

Sheppard Robson

UBS MANCHESTER

H11: Curtain walling

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H11

Curtain walling REVISED

Tendering

4 Sub-contractor's design responsibility

1. Based on the JCT guide to the use of Performance Specifications, the following are the requisite performance levels for Sub-Contractor design.
2. **Performance Level 1: Prescriptive Specification (no design by Sub-Contractor)**
 - 2.1. The Sub-Contractor is to construct the work in accordance with production information and a prescriptive specification provided by others and has no design responsibility.
 - 2.2. The Sub-Contractor is responsible for materials and workmanship and the provision of product manufacturer's guarantees and warranties where required.
3. **Performance Level 2: Performance Specification (no 'in context' design by the Sub-Contractor)**
 - 3.1. The Sub-Contractor's design input is limited to the selection of 'off the shelf' products that satisfy the performance specification and construction of the works using the selected components.
 - 3.2. The Sub-Contractor is responsible for materials and workmanship, design input in selecting products and the provision of product manufacturer's guarantees and warranties where required.
4. **Performance Level 3: Performance Specification (simple 'in context' design)**
 - 4.1. The Sub-Contractor's design input is limited to the selection of 'off the shelf' products that satisfy the performance specification, adapting them as necessary to suit the Specifier's design and constructing the works using the selected components as adapted.
 - 4.2. The Sub-Contractor is responsible for materials and workmanship, design input in selecting and adapting products and the provision of product manufacturer's guarantees and warranties where required.
5. **Performance Level 4: (complex 'in context' design)**
 - 5.1. The Sub-Contractor is to provide detail design and production information, including a prescriptive specification of products and construct the works in accordance with that design using selected components adapted as necessary.
 - 5.2. The Sub-Contractor is responsible for materials and workmanship and for design input. May obtain product manufacturers' guarantees and warranties for Client.

8 Sub-contractor's design scope performance level 4

1. The Performance Level 4 work associated with this Work Package is specified in the following clauses of this Work Package section: All clauses.
2. These clauses should be read in conjunction with the general clauses of the associated specifications.

13 Contractor's design

1. The work specified in this Section shall be designed by the Contractor based on the Employer's Requirements.
2. **Production information:** Shall be prepared by the Contractor, in conjunction with the novated Design Team, as necessary to procure and construct the work.

20 The scope of the works

1. **The Contractor:** Is entirely responsible for the detailed design, manufacturing, fixing, jointing, and installation of the works shown on the drawings and specified in this work section, including all necessary or required accessories and ancillary work.

2. The Contractor is responsible for coordinating the detail design of related and adjacent work to maintain the specified performance at all interfaces.
3. The Contractor is responsible for ensuring that all materials used are compatible with those of adjacent works so as not to compromise the specified performance or life expectancy of the works.

25 Generally

1. The design, fabrication, installation and performance requirements specified are intended to establish a minimum performance level and general principles. The Contractor shall be responsible for achieving or surpassing the design and performance criteria for all components.

30 Tender/ contract drawings

1. **Drawings:** Have been prepared as scheduled. Information shown is schematic and indicative of the design proposals for the basic functional and architectural requirements. The drawings do not indicate a detailed solution, nor do they prejudice the submission of alternative proposals complying with the specified requirement.

35 Read in conjunction with

1. **The following documents:** The Structural Engineer's documents.
The Services Consultant's documents.
The Fire Strategy Report.
The Acoustic Consultant's documents.
The Access Consultant's documents.
The Security Consultant's documents.

43 Compliance

1. **The Contractor:** Shall ensure that the works described in this Section are compliant with the current editions of:
2. The Building Regulations (England).

45 Approvals

1. The Contractor shall provide all drawings, calculations, and other technical information as may be required to submit the Contractor's proposals to the Building Control Officer/Approved Inspector/Fire Officer.
2. The Contractor shall provide all drawings, calculations, specifications, other technical information together with any risk assessments or risk analysis as may be required to contribute to the fire safety information required under Regulation 38 of the Building Regulations.

46 Approvals

1. The Contractor shall provide all drawings, calculations, and other technical information as may be required to submit the Contractor's proposals to the Principal Designer and/or Health and Safety Officer.

47 Compliance and approvals REVISED

1. The Contractor shall ensure that works described in this Section are compliant with the requirements of the Building Insurer.
2. The Contractor shall provide all drawings, calculations, and other technical information as may be required to submit the Contractor's proposals to the Building Insurer.

48 Compliance

1. The Contractor shall ensure that works described in this Section are compliant with the project fire safety requirements set out in Section B05: Whole project fire safety.

55 Production information

1. Shall be provided by the Contractor as follows: As clause A90:270.
2. Design and production information procedures shall comply with: Clause A90:281.
3. Design and production information shall include all interfaces of related and adjacent work.

60 Accuracy of contract works

1. In addition to any more stringent requirements specified elsewhere, the Works shall be constructed to the degrees of accuracy specified in clause A90:352.
2. Not less than 15 days before commencing the work specified in this section confirm, by survey relative to the Contractor's setting-out points, that the locations of all relevant previously-built works are correct taking account of all specified tolerances. The results of this survey shall be provided.
3. If the surveyed locations of the relevant previously-built works will not allow the works specified in this section to be completed within the specified degrees of accuracy, the Contractor is to seek instructions before proceeding.

70 Warranty

1. **The Contractor:** Must warrant that he has exercised, and will exercise, all reasonable skill and care in:
 - 1.1. The design of the Works insofar as the Works have been or will be designed by the Contractor.
 - 1.2. The selection of materials and goods for the Works insofar as such materials and goods have been or will be selected by the Contractor.
 - 1.3. The satisfaction of any performance specification or requirement insofar as such performance specification or requirement is included or referred to elsewhere in this specification.

80 Design life of the installation

1. The design life of the building, as defined in BS ISO 15686-1, is 60 years.
2. The design life of the envelope system works specified in this Section, as defined in BS ISO 15686-1, is 60 years.
3. **Primary components:** 25 years:
 - 3.1. All primary components, as defined in Section 7.2.4 of the CWCT Standard for Systemised Buildings, will have a predicted service life of not less than the design life of the envelope system, without the need for any cleaning or maintenance.
 - 3.2. All framing components, their fixings, and means of attachment to the structure.
 - 3.3. Thermal insulation and vapour barriers which cannot be removed without dismantling the envelope system.
 - 3.4. Flashings, gutters, copings, and similar metal weathering elements.
 - 3.5. Sealants and gaskets which are concealed within the system and cannot be removed without dismantling the envelope system.
 - 3.6. Brackets for attachment of additional components.
 - 3.7. Structural sealants and bonded joints.
 - 3.8. Fire stopping and cavity barriers.
4. **Secondary components:** 25 years:
 - 4.1. All secondary components, as defined in Section 7.2.5 of the CWCT Standard for Systemised Buildings which, under the specified conditions, have a predicted service life that is less than the design life of the Cladding will be capable of replacement without compromising the long-term structural or weatherproof integrity of the Cladding. They will be capable of replacement without progressive dismantling of the Cladding.

