the thickness of the joint filler board.

440 LONGITUDINAL CONSTRUCTION JOINTS

- Definition: Longitudinal joints are those parallel to the main axis of the paving.
- Standard: To Concrete Society Technical Report 28.
- Formed groove:
 - Size (minimum width x depth): 15 x 13 mm.
 - Preparation: Repair damaged edges of initially cast slab prior to forming groove.
 - Method: Fix preformed fillet against top edge of the initially cast slab before placing the adjacent slab. Remove when concrete is fully cured.
- Completion: Round upper edges of slabs at joints to 5 mm radius. Do not overwork concrete.

450 CONTRACTION JOINTS WITH SAWN GROOVE

- Standard: To Concrete Society Technical Report 28.
- Temperature: Do not start sawing if temperature is falling.
- Sawn groove:

- Timing: Cut as early as possible after the slab has been placed but without causing edges of groove to spall.
- Width (minimum): 3 mm.
- Depth: 3 mm per 10 mm depth of slab or 50 mm, whichever is the greater.
- Upper portion of joint: Enlarge by sawing a groove:
 - Width (minimum): 13 mm.
 - Depth: 25 mm

460 CONTRACTION JOINTS WITH WET FORMED GROOVE

- Standard: To Concrete Society Technical Report 28.
 - Bottom crack inducer: Preservative treated softwood, triangular section, height 50 mm
 - Locate vertically below the top groove within a horizontal tolerance of ± 10 mm.
 - Fix to sub-base to retain in position when concrete is placed.
- Wet formed groove: Form when surface of concrete is plastic.
 - Groove depth: 25 mm
 - Temporary fillet: 20 mm wide. Remove when concrete is fully cured.
- Completion: Recompact displaced concrete without overworking. Round edges of groove to 5 mm radius.

470 EXPANSION JOINTS

- Joint filler board:
 - Type: Closed cell polyethylene foam
 - Standard: To Highway Agency 'Specification for Highway Works', clause 1015.
 - Thickness: 25 mm.
 - Depth: Joint filler board must extend from underside of sealing groove fillet to full depth of slab to provide complete separation of adjacent slabs.
 - Holes for dowel bars: Accurately bored or punched holes to form a sliding fit for dowel bars.
- Completion: Round upper edges of slabs at joints to 5 mm radius. Do not overwork concrete.

SURFACE FINISH

510 SAMPLE AREA

- Finish: Submit proposals
- Size: 6 m²
- Location: Submit proposals
- Timing: Complete sample area and obtain approval before proceeding with remainder of work

520 TAMPED FINISH

- Method: Tamp surface with edge of a board or beam to give an even texture of parallel ribs.
- Direction: At right angles to the longitudinal direction of the slab.

530 BRUSHED FINISH

- Direction: At right angles to longitudinal direction of the slab.
- Texture depth: Approximately 1 mm with finished surface having an overall even texture.

550 POWER TROWEL FINISH

- Preparation: Float concrete to an even surface with no ridges or steps, then immediately commence curing.
- Surface finish: Uniform, smooth and free from trowel marks and other blemishes.
- Completion: Resume specified curing without delay.

570 WASH AND BRUSH FINISH

- Preparation: Float concrete to an even surface with no ridges or steps, then immediately commence curing.
- Finish:
 - When concrete is sufficiently hard to hold coarse aggregate in place, remove surface mortar by brushing with a stiff bristle brush and water spray.
 - Remove cement paste from concrete surface by flooding with clean water and applying a dilute solution of hydrochloric acid. Thoroughly rinse with water after acid has ceased effervescing.
- Completion: Resume specified curing without delay.

580 POWER GROUND FINISH

- Preparation: Float concrete to an even surface with no ridges or steps, then immediately commence curing.
- Timing: Commence grinding when concrete is sufficiently hard for fine aggregate particles not to be torn from the surface.
- Finish: Power grind to remove 1-2 mm from surface to give an even glass-paper texture, free from blemishes and trowel marks.
- Completion: Remove dust and wash down. Resume specified curing without delay.

- Heavy vehicles: 21 days after placing concrete

590 ABRASIVE BLASTED FINISH

- Timing: Carefully controlled in relation to strength of concrete.
- Finish:
 - Type: Brush blasted
 - Average depth of aggregates exposure: submit proposals
- Extent: Stop off the blasting to straight masked lines, leaving regular margins 100 mm wide round the perimeter

CURING/ PROTECTION/ FINISHING

610 CURING

- General: Immediately after completion of surface treatment prevent evaporation from surface and exposed edges of slabs for a minimum period of seven days.
- Early curing:
 - Cover with waterproof sheeting held clear of surface. Seal against draughts at edges and junctions.
 - Do not apply sprayed compounds or sheets in direct contact until surface is in a suitable state and will not be marked.
- Coverings for curing: Contractor's choice of:
 - Impervious sheet material.
 - Resin based aluminized curing compound containing a fugitive dye and with an efficiency index of 90% when tested to BS 7542.
 - Sprayed plastics film.

615 CURING PERIODS All Areas

- General: Curing periods are in days (minimum).
 - Definition of 't': The average surface temperature of concrete in degrees Celsius during the curing period.
- Curing periods:
 - Drying winds or dry, sunny weather (relative humidity < 50%): Submit Proposals
 - Intermediate conditions (relative humidity between 50 and 80%): Submit Proposals
 - Damp weather, protected from sun and wind (relative humidity > 80%): Submit Proposals
- Curing periods for concretes using admixtures or other types of cements/ combinations: Submit proposals.
- Other requirements: Submit Proposals

660 PROTECTION

- Prevent damage to concrete:
 - From rain, indentation, physical damage, dirt, staining, rust marks and other disfiguration.
 - From thermal shock.
 - In cold weather, from freezing expansion of water trapped in pockets, etc.
 - By use as a building platform or for storing, mixing or preparing materials.

660A PROTECTION OF GRASS GRID SYSTEM

- Prevent damage to newly laid grass-grid system concrete:
 - From physical damage,
 - Do not use as a site haul road for construction.
 - Delay laying until end of project.
 - .

670 OPENING TO TRAFFIC

- Light vehicles: 7 days after placing concrete

Q22 Asphalt roads/ pavings

To be read with Preliminaries/ General conditions.

TYPES OF PAVING

140 HOT ROLLED ASPHALT PAVING TO FOOTWAYS

- Standard: To BS EN 13108-4
- Subgrade improvement layer: As section Q20
 - Compacted thickness: Submit proposals
- Geotextile: Not required
 - Manufacturer: Contractor's choice
 - Product reference: Not required
- Granular sub-base: As section Q20
 - Compacted thickness: Submit proposals
- Base: N/A
 - Paving grade: N/A
 - Compacted thickness: N/A
- Binder course: Submit proposals
 - Paving grade: 100/125
 - Compacted thickness: Submit proposals
- Surface course: Submit proposals
 - Paving grade: 100/150
 - Slip/ Skid resistance: No requirement
 - Compacted thickness: 25 mm nominal, 20 mm minimum at any point
- Reclaimed content:
 - Standard: To BS EN 13108-8.
 - Value (maximum): Submit proposals
- Surface treatment: Not required
- Other requirements As HA Appendix 7/1

PREPARATORY WORK/ REQUIREMENTS

220 BITUMINOUS MATERIALS GENERALLY

- Suppliers names: Submit.
 - Timing (minimum): Two weeks before starting work.
- Test certificates: At the time of delivery for each manufacturing batch submit certificate:
 - Confirming compliance with this specification and the relevant standard.
 - Stating full details of composition of mix.

240 ACCEPTANCE OF SURFACES

- Surface: Sound, clean and suitably close textured.
- Level tolerances: To BS 594987.
- Kerbs and edgings: Complete, adequately bedded and haunched and to the required levels.

310 LAYING GENERALLY

- Preparation: Remove all loose material, rubbish and standing water.
- Adjacent work: Form neat junctions. Do not damage.
- Channels, kerbs, inspection covers etc: Keep clean.
- New paving:
 - Keep traffic free until it has cooled to prevailing atmospheric temperature.
 - Do not allow rollers to stand at any time.
 - Prevent damage.
 - Lines and levels: With regular falls to prevent ponding.
 - Overall texture: Smooth, even and free from dragging, tearing or segregation.
 - State on completion: Clean.

320 ADVERSE WEATHER

- Frozen materials: Do not use.

- Suspend laying:
 - During freezing conditions
 - If the air temperature reaches 0°C, or in calm dry conditions -3°C, on a falling thermometer.
 - Hot rolled asphalt: During periods of continuous or heavy rain or if there is standing water on the

base.

330 LEVELS

- Permissible deviation from the required levels, falls and cambers (maximum): In accordance with BS 594987, clause 5.2.

340 FLATNESS/ SURFACE REGULARITY

- Deviation of surface: Where appropriate in relation to the geometry of the surface, the variation in gap under a 3 m straightedge placed anywhere on the surface to be not more than:
 - Base: Machine laid, 25 mm
 - Binder course: Machine laid, 13 mm
 - Surface course: Machine laid, 7 mm
 - Where a straightedge cannot be used the surface must be of a comparable standard of accuracy when judged by eye.

350 CONTRACTOR'S USE OF PAVEMENTS

- Before use:
 - Timing: allow newly laid sections to cool before trafficking.
 - Open-grained surface: Fill with 0/4 mm size coated grit. Remove surplus.
 - Finish: Uncoated chipping and binder surface treatment.
- Preparation for final surfacing:
 - Timing: Defer laying until as late as practicable.
 - Immediately before laying final surfacing: Clean and make good the base/ binder course. Allow to

dry.

- Adhesion: Tack coat to BS 434-1 or BS EN 13808.
Application rate: As manufacturer's recommendation.
Accuracy: Uniform, without puddles.
- Finishing: Allow emulsion to break completely before applying surface.

351 CONTRACTOR'S USE OF PAVEMENTS

- Preparation for final surfacing:
 - Timing: Defer laying until as late as practicable.
 - Immediately before laying final surfacing: Clean and make good the base/ binder course.
Allow to dry.
 - Adhesion: Tack coat to BS 434-1 or BS EN 13808
Application rate: 0.15-0.25 kg/m²
Accuracy: Uniform, without puddles.
Finishing: Allow emulsion to break completely before applying surface.

Q24 Interlocking brick/ block roads/ pavings

	To be read with Preliminaries/ General conditions
	TYPES OF PAVING
115	PERMEABLE CONCRETE BLOCK PAVING - TOTAL INFILTRATION - TO CAR PARK • Subgrade improvement layer: Submit proposals - Compacted thickness: Submit proposals • Geotextile below granular sub-base: Submit proposals • Granular sub-base: Submit proposals - Compacted thickness: Submit proposals • Geotextile below laying course: - Manufacturer: Submit proposals - Product reference: Submit proposals • Laying course: - Material: In accordance with BS 7533-3, Annex D.2.2 - Compaction: In accordance with BS 7533-3. Determine by trial the depth of loose bedding material needed to ensure specified bedding course thickness after final compaction of paving. - Nominal thickness after compaction: 50 mm • Blocks: To BS EN 1338. - Manufacturer: Submit proposals - Product reference: Submit proposals - Sizes: 200 x 100 x 80 mm - Special blocks: None - Spacer nibs: Required - Arrises: No requirement - Colour/ Finish: Submit Proposals - Recycled content: Submit proposals - Requirements: as per architect's detail - Freeze/ thaw resistance: Class 1 - Abrasion resistance: Class 1 - Slip/ Skid resistance: PTV to BS 7976-2 of 40 • Jointing: - Material: Single size 5 mm washed aggregate - Joint width: 6 mm - Conventional sand jointing: Do not use • Setting out: - Bond: As drawing TBC - Features: White marker blocks defining parking bays • Accessories: None
124	PERMEABLE CLAY PAVER PAVING - TOTAL INFILTRATION - TO CAR PARK • Subgrade improvement layer: Submit proposals - Compacted thickness: Submit proposals • Geotextile below granular sub-base: Submit proposals • Granular sub-base: Submit proposals - Compacted thickness: Submit proposals • Geotextile below laying course: - Manufacturer: Submit proposals - Product reference: Submit proposals • Laying course: - Material: In accordance with BS 7533-3, Annex D.2.2 - Compaction: In accordance with BS 7533-3. Determine by trial the depth of loose bedding material needed to ensure specified bedding course thickness after final compaction of paving. - Nominal thickness after compaction: 50 mm • Pavers: To BS EN 1344: - Manufacturer: Submit proposals - Product reference: Submit proposals

	- Sizes: 200 x 100 x 65 mm - Special pavers: None - Spacer nibs: Required - Arrises: No requirement - Colour/ Finish: Submit Proposals - Requirements: None - Dimensional deviations: No requirement - Freeze/ thaw resistance class: No requirement - Mean transverse breaking load: Class T1 - Abrasion resistance (mm): Class A1 - Slip/ Skid resistance: PTV to BS 7976-2 of 40 - Acid resistance: Class C
	• Jointing: - Material: Single size 5 mm washed aggregate - Joint width: 6 mm - Conventional sand jointing: Do not use • Setting out: - Bond: As drawing TBC - Features: Mortar bedded edge restraint • Accessories: None and Submit proposals
	EXECUTION
200	EXECUTION GENERALLY - CONCRETE BLOCK AND CLAY PAVER PAVING • Standard: In accordance with BS 7533-3.
211	COLOUR BANDING • General: Unless premixed by manufacturer, select blocks/ pavers/ setts from at least 3 separate packs in rotation, to avoid colour banding.
220	SAMPLES • General: Before ordering, submit samples of all blocks/ pavers/ setts that are representative of colour and appearance.
451	LAYING GEOTEXTILE SHEET FOR PERMEABLE PAVING • Jointing: 300mm Overlap
485	LAYING BLOCKS/ PAVERS/ SETTS • Setting out: Start from an edge restraint. • Cutting: Cleanly, accurately and vertically, without spalling. Do not mark or damage visible surfaces. • Cut edges: Turn inwards where possible; do not position against edge restraints or other features. • In situ mortar or concrete infill: Do not use • Compaction: Vibrate to produce thoroughly interlocked paving of even overall appearance with regular joints and accurate to line, level and profile. Do not mark or damage paving units, kerbs and adjacent work. - Concrete blocks and clay pavers: In accordance with BS 7533-3, Annex F, to site category required for laying course material.
500	REGULARITY OF PAVED SURFACES • Maximum variation in gap under a 3 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface): - Precast concrete paving blocks and clay pavers for flexible pavements: 10 mm. • Difference in level between adjacent paving units (maximum): 2 mm. • Sudden irregularities: Not permitted.
505	REGULARITY OF PAVED SURFACES • Maximum undulations in the surface of pavings (except tactile paving surfaces) under a 1 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface): 3 mm. • Joints between paving units or utility access covers:

Disposal systems

- Joints flush with the surface: difference in level between adjacent units to be no more than twice the joint width (with a 5 mm max difference in level).
- Recessed, filled joints: difference in level between adjacent units to be no greater than 2 mm; the recess to be no deeper than 5 mm.
- Unfilled joints: difference in level between adjacent units to be no greater than 2 mm.
- Sudden irregularities: Not permitted.