- 4.2. Internal linings.
- 4.3. Internal gaskets.
- 4.4. Exposed finishes to metal components.
- 4.5. Window and door equipment.
- 4.6. Glass.
- 4.7. External panels and their fixings:
5. Secondary components: 25 years
 - 5.1. External gaskets.
 - 5.2. Accessible gaskets and compression seals.
 - 5.3. Accessible sealants.
6. The predicted service life of components will be the service life predicted from recorded performance over time, as defined in clause 3.20 of BS ISO 15686-1.
7. **Provide:** In the Building Manual specified in Section clause A90:715, information on the methods for replacing all components and assemblies with a design life less than that of the building or less than that of the installation of which they form part.

85 Building manuals

1. Are required and shall comply with: Clause A90:715.

Types of curtain walling

101 General

1. For configuration, dimensions and location refer to the Architect's drawings.
2. Cladding systems to take into account all design loads, including live loads, maintenance loads
3. For samples, prototypes and mock-ups refer to the Architect's Samples and Mock-up Schedule.
4. Services coordination:
 - 4.1. There shall be no trailing cables.
 - 4.2. Colour of services fittings shall match colour of cladding and be to the acceptance of the Architect.
 - 4.3. Mounting of fittings shall be coordinated with the Architect.
5. Systems shall include copings, cills, flashings and plinths as required according to location.

110 Curtain walling FOH - Ground Floor - Ext-WT22 REVISED

1. **Description:** Ground floor FOH curtain walling façade system
Double-glazed thermally broken structural glass assembly façade system
2. **Performance:**
 - 2.1. **Thermal:** Min U value of 1.2 W/m²K for glazed area
 - 2.2. **Air permeability:** Refer to clause H11:340
 - 2.3. **Barrier loading:** Suitable for mass barrier loading
See clause H11:311
 - 2.4. **Resistance to Wind load:** Refer to Structural Consultant documents
 - 2.5. **Security :** Refer to clause H11:434 and 435
3. **Supporting structure:** RC concrete
4. **Curtain walling system**
 - 4.1. **Manufacturer:** Schuco or equivalent
 - 4.1.1. **Product reference:** FWS 50 SG or equivalent bespoke mullion system to cater for large glazing sizes

- 4.2. **Type:** Stick system, thermally broken, drained and ventilated structural sealant/ bonded glazing system
5. **Internal framing member**
 - 5.1. **Material:** Aluminium
 - 5.2. **Finish:** Anodised
 - 5.2.1. **Colour/ texture:** Natural - Schuco reference C0
6. **Glazing:** Insulating glass units
Refer to clause H11:121
7. **Glazing system:** Structural sealant/ bonded, four side bonded
8. **Accessories:**
 - 8.1. As required to complete the system. Refer to manufacturer's details
 - 8.2. **Fasteners:** Manufacturer's standard.
 - 8.3. **Perimeter Seals:** Manufacturer's standard.
 - 8.4. **Flashings/trims/insulated panels:** Refer to Architect's details
 - 8.5. **External Flashing to column:** Allow for anodised aluminium closing trim to suit site dimensions. Secret fixed. Colour to match Schuco CO. Hairline joint to align with system joint. Refer to Architect's details.
 - 8.6. **Infill insulation:** Mineral wool board to BS EN 13162
Thickness as required to meet thermal performance
9. **Incorporated components:**
 - 9.1. Spandrel panels as clause H11:113
 - 9.2. Hinged doors as clause H11:130
 - 9.3. Revolving doors as clause H11:131.
 - 9.4. Pass doors as clause H11:132
 - 9.5. Double doors as clause H11:133
 - 9.6. Sliding doors as clause H11:134
 - 9.7. Windows/ glazed panes as clause H11:121.
10. **Other requirements:**
 - 10.1. **Note** - Certain glazing sizes will require bespoke Schuco system to accommodate.
Contractor to allow for special mullions as necessary.
 - 10.2. **Fixings, support surfaces and profiles** as required to integrate with the adjacent systems.
 - 10.3. **Cafe entrance:** Allow for signage fixings within cladding joint. Refer to Architect's drawings
 - 10.4. **Labelling:** Internet of facades (IoF) ID tag with unique QR code linked to the product data, ongoing maintenance instructions and installation records.
 - 10.5. **Recyclability:** Cradle2cradle

111 Curtain walling BOH - Ground Floor Solid infill panels - Ext-WT23

1. **Description:** Ground floor BOH solid panels
GRC rainscreen panel on blockwork
2. **Performance:**
 - 2.1. **Thermal:** Min U value of 0.15 W/m²K for all solid areas
 - 2.2. **Air permeability:** Refer to clause H11:340
 - 2.3. **Barrier loading:** Suitable for mass barrier loading
See clause H11:311
 - 2.4. **Resistance to Wind load:** Refer to Structural Consultant documents
 - 2.5. **Security:** Refer to clause H11:434 and 435
3. **Supporting structure:** RC concrete/blockwork

4. Panel/ facing type: Refer to Architect's drawings
 - 4.1. External material: GRC - on separate substructure.
Module dimension - Refer to Architect's drawings
 - 4.2. Manufacturer: Loveld or equivalent
 - 4.3. External finish: Light grit blast / Acid etched
 - 4.3.1. Final coating: Anti graffiti coating as clause F31 item 5.1.2
 - 4.4. External colour: KL-4150 Light cream colour
Contractor to submit samples for Architect's approval
 - 4.5. Internal material: Blockwall and RC plinth. Refer to Section F10
 - 4.6. Core insulation: Mineral wool board to BS EN 13162
Thickness as required to meet thermal performance
5. Accessories:
 - 5.1. As required to complete the system. Refer to manufacturer's details
 - 5.2. Fasteners: Manufacturer's standard.
 - 5.3. Perimeter Seals: Manufacturer's standard.
 - 5.4. Flashings/trims: Refer to Architect's details.
6. Incorporated components:
 - 6.1. Low level precast concrete plinth
 - 6.1.1. Manufacturer: Techrete or equivalent
 - 6.1.2. Mix: DRS 1267 AE
 - 6.1.3. Finish: Acid etched
 - 6.1.3.1. Final coating: Anti graffiti coating as clause F31 item 5.1.2
 - 6.1.4. Fixity & Accessories: To be mechanically fixed to base of system to manufacturer's recommendations.
Stainless steel fixings.
 - 6.2. Hinged doors as clause H11:130
 - 6.3. Solid fill doors as clause H11:136
 - 6.4. UKPN doors as clause H11:135
 - 6.5. Louvres as clause H11:141
7. Other requirements:
 - 7.1. Allow for 1 no 900x900mm mock up of system as item 6 for planning requirement. Refer to clause H11:280.
 - 7.2. Fixings, support surfaces and profiles as required to integrate with the adjacent systems.