- 615 COMPLETION OF PAVING
- Final compaction of the surface course: In accordance with BS 7533-3.
 - Vacuum cleaning machines: Not allowed.

R12 Below ground drainage systems

To be read with Preliminaries/ General conditions.

GENERAL

110 BELOW GROUND DRAINAGE SYSTEM FOUL and SURFACE WATER

- Surface water and rainwater drainage sources:
 - Adaptors;
 - One piece gullies and covers; and
 - Rainwater downpipes (non-siphonic), as section R10
- Foul drainage sources: One-piece gullies and covers, discharge stacks and adaptors
- Land drainage sources: None
- Pressure relief drainage sources: None
- Pipes, bends and junctions:
 - Clay - flexible joints;
 - Clay - rigid joints;
 - Concrete;
 - Plastics - structured wall; and
 - PVC-U - solid wall
 - Accessories:
 - Access points;
 - Flexible couplings;
 - Rodding points; and
 - Warning marker tapes
- Manholes, inspection chambers, traps, and separators: Inspection chambers - plastics and Manholes and inspection chambers - concrete.
 - Accessories: Manhole channels and branches - conventional and Sealing for concrete manholes - bituminous strips.
- Disposal:
 - To modular stormwater attenuation units;
 - To outfalls;
 - To pumping stations, as section R18; and
 - To sewers
- Accessories – general:
 - Access covers and frames;
 - Blockwork, as section F10;
 - Concrete;
 - Geotextile - filter;
 - Granular material; and
 - Granular sub-base material

116 GROUNDWATER PRESSURE RELIEF DRAINAGE SYSTEM – FILTER DRAINS if required

- Pipes, bends and junctions: Submit proposals.
- Pipe beddings and surrounds: Submit proposals.
 - Capping: Geotextile membrane, as section R16
- Disposal: To modular stormwater attenuation units.
- Accessories: Submit proposals.

SYSTEM PERFORMANCE

211 DESIGN – BELOW GROUND DRAINAGE SYSTEMS

- Design: Complete the design of the below ground drainage system in accordance with BS EN 752, BS EN 1295-1 and BS EN 1610.
- Ground conditions: Clay, sandy clay - stiff
- Performance criteria: Submit proposals.
- Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

215 DESIGN – GROUNDWATER PRESSURE RELIEF DRAINAGE SYSTEMS if required

- Design: Complete the design of the groundwater pressure relief drainage system.
- Ground conditions: Clay, sandy clay - stiff
- Performance criteria: Submit proposals.
- Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

PRODUCTS

311 ADAPTORS TO CLAY DRAINAGE FOUL and SURFACE WATER

- Material and standard: Polypropylene to BS EN 295-1 and Kitemark certified.
- Type:
 - DN 32 waste pipe to DN 100 clay;
 - DN 50 waste pipe to DN 100 clay;
 - DN 68 rainwater pipe to DN 100 clay;
 - DN 82 discharge stack to DN 100 clay;
 - DN 100 discharge stack to DN 100 clay; and
 - DN 100 rainwater pipe to DN 150 clay
- Manufacturer: Submit proposals
 - Product reference: Submit proposals

312 ADAPTORS TO PLASTICS DRAINAGE FOUL and SURFACE WATER OPTION

- Material and standard: Plastics to BS 4660 and Kitemark certified or to BS EN 1401-1 and Kitemark certified.
- Type:
 - DN 32 waste pipe to DN 100 plastics;
 - DN 50 waste pipe to DN 100 plastics;
 - DN 68 rainwater pipe to DN 100 plastics;
 - DN 82 discharge stack to DN 100 plastics;
 - DN 100 discharge stack to DN 100 plastics; and
 - DN 100 rainwater pipe to DN 150 plastics
- Manufacturer: Submit proposals
 - Product reference: Submit proposals

313 ONE PIECE GULLIES - PAVED FOOTPATH AREAS

- Standards: To BS EN 1253-1, -2, -3, -4 and -5; or
 - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
 - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
 - Plastics: To BS 4660 and Kitemark certified, or Agrément certified.
 - Polypropylene: To BS EN 1852-1.
- Material: Clay
- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Sizes: 600 x 300 mm
- Outlet sizes: DN 100
- Silt buckets: Plastics
 - Product reference: Submit proposals

315 ONE PIECE GULLIES AND COVERS - PAVED AREAS

- Standards: To BS EN 1253-1, -2, -3, -4 and -5; or
 - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
 - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
 - Plastics: To BS 4660 and Kitemark certified, or Agrément certified.
 - Polypropylene: To BS EN 1852-1.
- Material: Plastics
- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Sizes: As drawing TBC
- Outlet sizes: As drawing TBC

- Covers: Grating
 - Product reference: Submit proposals
 - Type: Hinged grating and As drawing TBC
 - Material: As drawing TBC
 - Sizes: As drawing TBC
 - Loading grades to BS EN 124: E600
- Silt buckets: As drawing TBC
 - Product reference: Submit proposals

315A ONE PIECE GULLIES AND COVERS

- Manufacturer: OSMA.
 - Web: www.wavin.co.uk.
 - Email: info@wavin.co.uk.
 - Product reference: 4D800 Osma Drain yard gully
- Cover and frame: 4D810 ductile iron hinged grating C250 rated
- Silt bucket: 4D815 galvanized mild steel silt bucket

329 PIPES, BENDS AND JUNCTIONS - SUPPLY

- Pipes and fittings: From same manufacturer for each pipeline.

336 PIPES, BENDS AND JUNCTIONS - CLAY - FLEXIBLE JOINTS FOUL and SURFACE WATER

- Material and standard: Vitrified clay to BS EN 295-1, Kitemark certified.
- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Sizes:
 - DN 100;
 - DN 150;
 - DN 225;
 - DN 300;
 - DN 350; and
 - DN 450
- Crushing strength (minimum): FN 40, 48 and 72
- Jointing type: Polypropylene sleeve

342 PIPES, BENDS AND JUNCTIONS - CONCRETE - SURFACE WATER DRAINAGE

- Standards: To BS 5911-1 and BS EN 1916, with flexible joints.
- Manufacturer: Contractor's choice
 - Product reference: Contractor's choice
- Sizes: DN 500
- Shapes: Circular
- Cement type and content: To BS 5911-1 and BS EN 1916
- Accessories: Cast in lifting anchors

344 PIPES, BENDS AND JUNCTIONS - PLASTICS - STRUCTURED WALL - SURFACE WATER DRAINAGE

- Standard: To BS EN 13476-1 and -2 or -3, Kitemark or Agrément certified
 - Supplementary requirements: Puncture resistance, jetting resistance and longitudinal bending to requirements of WIS 4-35-01, issue 2.
- Material: PVC-U
- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Recycled content: Submit proposals
- Sizes:
 - DN 110;
 - DN 150;
 - DN 255;
 - DN 300;
 - DN 400; and
 - DN 450
- Jointing type: Double spigot

346 PIPES, BENDS AND JUNCTIONS - PVC-U - SOLID WALL - FOUL and SURFACE DRAINAGE OPTION

- Standard: BS EN 1401-1 with flexible joints.
 - Class: SN4
- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Recycled content: 10% (minimum) to BS EN ISO 14021
- Sizes: DN 100 - DN300
- Application area code: UD.

348 PIPES, BENDS AND JUNCTIONS - POLYPROPYLENE - FOUL DRAINAGE

- Standard: To BS EN 1852-1.
- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Recycled content: Submit proposals
- Sizes: DN100 and DN150
- Application area code: UD.
- Jointing type: Ring seal spigot and socket

352 ACCESS POINTS - PLASTICS - FOUL & SURFACE DRAINAGE

- Standard: To BS 4660 and Kitemark certified, to BS EN 13589-1, or Agrément certified.
- Manufacturer: Submit proposals
- Nominal diameter: DN450 max
- Bases:
 - Product reference: Submit proposals
- Raising pieces:
 - Product reference: Submit proposals
 - Heights:
 - 100 mm;
 - 150 mm;
 - 200 mm;
 - 250 mm; and
 - 300 mm
- Access covers and frames:
 - Product reference: Submit proposals
 - Loading grades to BS EN 124: C250

367 RAT BARRIERS To outfalls

- Manufacturer: Contractor's choice
 - Product reference: Contractor's choice

371 RODDING POINTS Where required

- Standards:
 - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
 - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
 - Plastics: To BS 4660 and Kitemark certified, to BS EN 13598-1 or Agrément certified.
- Material: Plastics
- Manufacturer: Submit proposals
 - Product reference: Submit proposals
- Sizes: DN 150

373 ROOT BARRIERS if required

- Manufacturer: Submit proposals
 - Product reference: Submit proposals

401 INSPECTION CHAMBERS - PLASTICS TO FOUL and SURFACE WATER

- Standard: To BS 7158, BS EN 13598-1, BS EN 13598-2 or Agrément certified.
- Diameter: 450 mm
- Manufacturer: Submit proposals

- Bases:
 - Product reference: Submit proposals
 - Shaft units:
 - Product reference: Submit proposals
 - Access covers and frames:
 - Product reference: Submit proposals (restricted to 300mm >1.2m depth)
 - Loading grades to BS EN 124: C250
- 407 MANHOLES AND INSPECTION CHAMBERS - CONCRETE TO FOUL AND SURFACE WATER
- Standards:
 - To BS 5911-3 and BS EN 1917 and Kitemark certified; or
 - To BS 5911-4 and BS EN 1917.
 - Manufacturer: Submit proposals
 - Shape: Circular
 - Sizes: DN 1200 and DN 1800
 - Cement type and content: To BS 5911-1 and BS EN 1916
 - Chamber sections:
 - Product reference: Submit proposals
 - Jointing type: Bituminous strips
 - Cover slabs:
 - Product reference: Submit proposals
 - Thickness: 200 mm
 - Loading grades to BS EN 124: D400 and E600(HGV Areas)
 - Openings: To suit access covers.
 - Steps: Required in chambers over 900 mm deep
 - Vortex flow control unit: As drawing 92 101
- 409 MANHOLES - CONCRETE - ADDITIONAL COMPONENTS FOR DEEP MANHOLES
- Standards:
 - To BS 5911-3 and BS EN 1917 and Kitemark certified; or
 - To BS 5911-4 and BS EN 1917.
 - Manufacturer: Submit proposals
 - Cement type and content: To BS 5911-3 and BS EN 1917 and Kitemark certified; or to BS 5911-4 and BS EN 1917
 - Landing slabs:
 - Product reference: Submit proposals
 - Sizes: as required
 - Reducing slabs:
 - Product reference: Submit proposals
 - Sizes: as required
 - Straight backed tapers:
 - Product reference: Submit proposals
 - Nominal sizes: as required
 - Shaft sections:
 - Product reference: Submit proposals
 - Sizes: as required
- 412 MANHOLES AND INSPECTION CHAMBERS – PLASTICS TO SURFACE DRAINAGE
- Standard: To BS EN 13598-2
 - Manufacturer: Submit proposals
 - Product reference: Submit proposals
 - Material: Polypropylene
 - Shape: Circular
 - Size: As drawing TBC
 - Moulded base:
 - Channels and connections: As drawing TBC
 - Benching: As drawing TBC
 - Formwork for concrete surround: Required
 - Steps: Not required
- Vortex flow control unit: Not required
- 421 OIL AND PETROL SEPARATOR UNITS - PLASTICS Service Yard
- Standards: To Environment Agency PPG 3 and BS EN 858-1, with oil level alarm.
 - Manufacturer: Submit proposals
 - Product reference: Submit proposals
 - Type: Class 1 and Full retention
 - Size: Submit proposals
 - Inlet pipe size: TBC
 - Outlet pipe size: TBC
 - Accessories: Access covers and frames (as 407) and Alarm System
- 433 MANHOLE CHANNELS AND BRANCHES - CONVENTIONAL TO FOUL and SURFACE WATER
- Material: Clay
 - Manufacturer: Contractor's choice
 - Product reference: Contractor's choice
- 437 VORTEX FLOW CONTROL UNITS Outfall to attenuation tank
- Manufacturer: Hydro International
 - Product reference: Agrément certified and submit proposals
 - Material: Stainless steel
 - Drain down secondary outlet pipe: As drawing TBC
 - Control type: Disc valve
 - Operation: From surface.
- 439 MANHOLE STEPS For PCC
- Standard: To BS EN 13101.
 - Type: A
 - Manufacturer: Submit proposals
 - Product reference: Submit proposals
 - Material: Plastics coated steel
- 444 SEALING FOR CONCRETE MANHOLES - BITUMINOUS STRIPS FOUL and SURFACE WATER
- Manufacturer: DENSO
 - Product reference: Tokstrip
- 464 MODULAR STORMWATER ATTENUATION UNITS to SURFACE WATER SYSTEM
- Manufacturer: Wavin or equivalent
 - Product reference: Aquacell Plus or equivalent
 - Unit size: As drawing TBC
 - Tank capacity/ size (minimum): As drawing TBC
- 471 ACCESS COVERS AND FRAMES TO ALL CHAMBERS
- Standard: To BS EN 124.
 - Types: Single seal
 - Manufacturer: Contractor's choice
 - Product reference: Contractor's choice
 - Materials: Ductile cast iron
 - Finishes: Black bitumen painted & labeled FW or SW
 - Sizes: As drawing TBC
 - Loading grades to BS EN 124: As drawing TBC
 - Edging trims: Not required
 - Accessories: none
- 483 CONCRETE TO ALL DRAINAGE ELEMENTS UNLESS STATED OTHERWISE ON THE DRAWINGS
- Standard: To BS 8500-2
 - Concrete: Standardized prescribed, ST4
- 496 GRANULAR MATERIAL – NATURAL TO NEW DRAINAGE DEPENDANT UPON DEPTH
- Standards: To Water Industry Specification WIS 4-08-02 (as amended by WIS 4-08-02A, 2008).

- Supplier: Contractor's choice
- Recycled content: None permitted
- Size: Dependent on location – see Execution clauses in this section, and in sections R16, R17 and R18, if used.

FABRICATION

- 510 VERMIN GRATINGS FOR OUTFALLS AND OUTLET HEADWALLS
- Construction: Mild steel frame extending 75 mm beyond pipe opening all around, with 25 mm maximum opening steel mesh grille. Top hinged on built-in fish-tail straps and with bottom pin lock.
 - Finish: Galvanized to BS EN ISO 1461 after fabrication.
 - Submit: Shop drawings.
 - Timing: Before manufacture.