112 Curtain walling - unitised panels - All floors above ground - Ext-WT11, Ext-WT12, Ext-WT13, Ext-WT14, Ext-WT15 & Ext-WT16

1. Description: Fully thermally broken, weather sealed, insulated unitised panels with architectural features and silicone glazed
2. Performance:
 - 2.1. Thermal transmittance: U value of solid area
min 0.15 W/m²K
 - 2.1.1. U value of glazed area
min 1.2 W/m²K
 - 2.2. Air permeability: Refer to clause H11:340
 - 2.3. Water permeability: Refer to clause H11:350
 - 2.4. Impact resistance: Refer to clause H11:311
3. Supporting structure: RC concrete

4. Curtain walling system

4.1. Manufacturer: Schuco system or equivalent

4.1.1. **Product reference:** UDC 80 SG - unitised split mullion system to suit design parameters with silicon glazing

4.1.2. **Face width:** 80mm

4.1.3. **System depth basic:** Approximately 222mm
To meet design and performance requirements

4.2. **Type:** Unitised system, thermally broken, bonded glazing system, drained and ventilated via system mullions, pressure equalised.

Refer to Architect's detail drawings for details

4.2.1. **Type WT11:** Standard unitised panel to NE & NW Façade :-

- Double Glazing Unit (as H11:112 item 9)
- Spandrel Panel Above (as H11:112 item 8) with
- **Outward** Angled Shading Pier (as H11:112 item 11)

4.2.2. **Type WT12:**

As WT11 generally.

Located between levels L05 and L08 on NE elevation only.

Variations within the WT12 panels are within the **glazing panels** areas as below types.

Allow for scaffolding restraint sockets. Refer to Facade Access & Maintenance report for details and socket locations.

4.2.2.1. **Type WT12 A:** As WT 12, with fully fritted glass panel on L05 only on the low roof

Ceramic frit colour - translucent RAL colour

Refer to H11:121 clause 4.3.1.1 for colour of solid frit

Frit pattern - Solid with diffuse light transmission of <20%

Refer to Services Consultant's documents for required light transmission and daylight factor requirements

4.2.2.2. **Type WT12 B:** As WT 12, back painted glass panel with solid insulated back panel

Refer to H11:121 clause 4.3.1.1 for colour of solid frit

4.2.2.3. **Type WT12 C:** As WT 12, with a clear glazed panel next to a back painted glass panel with solid insulated back panel

Refer to H11:121 clause 4.3.1.1 for colour of solid frit

4.2.2.4. **Type WT12 D:** As WT 12, with **no glazing**.

Full flat anodized aluminium panel.

Colour to match adjacent panels

4.2.3. **Type WT13:** Standard unitised panel to SW & SE Façade :-

- Double Glazing Unit (as H11:112 item 9)
- Spandrel Panel Above (as H11:112 item 8) with
- **Inward** Angled Shading Pier (as H11:112 item 11)

4.2.4. **Type WT14:** Crown unitised panels with integrated structural support.

Without glazing and insulation

All vertical and horizontal sides are external facing.

Refer to Structural Engineer documents

4.2.4.1. **Note :-** The piers are both inward/outward.

Inward for SE/SW and outward for NE/NW

4.2.4.2. **Coping:**

4.2.4.2.1. **Alloy flashing:** 3mm aluminium

4.2.4.2.2. **Colour and finish:** To match adjacent finish

4.2.4.2.3. GRC fascia and soffit: As H11:112 item 12.1

4.2.5.Type WT15: Corner unitised panels. Hybrid version of WT11 and WT13 with addition vertical GRC panel (as H11:112 item 12.1)

Refer to Architect's drawings

4.2.5.1. Note :- The piers are both inward/outward.

Inward for SE/SW and outward for NE/NW, but with different/smaller profiles to suit

4.2.6.Type WT16: As WT11, WT13 and WT15 with extended lower spandrel panel feature (as H11:112 item 8)

5. Internal framing member

5.1. Material: Aluminium

5.2. Finish: Schuco C32 anodised finish

5.3. Size: To meet performance requirements and architectural design intent

5.4. Unit Insulation: Full fill mineral wool to meet performance requirements
Refer to clause H11:112 item 2.1

6. Internal finish:

6.1. Material : Min 2mm mild steel back panel (due to fire barrier condition requirements)

6.2. Finish to seen faces: PPC

6.3. Colour/texture (seen): RAL colour to **match** Alumet AluBronze 02 - matt etched.

Contractor to submit proposals and confirm colour

7. External finish to glass interface:

7.1. Material: Silicon joint

7.2. Colour: Dark Grey to match interface frit colours. Manufacturer to submit proposals
Refer to H11:121 clause 4.3.1.1 for colour of solid frit

8. External architectural spandrel profile: Integrated generally with unitised panels as a feature. Refer to Architect's drawings

8.1. Material: 3mm Aluminium

8.2. Profile: Folded triangular profile panel - solid.
125mm c/c set out.
Set into a full rectangular cassette frame with front edge lip.
Refer to Architect's drawings

8.2.1.Include for fire barriers at set centres to meet statutory requirements

8.3. Manufacturer:: Cadish MDA or equivalent

8.4. Finish: Anodised

8.4.1.Manufacturer:: Alumet or equivalent

8.5. Colour: AluBronze 02 - matt etched

9. Glazing: Insulating glass units

9.1. Inner pane: See clause H11:121

9.2. Outer pane: See clause H11:121

10. Glazing system: Structural sealant/ bonded, four side bonded. Fritted to edges.

11. Feature panel/ facing type/pier: Architectural feature folded panel/piers Profiled dependant on cladding type & location (inward/outward/corner/flat etc) eg. Types WT11, WT12, WT13, WT14 & WT15. Refer to architectural drawings

11.1. External material: 3mm Aluminium sheet

11.2. External finish: Anodized

11.2.1. Manufacturer:: Alumet or equivalent

11.3. Colour: AluCopper 03 - matt etched

11.4. Anti drumming measures: Refer to Acoustic Consultant's documents.

The possibility of re-radiated noise generation, onto vertical facades shall be minimised by suitable measures such as stiffeners and anti-vibration mounts.

Contractor to submit proposals

12. GRC horizontal feature panels & cill / coping: Horizontal feature fascia band, integrated cill flashing and associated soffit

12.1. GRC feature: GRC

12.1.1. Manufacturer: Loveld or equivalent

12.1.2. Finish: Light grit blast/acid etched

12.1.3. Colour: KL-4150 Light cream colour

Contractor to submit samples for Architect's approval

12.2. Cill flashing: 3mm aluminium extrusion

12.2.1. Drip detail: 20mm drip overhang.

Refer to Architect's drawings.