EXECUTION

- 610 STRIPPING OUT
- Extent of stripping out: Existing soakaway to be abandoned under footprint of Multi sports hall
 - Exposed ends of existing drainage to be abandoned: Seal with concrete (general).
- 611 EXISTING DRAINS
- Setting out: Before starting work, check invert levels and positions of existing drains, sewers, inspection chambers and manholes against drawings. Report discrepancies.
 - Protection: Protect existing drains to be retained and maintain normal operation if in use.
- 613 EXCAVATED MATERIAL
- Turf, topsoil, hardcore, etc: Set aside for use in reinstatement.
- 616 SELECTED FILL FOR BACKFILLING
- Selected fill: As-dug material, free from vegetable matter, rubbish, frozen soil and material retained on a 40 mm sieve.
 - Compaction: By hand in 100 mm layers.
- 616A IMPORTED FILL FOR BACKFILLING TO TRENCHES UNDER PAVERD AREAS
- Imported well graded granular fill: free from vegetable matter, rubbish, frozen soil and material retained on a 40 mm sieve.
 - Compaction: By hand in 100 mm layers.
- 616B SELECTED FILL FOR BACKFILLING TO TRENCHES UNDER LANDSCAPED AREAS
- Selected fill: As-dug material, free from vegetable matter, rubbish, frozen soil and material retained on a 40 mm sieve.
 - Compaction: By hand in 100 mm layers.
- 623 LOWER PART OF TRENCH – GENERAL
- Trench up to 300 mm above crown of pipe: Vertical sides, width as small as practicable.
 - Width (minimum): External diameter of pipe plus 300 mm.
- 625 LOWER PART OF TRENCH - TRANSITION DEPTH
- Trench widths up to 300 mm above crown of pipe (maximum):
 - DN 100 pipelines more than 6.0 m deep: 600 mm.
 - DN 150 pipelines more than 5.4 m deep: 700 mm.
 - DN 225 pipelines more than 4.0 m deep: 800 mm.
 - DN 300 pipelines more than 2.9 m deep: 900 mm.
- 631 TYPE OF SUBSOIL
- General: Where type of subsoil at level of crown of pipe differs from that stated for the type of bedding, surround or support, give notice.

- 635 FORMATION FOR BEDDINGS
- Timing: Excavate to formation immediately before laying beddings or pipes.
 - Mud, rock projections, boulders and hard spots: Remove. Replace with consolidated bedding material.
 - Local soft spots: Harden by tamping in bedding material.
 - Inspection of excavated formations: Give notice.
- 641 PIPES AT DIFFERENT LEVELS IN COMMON TRENCH
- Subtrench: Permissible provided soil of step is stable and unlikely to break away.
 - Subtrench not permissible: Trench depth as required for lower pipe. Increase thickness of bedding to upper pipe as necessary.
 - Lower pipe: Backfill with compacted granular material to at least half way up higher pipe.
 - Clear horizontal distance between pipes (minimum):
 - Pipes up to DN 700: 350 mm.
 - Pipes exceeding DN 700: 500 mm.
- 667 CLASS S SURROUND Used where pipelines have greater than 0.6m depth in landscape areas and greater than 1.2 m in trafficked areas
- Type of subsoil: Clay, gravelly sandy clay
 - Trench width up to 300 mm above crown of pipe (maximum):
 - DN 100 nominal pipe size: 600 mm.
 - DN 150 nominal pipe size: 700 mm.
 - DN 225 nominal pipe size: 800 mm.
 - DN 300 nominal pipe size: 900 mm.
 - Granular material: Natural
 - Sizes: To Water Industry Specification WIS 4-08-02 (as amended by WIS 4-08-02A, 2008).
 - Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 50 mm for sleeve jointed pipes, 100 mm for socket jointed pipes. Where trench bottom is uneven, increase depth by 100 mm.
 - Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
 - Initial testing before placing surround: Required
 - Surround:
 - Material: Granular.
 - Depth: To 50 mm above crown of pipe.
 - Compaction: By hand in 100 mm layers.
 - Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.
- 678 CLASS Z SURROUND Used where pipelines have less than 0.6m depth in landscape areas and less than 1.2 m in trafficked areas
- Type of subsoil: Clay gravelly sandy clay
 - Blinding:
 - Material: Concrete (general).
 - Thickness (minimum): 25 mm.
 - Width: Full width of trench.
 - Allow to set before proceeding.
 - Pipes:
 - Temporary support: Folding wedges of compressible board. Prevent flotation.
 - Clearance under pipes (minimum): 100 mm.
 - Adjust pipes to line and gradient.
 - Initial testing before placing surround: Required
 - Surround:
 - Material: Concrete.
 - Depth: To 150 mm above crown of pipe.
 - Width: Full width of trench.
 - Vertical construction joints:
 - Location: At face of flexible pipe joints.
 - Material: 18 mm thick compressible board pre-cut to profile of pipe.

- Socketed pipes: Fill gaps between spigots and sockets with resilient material to prevent entry of concrete.
- 680 CONCRETE SURROUND FOR PIPE RUNS NEAR FOUNDATIONS
- Class Z surround: Provide in locations where bottom of trench is lower than bottom of foundation and as follows (horizontal clear distance between nearest edges of foundations and pipe trenches):
 - Trenches less than 1 m from foundations: Top of concrete surround not lower than bottom of foundation.
 - Trenches more than 1 m from foundations: Top of concrete surround not lower than D mm below bottom of foundation, where D mm is horizontal distance of trench from foundation, less 150 mm.
- 683 LAYING PIPELINES
- Laying pipes: To true line and regular gradient on even bed for full length of barrel with sockets (if any) facing up the gradient.
 - Ingress of debris: Seal exposed ends during construction.
 - Timing: Minimize time between laying and testing.
- 685 JOINTING PIPELINES
- Connections: Durable, effective and free from leakage.
 - Junctions, including to differing pipework systems: With adaptors intended for the purpose.
 - Cut ends of pipes: Clean and square. Remove burrs and swarf. Chamfer pipe ends before inserting into ring seal sockets.
 - Jointing or mating surfaces: Clean and, where necessary, lubricate immediately before assembly.
 - Allowance for movement: Provide and maintain appropriate clearance at ends of spigots as fixing and jointing proceeds.
 - Jointing material: Do not allow to project into bore of pipes and fittings.
- 687 CONCRETE SURROUND FOR CROSSOVERS
- Class Z surround: Provide where two pipelines (other than plastics pipes) cross with less than 300 mm separation.
 - Extent, on both pipes: 1 m centred on the crossing point, and beyond as necessary to come within 150 mm of nearest flexible joints.
- 689 PIPELINES PASSING THROUGH STRUCTURES
- Pipelines that must be cast in or fixed to structures (including manholes, catchpits and inspection chambers): Provide 600 mm long rocker pipes adjacent to the external face of the structure (or both faces where appropriate, e.g. walls to footings), with flexible joints at both ends.
 - Distance to rocker pipe from structure (maximum): 150 mm.
 - Provision for movement for pipelines that need not be cast in or fixed to structures (e.g. walls to footings):
 - Rocker pipes as specified above; or
 - Openings in the structures to give 50 mm minimum clearance around the pipeline. Closely fit a rigid sheet to each side of opening to prevent ingress of fill or vermin.
- 691 BENDS AT BASE OF SOIL STACKS
- Type: Nominal 90° rest bends
 - Radius to centreline of pipe (minimum): 200 mm
 - Height of invert of horizontal drain at base of stack below centreline of lowest branch pipe (minimum): 450 mm
 - Bedding: Do not impair flexibility of pipe couplings.
Material: Concrete (general).
- 693 DIRECT CONNECTION OF GROUND FLOOR WCS TO DRAINS
- Drop from crown of WC trap to invert of drain (maximum): 1.5 m
 - Horizontal distance from the drop to a ventilated drain (maximum): 6 m.
- 695 BACKDROP PIPES OUTSIDE MANHOLE WALLS
- Excavation beneath backdrop pipe: Backfill.
 - Material: Concrete.
 - Pipe encasement:

- Material: Concrete.
 - Thickness (minimum): 150 mm.
- 697 INSTALLING FLEXIBLE COUPLINGS
- Ends of pipes to be joined: Cut cleanly and square.
 - Outer surfaces of pipes to be joined: Clean and smooth. Where necessary, e.g. on concrete or iron pipes, smooth out mould lines and/ or apply a cement grout over the sealing area.
 - Clamping bands: Tighten carefully to make gastight and watertight seals.
- 699 CONNECTIONS TO SEWERS
- General: Connect new pipework to existing adopted sewers to the requirements of the adopting authority or its agent.
- 705 INITIAL TESTING OF PIPELINES
- Before testing:
 - Cement mortar jointing: Leave 24 h.
 - Solvent welded pipelines: Leave 1 h.
 - Method: Block open ends of pipelines to be tested and pressurise. Air test short lengths to BS EN 1610.
- 711 TRENCH SUPPORTS
- Removal of trench supports and other obstacles: Sufficient to permit compacted filling of all spaces.
- 713 INSTALLING ROOT BARRIERS
- Root barrier installation: Full depth of excavation. Fit closely to trench wall nearest the tree.
- 715A BACKFILLING TO PIPELINESPAVED AREAS
- Backfilling above top of surround or protective cushion: Imported material compacted in layers 150 mm (maximum) thick subject to compaction plant used.
 - Heavy compactors: Do not use before there is 600 mm (total) of material over pipes.
- 715B BACKFILLING TO PIPELINESLANDSCAPED AREAS
- Backfilling above top of surround or protective cushion: Material excavated from trench, compacted in layers 150 mm (maximum) thick subject to compaction plant used.
 - Heavy compactors: Do not use before there is 600 mm (total) of material over pipes.
- 718 BACKFILLING OVER CONCRETE
- Minimum times from placing concrete:
 - Backfilling generally: 24 h.
 - Heavy compactors and traffic loads: 72 h.
- 720 BACKFILLING UNDER ROADS AND PAVINGS
- Backfilling from top of surround or protective cushion up to formation level: Granular sub-base material, laid and compacted in 150 mm layers.
- 728 LAYING WARNING MARKER TAPES
- Installation: During backfilling, lay continuously over pipelines.
 - Depth: 300-400 mm.
 - Pipelines deeper than 2 m: Lay an additional tape 600 mm above the top of the pipeline.
- 732 TEMPORARY BRIDGES
- Trench bridges: As necessary to prevent construction traffic damaging pipes after backfilling.
- 734 INSTALLING ACCESS POINTS AND GULLIES
- Bedding:
 - Material: Concrete
 - Thickness (minimum): 150 mm
 - Surround:
 - Material: Concrete
 - Thickness (minimum): 150 mm

- Height: Full height
- Backfilling: Imported material
 - Material: Selected fill
 - Compaction: By hand in 100 mm layers.
- Setting out relative to adjacent construction features: Square and tightly jointed.
- Permissible deviation in level of external covers and gratings: +0 to -6 mm.
- Raising pieces (clay and concrete units): Joint with 1:3 cement:sand mortar.
- Exposed openings: Fit purpose made temporary caps. Protect from traffic.

736 INSTALLING RODDING POINTS

- Bedding and surround:
 - Material: Concrete (general).
 - Thickness (minimum): 150 mm
- Permissible deviation in level of external covers and gratings: +0 to -6 mm.

741 INSTALLING INSPECTION CHAMBERS - PLASTICS

- Bedding:
 - Material: Concrete
 - Thickness (minimum): 150 mm
- Surround:
 - Material: Concrete
 - Thickness (minimum): 150 mm
- Backfilling: imported material
 - Compaction: By hand in 100 mm layers.
- Concrete collar:
 - Material: Concrete
 - Thickness (minimum): 225 mm
 - Width (minimum): 300 mm
- Seating: Brickwork Eng B

743 INSTALLING CONCRETE MANHOLES

- Bases:
 - Material: Concrete
 - Thickness (minimum): 225 mm
- Surround:
 - Material: Concrete
 - Thickness (minimum): 150 mm
 - Height: Full height
- Backfilling:
 - Material: imported material
 - Compaction: By hand in 100 mm layers.

747 INSTALLING OIL AND PETROL SEPARATOR UNITS

- Base:
 - Material: Concrete (general).
 - Thickness (minimum): 200 mm
- Surround:
 - Material: Not required
 - Thickness (minimum): 150 mm
- Backfilling: Granular material - manufactured, size 4/10 to BS EN 13242, to 100 mm above crown of pipes, then selected fill
 - Compaction: By hand in 100 mm layers.
- Installation: Fill tank with water then encase tank and access shafts with concrete to fully support tank.
- Vent pipe termination: 2.4 m (minimum) above ground level

750 INSTALLING VORTEX FLOW CONTROL UNITS

- Benching:
 - Material: Concrete
 - Profile: Rise from manhole base to a level not lower than soffit of outlet pipe, then slope upwards at 10% towards soffit of inlet pipe.

- Topping:
 - Material: Granolithic Concrete
 - Application: Before benching concrete has set, and with dense smooth uniform finish.
- Vortex flow control mounting block (cast in situ):
 - Material: Concrete
 - Profile: Rise from manhole base vertically to provide plane surface for attachment of unit.
- Outlet pipe: Build in.
- Drain down secondary outlet pipe: Not applicable

753 FIXING MANHOLE STEPS

- Fixing: Secure to chamber wall
- Positioning: 300 mm vertical centres staggered 300 mm horizontally, with lowest step 300 mm (maximum) above benching and top step 450 mm (maximum) below top of cover.

755 JOINTING CONCRETE MANHOLE CHAMBER SECTIONS

- Jointing and sealing: Tokstrip
- Inner joint surface: Trim surplus jointing material extruded into chamber and point neatly.

757 LAYING CONVENTIONAL CHANNELS, BRANCHES AND BENCHING

- Main channel: Bed solid in 1:3 cement:sand mortar.
 - Branches: Connect to channel, preferably at half pipe level, so that discharge flows smoothly in direction of main flow.
 - Branches greater than nominal size 150 mm: Connect the branch soffit level with the main drain soffit.
 - Connecting angles more than 45° to direction of flow: Use three-quarter section channel bends.
- Benching:
 - Material: Concrete
 - Profile: Rise vertically from top of main channel to a level not lower than soffit of outlet pipe, then slope upwards at 10% to walls.
 - Topping:
 - Material: Granolithic Concrete
 - Application: Before benching concrete has set, and with dense smooth uniform finish.

766A INSTALLING UNDERGROUND STORAGE TANK UNITSMODULAR CRATE SYSTEM

- Base:
 - Material: Blinding Concrete 100mm thk over 225 mm thk type 1 sub base
 - Thickness (minimum): 100mm + 225 mm
- Stabilizing: Before placing surround, fill with water to Not required
- Surround:
 - Material: Backfill material lto sides of units as per manufacturers recommendations
 - Thickness (minimum): as required
 - Height above top of base: Full height of tank
- Backfilling to upper part of tank: Imported well graded fill material
 - Compaction: By hand in 100 mm layers.

771 INSTALLING OUTFALLS

- Pipe outflow invert (minimum): Seasonal peak level or 150 mm above normal water level, whichever is the higher.
- Pipe surround and backfill to the last 2 m run of drain: Excavated subsoil, rammed home.

776 EXPOSED OPENINGS IN INSPECTION CHAMBERS, ACCESS POINTS, FITTINGS AND EQUIPMENT

- General: Fit purpose made temporary caps. Protect from site traffic.

COMPLETION

901 REMOVAL OF DEBRIS AND CLEANING

- Preparation: Lift covers to manholes, inspection chambers and access points. Remove mortar droppings, debris and loose wrappings.
 - Timing: Before cleaning, final testing, CCTV inspection if specified, and immediately before

handover.