12.2.2. Edge condition at visible joints: To be capped and hidden from view

12.2.2.1. Mitred joints: To be fully welded in the factory

12.2.3. Finish: Anodised

12.2.4. Colour: Alumet Alunature - matt etched

12.3. Fixing: To manufacturer's recommendations and incorporated within base structure of panel system

13. Accessories:

13.1. As required to complete the system

13.2. Fasteners: Manufacturer's standards

13.3. Perimeter seals: Manufacturer's standards

13.4. Flashings/trims: Refer to Architect's details

14. Incorporated components:

14.1. Glazed panes as clause H11:121.

14.2. Stick system as clause H11:110

14.3. Soffit system as clause H11:118

14.4. Blind box as clause H11:148

14.5. Aluminium flashings/cills/trims/copings: To match adjacent finishes and colour as required
Refer to Architect's drawings and details

14.5.1. Thickness: Min 2mm

14.6. Fire control: To include fire cavity barriers in positions as shown on drawings.
Refer to Section P21

14.7. Plasterboard internal linings as Section K10

15. Other requirements:

15.1. Fasteners and seals to manufacturer's requirements

15.2. Specialist contractor to ensure all back-painted glass panels are laminated heat strengthened glass panels, or equivalent.

It is up to the specialist subcontractor to make the final selection of the glass to be used and to ensure that it meets all the relevant performance requirements including the Building Regulations, any additional requirements of the building insurer and/or warranty provider. Contractor to justify their design proposals through the use of appropriate risk assessments to demonstrate that the contractor's proposals fully meet the performance requirements. As covered under CWCT Technical Note no TN68

- 15.3. Labels. Internet of facades (IoF) ID tag with unique QR code linked to the product data, ongoing maintenance instructions and installation records. Location TBA with architect
- 15.4. All primary, secondary and tertiary framing and fixity to meet performance and maintain structural integrity
- 15.5. Fixings, support, restraint and profiles as required to affix to the structural frame
- 15.6. Fixings, support surfaces and profiles as required to integrate with the adjacent systems.
- 15.7. To meet all fire and acoustic requirements, especially with internal wall interfaces
Refer to Services and Fire Consultant's documents
- 15.8. Separation layer between dissimilar materials
- 15.9. Integrated drainage gap and waterproofing layers as required to meet design intent and to ensure no water ingress
- 15.10. Prevention of insect or fauna ingress with fully fixed meshes as appropriate
- 15.11. **Recyclability:** Cradle2cradle certified

113 Spandrel panels - Ext_WT22

- 1. Description: Back painted insulated glass unit to spandrel window frame.
- 2. Location: Integrated within the Ext_WT22 type system on the GF high level. Refer to clause H11:110
- 3. Insulated back panel with high density full fill mineral wool in locations as required
- 4. System fixed back to surrounding structure and adjacent cladding systems with closure elements maintaining the system performance levels and visual quality.
- 5. Glazing:
 - 5.1. As H11:121 except spandrel pane back painted.
 - 5.2. Colour: Refer to clause H11:121 item 4.3.1.1

117 Cladding system - Atrium & Water Plant Rooms - WT51, WT 52 & WT53

- 1. Description: A rainscreen metal cladding system on custom fabricated steel or aluminium secondary framing forming insulated and weathertight cladding to the walls of the atrium and L08 core overrun and water tank plant rooms
- 2. Substrate: Reinforced concrete
Refer to the Structural Engineer's documents and Section F10
- 3. Performance requirements:
 - 3.1. **Thermal performance:** Min 0.15 W/m2K
 - 3.2. **Insulation:** Mineral wool
 - 3.2.1. **Manufacturer:** Rockwool or equivalent
 - 3.2.2. **Product:** Rainscreen Duo-slab
- 4. Material: 3mm aluminium unprofiled panels with stepped shadowgap and hidden fixings
 - 4.1. Finish: PPC coated
 - 4.2. Colour/texture: RAL colour to match the Alumet Alubronze 02 matt etched colour.
Contractor to confirm colour with sampling to Architect's approval
- 5. Incorporated components:
 - 5.1. Solid fill doors as clause H11:136.
 - 5.2. Flashings, trims, copings, covers, gutters, hidden rainwater pipes with incorporated access panels. Refer to Architect's drawings
 - 5.3. Co-ordinate the installation of louvers, penetration cloaks, flashings and trims, access hatches, service penetrations, as specified by the Services Consultants.
 - 5.4. Fire stopping refer to Section P12 and H11:430.

118 Soffits - Ground Floor - Ext-S0 01

1. Description: An external aluminium soffit cladding panel with integral lighting
2. Substrate: Concrete slab.
3. Design profile: Refer to Architect's drawings
4. Performance requirements:
 - 4.1. Thermal performance: U value - Min 0.10 W/m²K
 - 4.2. Refer to the Services Consultant's documents.
5. Material: Aluminium
 - 5.1. Finish: Anodised
 - 5.2. Colour: Alumet Alubronze 02 - matt etched
6. Support:
 - 6.1. Secondary galvanised steel or aluminium framing.
 - 6.2. Suspension system shall incorporate thermal breaks at fixing points.
7. Insulation
 - 7.1. Mineral fibre insulation fixed to structural soffit and beams above to manufacturer's recommendations
 - 7.2. Rockwool Soffit board with tissue face or equivalent.
 - 7.3. Thickness: Min 370mm
 - 7.4. To be supported and installed to manufacturer's recommendations with T bars and necessary fixing accessories to complete the system
8. Other requirements:
 - 8.1. Provide cut outs for lighting and other electrical items.
 - 8.2. Co-ordinate with maintenance rails, lifting beams and other items.
 - 8.3. Concealed services containment, accessible with removable panels as required.
 - 8.4. Flashings, trims, copings and covers.

121 Pane material type

1. Unless noted otherwise, all glass shall be clear, annealed, low iron, heat treated and/ or laminated, as required to meet the specified performance and design requirements.
2. Performance requirements: Contractor to submit proposals for approval reading the following pane types.
 - 2.1. Light transmission: Refer to clause 380
 - 2.2. External light reflectance: max 11%
 - 2.3. Shading coefficient: Refer to clause 380
 - 2.4. Thermal transmittance: U-Value: Not more than 1.2 W/m²K.
 - 2.5. Sound reduction: Refer to Acoustic Consultant documents
3. Glazing:
 - 3.1. High performance triple silver coated, argon filled, laminated inner and outer leaf, double glazing unit with back warm edge spacer bar.
 - 3.2. Low iron glass to mean Guardian Extra Clear or equivalent.
 - 3.3. Overall unit thickness: As required to meet the performance requirements.
 - 3.4. Outer pane material: Clear low iron glass laminated.
 - 3.5. Air gap/Cavity: Cavities shall be filled to meet performance requirements.
 - 3.6. Spacer bar:
 - 3.6.1. Black warm edge spacer bar: Swisspacer Ultimate or equivalent.