- Cleaning: Thoroughly flush pipelines with water to remove silt and check for blockages. Rod pipelines between access points if there is any indication that they may be obstructed.
- Washings and detritus: Do not discharge into sewers or watercourses.
- Covers: Securely replace after cleaning and testing.

911 TESTING AND INSPECTION

- Dates for testing and inspection: Give notice.
 - Period of notice: agree with Building control (minimum 48hrs .

921 FINAL TESTING OF PRIVATE GRAVITY DRAINS AND SEWERS UP TO DN 300

- Before testing:
 - Cement mortar jointing: Leave 24 h.
 - Solvent welded pipelines: Leave 1 h.
- Standard: To Building Regulations.
- Method: Air or as agreed with Building Control

941 WATER TESTING OF MANHOLES AND INSPECTION CHAMBERS

- Timing: Before backfilling.
- Standard:
 - Exfiltration: To BS EN 1610.
 - Method: Testing with water (method W).
 - Infiltration: No identifiable flow of water penetrating the chamber.

971A CCTV INSPECTION OF PRIVATE PIPELINES

- General: Carry out and record internal inspection using CCTV equipment.
 - Locations to be inspected: all new foul and surface water drains
- Illumination: Of adequate intensity.
- Recording: Provide continuous position recording, still photographs and stopping of the camera at any point.
 - Copy of videotape recording: Submit electronic issue.

978 LIFTING KEYS

- Lifting keys: Supply suitable keys for each type of access cover.
 - Timing: At completion.

R17 Soakaway, septic tank and sewage treatment units

To be read with Preliminaries/ General conditions

PRODUCTS

305 BELOW GROUND DRAINAGE SYSTEMS - PRODUCTS

- Products generally: As section R12.

315A MODULAR PLASTICS ATTENUATION UNITS

- Manufacturer: Wavin Ltd.
 - Web: www.wavin.co.uk.
 - Email: info@wavin.co.uk.
 - Product reference: AquaCell Core
- Installation Size: As drawing TBC
- Accessories: Silt trap ref. 6LB600

EXECUTION

605 BELOW GROUND DRAINAGE SYSTEMS - EXECUTION

- Execution generally: As section R12.

650 BACKFILLING WITH AS-DUG MATERIAL

- Material: As excavated from the trench.
- Placing and compaction: Maximum 300 mm thick layers, up to finished ground level. Compact each layer before placing the next.
- Heavy compactors: Do not use before there is 600 mm of material over pipes.

Appendix F: Ground Floor Slab (Suspended)

The following Specification is to be adhered to in the design and construction of the suspended ground floor slab. Where items in the following Specification differ from similar items detailed within the AKS Ward Ltd NBS specification, the most stringent/onerous item should be adopted.

1. The ground floor slab is to be constructed in accordance with the recommendations of the Concrete Society Technical report 34:2013 (Fourth Edition).
2. The ground floor slab shall be of reinforced concrete construction and shall be designed for a minimum imposed loading of 30kN/m² or for the imposed loads shown on the Engineer's drawings (whichever is greater). The design should account for any point loads to be applied by any planned installation, such as pallet racking. The slab shall have a power trowelled surface finish. Fibre (steel and polypropylene) reinforced slabs are not acceptable.
3. The ground floor slab shall be designed to allow the Client to locate the legs of any pallet racking anywhere on the ground floor slab including immediately adjacent to floor joints. The racking system applies point loads of up to 100kN on two racking legs immediately adjacent to each other (50kN per leg) each with a 100mm x 100mm base plate.
4. Where it is identified within the agreement that a mezzanine floor is to be installed by the Client, then the Designer shall ensure that the appropriate area of the ground floor slab is designed to accommodate point loads from the mezzanine floor structure as indicated on the Engineer's drawings. As a minimum, a 150 kN (unfactored) point load applied via a surface fixed 300mm x 300mm base plate should be considered. The point loading criteria for the mezzanine floor is to apply up to 50mm away from any floor joints. If this distance is to differ, approval should be sought from the Client and Engineer.
5. The floor slab shall be laid to a minimum thickness of 300mm for conventional suspended ground floor slabs using 'specialist' large area techniques.
6. The slab will conform to the performance criteria detailed within The Concrete Society Technical Report No. 34 (4th Edition) in respect of level and surface regularity (flatness) of:

- FM2 – Reach trucks operating at 8-13m without side-shift

The maximum allowable deviation from the specified datum will be 15mm over the whole floor. No steps are allowed at joints.

7. Contractors, when selecting the cement to be used, should, in consultation with the Concrete Producer, consider the ambient temperature, relative humidity and site exposure conditions that are anticipated at the time of construction. Where the building shell is incomplete, suitable secure temporary coverings shall be erected to protect the entire floor area from sunshine, snow, wind and rain or any other weather condition detrimental to achieving a well finished floor. In hot weather the roof lights are to be temporarily sealed over during the floor laying process. Environmental conditions are to be controlled to prevent the likelihood of delamination, excessive crazing and curling occurring in the floor slab. Temporary weathering is to be maintained in place for a minimum of 7 days following completion of the installation of the slab, (except to allow for the installation of permanent works).
8. All down-pipes shall be connected, and manholes, service entries etc. constructed such that high-quality edge detailing and finishing is practical.
9. The structural floor slab is also the final floor finish for trading purposes for the Client and is therefore of high visual importance. Particular care must be taken when finishing the slab adjacent to doorways and the perimeter walls as the criteria for surface regularity (flatness) and levels are critical in these areas.
10. The floor slab is to be power-trowelled to a smooth reflective finish, be of uniform colour and without localised deviations or patchiness in either colour or surface finish. There shall be no 'rippling' or 'lipping' to joints. The surface shall be free from excess trowel marks, score marks, scratches, delamination and loose

aggregate at the surface, in addition to black marks and associated defects related to over-trowelling or 'cold joints'. The surface shall be fully closed and 'polished'.