- 3.7. Inner pane material: Clear low iron glass laminated.
4. Pane types:
- 4.1. Façade Pane: : Ground floor only
- 4.1.1. Two layers of Extra Clear 6mm glass laminated with a PVB neutral interlayer both sides of a 12mm 90% Argon filled gap between black warm edge spacers. See clause 7.1 below
- 4.2. Façade Pane: Above ground floor only
- 4.2.1. Two layers of Extra Clear 6mm glass laminated with a PVB neutral interlayer both sides of a 12mm 90% Argon filled gap between black warm edge spacers. See clause 7.1 below
- 4.3. Spandrel Pane:
- 4.3.1. Two layers of Guardian Extra Clear 6mm glass laminated with a clear PVB Interlayer SunGuard SN75 coating on Face 4
12mm 90% Argon filled Gap between Black warm edge spacers and a Single Layer of 6mm ExtraClear Glass with a Ceramic Frit 100% Full Coverage on Face 8
See clause 7.1 below
- 4.3.1.1. Ceramic Frit Colour - Umbra Grey RAL 7022 30% to suit solar control interface and to manufacturers recommendations
- 4.3.1.2. Allow for full thermal shock risk assessment
- 4.4. Rooflight and AOV Pane:
- 4.4.1. External - One layer of 6mm Guardian ExtraClear with Sunguard SN70/35 HT coating on Face 2
16mm 90% Argon filled Gap between Black warm edge spacers -
Internal - Two Layers of 5mm ExtraClear Glass with a pvb SentryGlas Interlayer.
See clause 7.1 below
- 4.4.2. To meet CWCT TN67 test for safety of glazed roofing
5. Manifestation:
- 5.1. Glass shall be fritted to a custom pattern according to location.
Refer to Architect's details
6. Fritting:
- 6.1. Fritting to various level of coverage as noted on Architects drawings.
- 6.2. There shall be opaque fritting to Face #2 or Face #4 at glass to glass corners and at all edges not covered by metal cappings or internal mullions. To manufacturer's recommendations
- 6.3. Colour: To match H11:121 item 4.3.1.1
- 6.4. Seal layer to oversail edge condition of coating to avoid visible strip line
7. Other requirements:
- 7.1. Carry out risk assessments: For all glass types in accordance with clause H11:231.
- Contractor to indicate any glass pane sizes that do not match the clauses above due to risk assessment analysis.
- 7.2. A full complete selection of 3no sample units shall be submitted by the contractor for acceptance of visual quality and sign off by the Architect. .
- 7.3. A weight assessment of the heaviest glazing pane to be clarified at tender and issued to the design team and contractor to ensure installation and future maintenance capability

130 Doors - General External

1. Refer to the Architects drawings, door schedule and documents for:
- 1.1. Door reference.
- 1.2. Colour and finish.

- 1.3. Performance: Fire, acoustic, thermal and security.
- 1.4. Number of leaves.
- 1.5. Double or single swing, sliding, revolving, louvred
2. For configuration, dimensions, and location refer to the Architect's drawings.
3. Vision panels and glazed side panels shall be formed from clear safety glass and maintain the fire, acoustic, thermal and security performance of the doorset.
4. Ironmongery: Refer to Section P21
5. Threshold: Weathered with a maximum 15mm step.
6. Manifestation : As required. Refer to Architect's details
7. Powered: Sliding and folding doors: To BS 7036-0 and BS EN 16005.
8. Emergency exit devices: Operated by lever handle or push pad: To BS EN 179.
9. Panic exit devices: Operated by a horizontal bar: To BS EN 1125.
10. Controlled door closing devices: To BS EN 1154.
11. Hold-open devices for swing doors: Electrically powered to BS EN 1155.
12. Security rating. Refer to Crime Impact Statement/ Security Consultant documents and clauses below. Minimum requirements as below:-
To DIN EN 1627
 - Revolving doors to achieve minimum RC3
 - Glazed doors to achieve minimum RC3 or PAS 24
 - Laminated glass to ground floor areas to achieve minimum P2A to EN 356
 - Back of house doors to achieve minimum RC2
 - Sliding doors to cycle store to achieve minimum RC3

131 Doors - Revolving door

1. Description: Ground floor - Automatic Revolving Doors .
2. Incorporated with: Curtain walling as clause H11:110.
3. Performance:
 - 3.1. Part M compliant
 - 3.2. Security: To meet minimum RC3 rating
4. Manufacturer: Boon Edam Ltd., or equivalent.
 - 4.1. Crystal Tourniket, 3-wing frameless glass revolving doors.
Reference:- TGAR3503
5. Dimensions:
 - 5.1. 2600mm internal diameter, 2650mm external diameter.
3100mm height under canopy.
18mm thick solid soffit.
3118mm overall door height.
6. Materials:
 - 6.1. Doorset: Slimline sections and patch fittings.
 - 6.2. Frame: Slimline edge cappings.
 - 6.3. Glazing: 12mm low iron toughened glass to the doorset.
16.76mm low iron laminated glass to the curved walls recessed into glazing pocket in the floor with no visible bottom rail.
 - 6.4. Soffit: 17.52mm low iron laminated / toughened glass in two semi-circular sections with 360 degree rain / sensor trim.
 - 6.5. Junctions: Insulated interfaces on the centreline.
 - 6.6. Finish: Polyester powder coated to Boon Edam Anodic Natural 20% finish.
7. Activation and control system:

- 7.1. Fully automatic electro-mechanical motor activated by motion sensors complying fully with EN16005.
Drive located in the floor into a cast floor pit 900 x 900 x 350mm deep.
Handles omitted in conformance with EN16005.
- 7.2. Access control selectable via the control panel.
- 7.3. Safety: Safety sensors in compliance with EN16005.
SRB – Active vertical safety buffer on the leading edge of the drum wall.
SRD – Active horizontal safety buffer on the bottom leading edge of the doorset.
SRT – Passive safety buffer on the leading edge of the rotating doorset.
EBS – Vertically scanning infra-red safety sensor in front of each SRB.
2no. E-stop buttons, 2no. Disabled Buttons & 1no. Control Panel.
- 7.4. TL360 Lockdown Function:
Electro-mechanical, multi-plate direct locking mechanism. The unit locks the revolving centre column instantly upon activation of a remote switch. It is possible for the doorset to be stopped in any position.
- 7.5. Locking mechanism: 2no. Manual patch locks.
- 7.6. Break out facility: Not included.
8. Base Ring: 54mm deep stainless-steel base ring (supplied & installed by Boon Edam Ltd.)
Motor box: Stainless steel motor box 720 x 720 x 318mm deep (supplied & installed by Boon Edam Ltd.)
9. Other requirements:
 - 9.1. Allow for integrated pit detail
 - 9.2. Drainage beneath barrier matting.

132 Pass doors - Ground Floor - Single Door Automatic

1. Description: A fully glazed, thermally broken, automatic, single action doorset.
 - 1.1. Shall have a flush, structurally silicon glazed outward appearance.
 - 1.2. Aluminium framed internally with a masking frit on external pane to conceal the frame.
2. Incorporated with: Curtain walling system as clause H11:110.
3. Door system: Schuco AD UP 75
4. Metalwork generally:
 - 4.1. Material: Aluminium.
 - 4.2. Finish: Anodised to match adjacent
 - 4.3. Colour/texture: To match adjacent
 - 4.4. Minimum film thickness: Refer to Section Z31.
5. Glazing system:
 - 5.1. Structural silicon glazed.
 - 5.2. Clear double glazing as clause H11:121
6. Ironmongery: Generally as clause H11:146 and includes:
 - 6.1. Access control to be via mounted card reader, push button on door entry posts and powered open. Refer to Service's Engineer's documents
7. Category of use: Heavy in accordance with BS 6375-2.
8. Other requirements:
 - 8.1. Threshold: weathered with a maximum 15mm step
 - 8.2. Ironmongery to suit curtain walling system. Refer to Door Schedule
 - 8.3. Emergency exit devices: Fail safe open
 - 8.4. Controlled door closing devices: To BS EN 1154.

- 8.5. Hold-open devices for swing doors: Door to be hold open in case of fire. Electrically powered to BS EN 1155.
- 8.6. Include wireways within framing system for future use to both sides

133 Doors - Ground Floor - Double Doors Automatic Glazed infill

- 1. Description: A fully glazed, thermally broken, automatic, double action doorset.
 - 1.1. Shall have a flush, structurally silicon glazed outward appearance.
 - 1.2. Aluminium framed internally with a masking frit on external pane to conceal the frame.
- 2. Incorporated with: Curtain walling as clause H11:110 and H11:111.
 - 2.1. Door system: Schuco AD UP 75
- 3. Metalwork generally:
 - 3.1. Material: Aluminium.
 - 3.2. Finish: Anodised to match adjacent
 - 3.3. Colour/texture: To match adjacent
- 4. Glazing system:
 - 4.1. Structural silicon glazed.
 - 4.2. Clear double glazing as clause H11:121
- 5. Ironmongery: Refer to Door Schedule
- 6. Solid infill panel
 - 6.1. Material: Aluminium
 - 6.2. Finish: To match adjacent
 - 6.3. Colour/texture: To match adjacent
 - 6.4. Infill material - high density mineral wool insulation to meet performance requirements as H11:111
- 7. Category of use: Heavy in accordance with BS 6375-2.
- 8. Other requirements:
 - 8.1. Threshold: weathered with a maximum 15mm step
 - 8.2. Emergency exit devices: Fail safe open only required for café glazed door
 - 8.3. Panic exit devices: Operated by a horizontal bar: To BS EN 1125.
 - 8.3.1. Refer to door schedule as café doors do not require panic exit device
 - 8.4. Controlled door closing devices: To BS EN 1154.
 - 8.5. Hold-open devices for swing doors: Door to be hold open in case of fire. Electrically powered to BS EN 1155.
 - 8.6. Include wireways within framing system for future use to both sides

134 Doors - Ground Floor - Sliding

- 1. Description: Thermally separated, fine framed, double glazed automatic single sliding door system with certified burglary protection
 - 1.1. Refer to architect's drawings
- 2. Standards: The installation shall comply with BS EN 16005 and Risk Assessment BS 7036
- 3. Incorporated with: Curtain walling as clause H11:110
 - 3.1. Manufacturer:: Dormakaba or equivalent
 - 3.2. Product reference: ST PRO Green RC3 - Automatic Sliding Door
- 4. Performance requirements:
 - 4.1. Thermal: 1.285W/m²K
 - 4.2. As Clause H11:110

- 4.3. Burglar resistance: RC3
5. Metalwork generally:
 - 5.1. Material: Aluminium
 - 5.2. Finish: Anodised as clause H11:110
 - 5.3. Colour/texture: As clause H11:110 to match adjacent
 - 5.4. Minimum film thickness: Refer to Section Z31.
6. Glazing:
 - 6.1. Glazing system interface: As clause H11:110
 - 6.2. Pane material: As clause H11:121.
7. Ironmongery: As required as part of the system.
 - 7.1. Access control shall be via mounted card reader on door entry posts and powered open generally.
8. Category of use: Heavy in accordance with BS 6375-2.
9. Security devices:
 - Electromotive multi-point hook bolt locking mechanism
 - Secondary closing edge hook
 - Continuous floor guide rail in door leaf area
 - Drive unit tamper protection
 - Burglary protection glazing: P5A (RC3)
 - Reinforced profiles
10. Operation: Powered. Energy-efficient sliding door drive
 - 10.1.
 - Configurable hold open time: 0-180 seconds
 - Configurable partial opening mode
 - Pharmacy mode to restrict access.
 - Synchronous operation
 - Night bank to unlock, open, close and relock to allow last person exit.
 - Airlock function: enables two doors to provide a personal interlock.
 - Slide and Go: manual door activation.
 - Emergency stop
11. Accessories: To manufacturer's recommendations
 - 11.1. Safety devices:
 - Self-regulating safety system monitoring all door movements including closing force.
 - Auto reverse function if the doors make contact with an obstruction during the closing cycle (infrared threshold safety sensor)
12. Other requirements:
 - 12.1. To include card access control fixed to external and internal columns
 - 12.2. Include wireways within framing system for use to both sides of framing as required
 - 12.3. Manifestation markings: Refer to Architect's details
 - 12.4. Signage: The following signage to be affixed to the power door system at a height of between 1300mm and 1600mm to comply with BS 7036.
 - 150mm x 150mm 'Automatic Door' on white background with black letters to be applied to both side of each moving leaf.
 - 'Keep Clear' 150mm in width consisting of a blue circle and rectangle on a white background with white letters
 - 12.5. Emergency exit devices: Fail safe open
 - 12.6. Power failure/Fire Alarm: Monitored battery back-up system to automatically open the doors in the case of a power failure or upon a signal from the interfaced fire alarm system

12.6.1. The fire alarm specialist shall provide a normally open volt free contact that is closed on alarm. The contacts shall be terminated adjacent to the fused spurs.

12.7. **Locking:** Magnetic locking for escape route and emergency exit doors

12.8. **Controlled door closing devices:** To BS EN 1154.

12.9. **Operation:** To integrate with BMS.

Refer to Service's Consultant documents

135 Doors - Total Utility sub station - louvred

1. **Description:** Custom fabricated louvred bi folding doorsets.
Refer to Architect's drawings
2. **Substrate** - RC concrete walls
3. **Manufacturer:** Sunray or equivalent to meet Total Utility requirements
 - 3.1. **Reference:** Stackable louveres flangeless.
4. **Performance requirements:**
 - 4.1. Refer to the Services Consultant's documents.
5. **Material:** Steel.
 - 5.1. **Finish:** Galvanised
 - 5.2. **Colour:** RAL colour to match H11:111
6. **Ironmongery:**
 - 6.1. Projecting stainless steel butt hinges.
 - 6.2. Internal and external pull handles.
 - 6.3. Min 90 degree hold open restraints and limiting stays.
 - 6.4. Cylinder deadlock with internal thumb turns to active leaf
 - 6.5. Vertical shoot bolts to all slave leaves
7. **Category of use:** Heavy in accordance with BS 6375-2.
8. **Other requirements:**
 - 8.1. To fully meet electrical supplier's specifications. Refer to Service's Consultant's documents
 - 8.2. There shall be no exposed sharp edges at door stiles or around ironmongery.