11. The floor shall incorporate Rocland HP Qualidur Light Grey dry shake or an equal and approved product at an application rate of 6kg/m² or in accordance with the manufacturer's recommendations. Post applied colour treatments shall not be used.
12. In the event of minor delamination or similar defects, the areas are to be patch repaired in a manner approved by the Engineer. If more than 5% of one bay bounded by saw cuts is subject to any of the above defects, then the bay shall be removed in its entirety and replaced, unless otherwise agreed by the Client.
13. Finishing of the edges should be timed such that this is smooth, free from trowel ridges and not significantly lighter than the surrounding areas. Water should specifically not be used in these areas, as they tend to be lighter in any event.
14. The pours are to be planned and managed such that 'cold joints' do not occur, and uniformity of concrete setting is achieved.
15. A meeting is to be arranged with the Specialist Floor Layer, the Concrete Supplier (part of meeting), the Structural Engineer, the main Contractor, the Client Project Manager and the Client Specialist Flooring Consultant (where applicable) at least one month, in advance of the floor laying process to agree and document all designs, workmanship, construction, supervision, monitoring and testing procedures that apply to the laying of the floor slab, with particular reference to the very high qualitative standards to be achieved. In addition, a senior representative of the Concrete Supplier and Specialist Floor Layer shall attend site on the afternoon prior to the first pour to meet with the Client Project Manager or Client Specialist Flooring Consultant (where applicable) to re-confirm delivery arrangements and site issues. This meeting shall form part of the pre-pour checks.
16. A Quality Plan detailing how the finish required is to be consistently achieved shall be submitted to the Engineer for comment 14 days prior to installation of the floor slab. Assurances regarding timely deliveries of concrete shall be sought from the Concrete Supplier and the details of these assurances and the contingency plans proposed to ensure uninterrupted supplies is to form part of the quality plan.
17. Care shall be taken to minimise the risk of cracking and/or surface crazing within the constraints of the approved construction method. The use of plate dowels and inbuilt allowance for lateral movement is required in place of traditional dowel bars, which may cause restraints of the natural shrinkage of the floor.
18. All formed concrete construction joints and day-work joints will be kept to a minimum and will be armoured by Alpha Joints or equivalent, set at no more than 50m centres. All pedestrian/emergency doors will be isolated on the inside wall by a galvanised Beta Strip or equivalent. The stop end at access doors is to be located in line with the centre line of the door threshold. Installation of Alpha Joint and Beta Strips shall be carried out in accordance with manufacturer's selection criteria, technical data sheets and instructions for use. Unless agreed otherwise at the pre-construction meeting, Alpha Joints shall be pre-fitted with a 3-5/18mm T Foam Tape System. No abrupt changes in levels across joints shall be permitted.
19. No later than 12 months after the floor has been laid, Alpha Joints opening wider than 3mm in trafficked areas only shall be filled with an approved joint sealant with a min. Shore A hardness of 70, approved sealant in colour to match the floor surface colour.
20. The perimeter of the slab shall be isolated with 10mm polyethylene foam. Internal columns shall be isolated from the main floor by means of "leave in place" steel plates and 20mm wide polyethylene foam surround with a 25mm tear off strip at the top. The area within the web of the columns shall be infilled with concrete and the specified dry shake with a minimum application rate at these locations of 7kg/m², finished by hand to a smooth hard trowelled finish. The perimeter and column joints shall be sealed with a polysulphide sealant to match the floor colour.
21. All sawn joints shall be diamond cut 3mm wide in panels with a maximum aspect ratio of 3:2, at no more than 6m centres, unless otherwise agreed by the consultant Engineer. The joints are to be sawn as soon as practicable after slab laying and finishing to release stress build-up. These joints shall be sealed immediately prior to handover to the Client with polyurethane sealer with a Shore A hardness in the range

of 45-55-. When it is anticipated that joint opening has reached its optimum level, but no later than 12 months after the floor has been laid, the saw cuts in trafficked areas only shall be filled with a semi-rigid resin-based sealant such as Expoflex 800 or similar approved, in a colour to match the floor surface colour.

22. The concrete mix shall not bleed excessively. The mix shall also not be over-cohesive. In order to achieve this requirement, the concrete shall normally possess the following characteristics set out below.
 - A maximum aggregate size is 20mm
 - Lignite content in aggregates used should not exceed the limits set out in BS EN 12620, Annex G4.
 - Fineness Modulus of the (blended, if necessary) fine aggregate should be in the range of 2.6 to 3.0.
 - Not more than 30% of the coarse aggregate should ideally pass the 10mm sieve size.
 - The coarse aggregate should meet the requirements of a maximum Los Angeles coefficient of 40 (LA₄₀) or have established suitability through history of use.
 - The aggregate flakiness index should not exceed FL₃₅ when tested in accordance with BS EN 933-3: 1997.
 - The aggregate drying shrinkage value should not exceed 0.075% when tested in accordance with BS EN 1367-4: 1998.
 - The percentage by weight of aggregate passing the 1 mm sieve should normally be in the range of 25-32% of the overall weight of aggregate.
 - Maximum aggregate proportion less than 4 mm should not normally exceed 44%, except in the case of very angular crushed materials. In this case special precaution should be taken to ensure a cohesive mix.
 - Maximum fines passing the 300 micron sieve including cement should be between 410/460kg.
 - Where a direct-finish is required, fine aggregates should not contain soft or friable particles.
 - Total cement content shall not exceed 360kg/m³.
 - Mixing water should conform to BS EN 1008.
23. It is the responsibility of the Concrete Producer to seek assurance from the aggregate supplier that procedures to minimise the presence of Pyrites and Clay agglomerates are in place. Information on the history of use should also be sought.
24. Where admixtures are to be used, they must not retard the hydration of the cement and delay finishing operations. Strict control on dosage and mixing is also required to ensure that the concrete sets in the same order in which it was placed, to avoid differential setting. The admixture manufacturer's recommendations should also be strictly adhered to and the Contractor should inform the supplier if admixtures or fibres are to be added to the concrete on site.
25. The Concrete Supplier and Contractor should ensure that the proposed concrete is sufficiently cohesive to avoid segregation of the constituent materials. This is particularly relevant where super-plasticisers are to be used.
26. The maximum water/cement ratio shall be 0.55, but the Concrete Supplier should note that minimum water/cement ratio suitable for power-trowelled concrete floors at normal cement contents is 0.48 (approx. 170 l/m³ of water). This is necessary for adequate finish-ability. Cement blends (GGBS, PFA) should not be used where the ambient temperature at the time of placing or finishing is likely to fall below 10 degrees centigrade. The maximum blend allowed outside of the period in which the use of blended cements is prohibited shall be 30% for GGBS and 15% for PFA.
27. Concrete placing shall be suspended unless special measures are taken when the ambient temperature inside the unit falls below 4 degrees Celsius on a falling thermometer. Where appropriate, measures are to be taken to ensure that the temperature of the concrete is maintained above 5 degrees Celsius until the concrete achieves a compressive strength of 5 N/mm². Following the completion of power-trowelling, the floor should be spray cured with Rocland Rocseal or other product recommended by a hardener manufacturer and approved by the Client and Engineer. The curing membrane shall be applied using a power sprayer in such a manner to ensure even application and appearance over the floor slab, preferably with a Stihl SR420 motorised atomiser spray.
28. If, during the pouring of the slab, the source or design of the concrete mix is altered (either through a change of concrete supplier, concrete producer or batching plant), the Contractor and/or Specialist Floor

Layer are to ensure that the finish, appearance and compressive strength of the slab remains consistent throughout the entire slab area. If this does not occur and approval for it to remain is not provided by the Client and the Engineer, the entire slab shall be broken out and re-laid by the Contractor or Specialist Floor Layer.

29. The power-trowelled finished surface shall be protected from damage due to impact or scratching, spillages of oil, grease, coffee, rusty water, acid or any other substance that could stain or damage the floor surface. The method of floor protection shall be approved by the Client and/or Project Manager prior to installation of the floor slab.
30. Unless otherwise agreed by the Engineer and Client, the floor area must not be trafficked or walked on for 3 full days. Nothing must be parked on the floor. After 7 days, vehicles with non-marking tyres will be permitted on the slab subject to loading considerations.
31. The floor slab must have been completed a minimum of 8 weeks prior to the date of practical completion and should be kept dry and protected from flooding by rainwater or other water sources.
32. The Developer shall provide the Client project manager with an independent survey of the floor slab within 2 weeks of the floor slab being laid. The survey shall include levels on a 3m grid across the floor and around the perimeter of the unit within 150mm of the edge of the floor slab. The survey shall identify both TR34 Property II & IV tolerances across the floor joints.
33. Where applicable, cleaning of the floor prior to hand-over shall be carried out in accordance with the procedure agreed in advance of the installation of the floor slab with the Client and Flooring Consultant (where applicable). The cleaning regime shall be approved by the supplier of the floor hardener. Aggressive floor cleaning chemicals and hard brushes / harsh cleaning pads are not to be used.
34. Where the floor slab finish is not in compliance with this Specification proposed remedial works must be agreed with the Client. If an agreed schedule of remedial works does not bring the floor slab surface finish up to a standard compatible with the requirements of this Specification, then the Contractor shall break out and relay the floor slab.