136 Doors - Solid fill REVISED

1. **Description:** Solid fill, heavy duty, thermally broken doorsets.

Refer to Architect's drawings for sizes
2. **Incorporated with:** Curtain walling as clause H11:111 and H11:117 atrium overrun
 - 2.1. **Manufacturer:** Jansen or equivalent.
 - 2.2. **Product reference:** Arte 2.0 or equivalent
3. **Performance requirements:**
 - 3.1. **Thermal performance:** Min 0.15 W/m2K
 - 3.2. **Fire resistance:** Refer to the Fire Strategy Report.
4. **Metalwork generally:**
 - 4.1. **Material:** Steel framed.
Overclad with aluminium sheet as required to match adjacent material.
 - 4.2. **Finish:** Anodized - To match adjacent interface as per architect's drawings
 - 4.3. **Colour/texture:** To match adjacent interface
5. **Ironmongery:** To manufacturer's recommendations and as door schedule
6. **Fixing:** To manufacturer's recommendations

7. **Category of use:** Heavy in accordance with BS 6375-2.
8. **Other requirements:** Shall be integrated with and be overlaid with adjacent cladding system as required.
 - 8.1. **Access requirement:** Refer to Door Schedule
 - 8.2. **Door no:- DE14 - Fire Brigade access door (asymmetric door):** Glass fronted insulated spandrel units with full frit in lieu of aluminium front panel
 - 8.2.1. **Frit colour :** Refer to clause H11:121 item 4.3.1.1 and to be approved by Architect following sampling
 - 8.3. **Panic exit devices:** Operated by a horizontal bar as required: To BS EN 1125.
 - 8.4. **Controlled door closing devices:** To BS EN 1154.
 - 8.5. **Hold-open devices for swing doors:** Electrically powered To BS EN 1155.

138 Doors - Louvred - non Electrical Substation doors Gas Bottle Store

1. **Description:** Louvred, heavy duty, thermally broken doorsets.
Gas Bottle Store doors outside thermal line
2. **Incorporated with:** Blockwork masonry
Refer to Sections F10 and F30
 - 2.1. **Manufacturer:** Jansen or equivalent.
 - 2.2. **Product reference:** Arte 2.0 or equivalent
3. **Performance requirements:**
 - 3.1. **Fire resistance:** Refer to the Fire Strategy Report.
4. **Louvres:**
 - 4.1. **Infill panels:** As clause H11: 141 or similar approved.
Fitted and framed with enclosed edges within door system
5. **Metalwork generally:**
 - 5.1. **Material:** Steel. Overclad with anodized aluminium louvres as required to match adjacent material.
 - 5.2. **Finish:** To match adjacent interface.
Refer to architect's drawings
 - 5.3. **Colour/texture:** To match adjacent interface
6. **Ironmongery:** Refer to Door Schedule
7. **Fixing:** To manufacturer's recommendations
8. **Category of use:** Heavy in accordance with BS 6375-2.
9. **Other requirements:** Shall be integrated with and be integrated with adjacent cladding system as required.
 - 9.1. **Emergency exit devices:** Operated by lever handle or push pad: To BS EN 179.
 - 9.2. **Controlled door closing devices:** To BS EN 1154.

141 Weather Louvres - External Use

1. **Description:** External weather louvre for the protection of ventilation and air systems
2. **Blade orientation:** Horizontal or as required and described within Architect's Details
3. **Manufacturer:** Trox Technik or equivalent.
 - 3.1. **Product reference:** WG range to suit application
4. **Material:** Aluminium
5. **Finish:** Anodised

- 5.1. **Colour/ texture:** Alumet AluBronze 02 - matt etched.
Colour to match adjacent.
Refer to Architect's drawings
6. **Fixing:** Concealed.
7. **Accessories:**
 - 7.1. As required to complete the system
 - 7.2. **Insulated panel:** Insulated back panel in areas as indicated on Architect's details
8. **Other requirements:**
 - 8.1. To integrate with internal M&E requirements. Refer to the Services Consultant's documents.
 - 8.2. **Free area::** Free vent area: min 50% incl insect mesh
Refer to the Services Consultant's documents.
 - 8.3. **Insect mesh::** Allow for insect mesh fixed to rear side in all open louvre cases

145 Plant Screen - Ext - WT31

1. Description: Perforated cassette screen on steel sub-frame.
2. Substrate: Structural steel framing with secondary/tertiary railings.
Refer to the Structural Engineer's documents.
3. Extrusions to cassette:
 - 3.1. Material: Aluminium
 - 3.2. Design profile: To meet the structural integrity requirements
4. Performance requirements:
 - 4.1. Free vent area: Refer to Service Consultant's documents. Free area (dimension of the perforations) to align with wind/noise consultant reports for noise mitigation.
5. Screen panel: 3mm thick aluminium.
 - 5.1. Manufacturer: Cadish MDA or equivalent
 - 5.2. Profile : Refer to Architect's drawings
 - 5.3. Perforated to provide free vent area as specified by Service Consultant.
Free area (dimension of the perforations) to align with wind/noise consultant reports for noise mitigation.
 - 5.4. Hole sizes = min 20mm, triangular pitch - as required to meet folding dimensions and Services Consultatant's free area requirements
6. Finish: Adonised. To all components, structure and faces of the cassette assembly
 - 6.1. Colour: Alumet Alubronze 02 matt etched
7. Other requirements
 - 7.1. To include for all primary, secondary and tertiary support steelwork
 - 7.2. To include for all flashing, trims and accessories as required to complete the system.
 - 7.3. Integrated eyelets/ anchor points for A+M requirements
 - 7.4. To align with wind/noise consultant reports for noise mitigation.

146 Fixed Rooflight - RFT 03 REVISED

1. Description: Type RFT 03 - A thermally broken fully framed glazed system to fall
2. Manufacturer: Velux or equivalent
 - 2.1. Reference: Velux Modular Skylights
3. Material: Pulltruded composite material as manufacturer's details
 - 3.1. Finish: Light Grey - RAL 7037 30% matt
4. Performance requirements:
 - 4.1. Refer to Services Consultant's documents.

- 4.2. Class 2 Non-Fragile roof assembly.
- 4.3. U value - 0.69 W/m²K
- 4.4. LT - 61%
- 4.5. g value - 34%
- 4.6. Refer to clause H11:121 item 4.4.1
- 5. Incorporated components:
 - 5.1. Concealed aluminium gutters, waterproofed and butt strapped as required.
 - 5.2. System shall include waterproofing, upstands, flashings, trims, vapour barriers, copings and covers as required by manufacturer to meet performance requirements
 - 5.3. Upstand: As part of the secondary steelwork system
 - 5.4. External aluminium flashings to suit profiles. Refer to Architect's details
 - 5.4.1. Finish - PPC
 - 5.4.2. Colour : To match H11:146 item 3.1
 - 5.4.3. Include for fully waterproof sealed butt straps to create line and level across length whilst still ensuring thermal expansion of approximately 10mm
 - 5.5. Internal lining.
 - 5.6. External cladding and internal lining shall allow for potential services penetrations.

147 **AOV Glazed Smoke Vents - RFT 08** REVISED

1. Description: Type RFT 08 - A thermally broken fully framed glazed AOV system
2. Manufacturer: Surespan or equivalent
 - 2.1. Reference: SRHG_AOV smoke vent
3. Material: Cover and frame aluminium
50mm thermally broken frame and upstand.
Aluminium extrusion grade 6063T6
Aluminium sheet grade 1050
 - 3.1. Finish: PPC silver grey
 - 3.2. Colour: Interpon Akzo Nobel - Anodic Ice Matt YW201E
4. Performance requirements:
 - 4.1. Refer to Services Consultant's documents.
 - 4.2. Class 2 Non-Fragile roof assembly.
 - 4.3. Refer to clause H11:121
5. Size: Minimum 1800 x 1400mm
Refer to Architect's details for clear opening sizes
6. Glazing: As clause H11:121 item 4.4.1
7. Upstand:
300mm in height with external curb liner, thermal break and 50mm polyisocyanurate insulation to 0.43 W/m²K U-value.
8. Incorporated components:
 - 8.1. Integrated Surespan Sureguard guardrail around each and every vent fixed to manufacturer's recommendations.
Contractor to investigate creating and extending guardrails around AOV triple and pairing arrays.
 - 8.2. Colour of guardrail:
RAL colour to match the Alumet Alubronze 02 matt etched colour
 - 8.3. System shall include waterproofing, upstands, flashings, trims, copings and covers as required to manufacturer's recommendations
 - 8.4. Hinge : Heavy duty continuous hinge.

8.5. Controls : 24V control centre to include:

- Fireman's switch
- Key switch
- Push button
- Smoke detector

Refer to Service's Consultant's documents

8.6. Concealed containment, rainwater management and fixings.

8.7. Operation : 24V DC/10A (max) actuator with electro-magnetic locking

Tested to EN 12101-2.

Actuator to be supplied concealed.

8.8. Contractor to ensure opening hatch will meet wind load requirements in fully openable position.

Refer to structural engineer's documents

Issue corresponding check calculations as required

8.9. External cladding and internal lining shall allow for potential services penetrations.

148 Blind Box to Roller Blinds

1. Description: Blind box to roller blinds and accessories

1.1. Refer to Architect's Details.

Function is to host and hide the roller blinds, accessories, components and associated containment

1.2. Refer to ceiling packages spec sections K10 and K40 for further details (as not fully part of the cladding/façade specs)

2. Manufacturer: Submit Proposals

3. Material:

3.1. Aluminium

3.2. Finish:: Finish to match H11:110 item 5

Contractor to provide samples for Architect's approval

4. Accessories:

4.1. Fixity and mounting system:: As required with hidden fixings to associated curtain walling system.

Submit proposals with full sample

5. Other requirements:

5.1. To integrate with curtain walling system, internal cladding and associated elements

5.2. Refer to Service's Consultant drawings for services containment routes

149 Entry posts

1. Description:

1.1. Custom designed aluminium posts containing all the required access controls for the doorway.

1.2. Square post with 20mm radiused vertical corners and sloped top.

1.3. To control pass door as clause H11:132

1.4. Incorporated with: Curtain walling as clause H11:110.

2. Metalwork generally:

2.1. Aluminium - anodised to match H11:110 item 5

2.2. Fully welded construction. All welds ground flush and brushed.

3. Fixing:

3.1. Casing to be mounted over a steel spigot prefixed to a concrete base or internal slab.

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- 3.2. Outdoor casing to be secured with tamper proof screws at low level.
4. Services:
 - 4.1. Internal pass door post:
 - 4.1.1. Door access buttons: Refer to the Security Consultant's documents and the Services Consultant's documents.
 - 4.1.2. Coordinate red fire alarm break glass unit specified by the Services Consultant.
 - 4.2. External pass door post:
 - 4.2.1. Door access button: Refer to the Security Consultant's documents and the Services Consultant's documents.
 - 4.2.2. Button: By others.
 - 4.2.3. Card reader: By others.
5. Other requirements:
 - 5.1. Steel conduits with draw wires to the interior of the building.
 - 5.2. Integrate with door operators and locks.
 - 5.3. Concealed containment and fixings.

150 Materials specification

1. Specification of glazing materials to be in accordance with guidance in CIRIA document 'Guidance on glazing at height'.

General requirements/ preparatory work

210 Design

1. **Curtain walling and associated features:** Complete the detailed design. Submit before commencement of fabrication.
2. **Related works:** Coordinate in the detailed design.

215 Design proposals

1. **Submission of alternative proposals:** Preliminary design drawings indicate intent. Other reasonable proposals will be considered.

220 Specification

1. **Compliance standards:** BS EN 13830 and The Centre for Window and Cladding Technology (CWCT) 'Standard for systemised building envelopes'.
2. **Reference information:** For the duration of the contract, keep available at the design office, workshop and on site copies of:
 - 2.1. The CWCT 'Standard for systemised building envelopes'.
 - 2.2. Publications invoked by the CWCT 'Standard for systemised building envelopes'.

226 Information to be provided with tender

1. Submit the following curtain walling particulars:
 - 1.1. Typical detailed drawings at large scales.
 - 1.2. Elevation drawings indicating the exposure categories of the areas of the elevations.
 - 1.3. Technical information and certification demonstrating compliance with the specification of proposed incorporated products and finishes.
 - 1.4. Certification, reports and calculations demonstrating compliance with the specification of the proposed curtain walling.

- 1.5. Proposals for connections to and support from the building structure and building components.
- 1.6. Proposals for any amendments to primary supporting structure and for any secondary supporting structure additional to that shown on preliminary design drawings.
- 1.7. Schedule of builder's work, special provisions and special attendance by others.
- 1.8. Examples of standard documentation from which the project quality plan will be prepared.
- 1.9. Preliminary fabrication and installation method statements and programme.
- 1.10. Schedule of products and finishes with a design life expectancy less than that specified in clause H11:80, with proposals for frequencies and methods of replacement.
- 1.11. Proposals for replacing damaged or failed products.
- 1.12. Areas of non-compliance with the specification.

227 Information to be provided with tender

1. The typical detailed drawings at large scales, referred to in clause H11:226, shall include, as a minimum, the Contractor's proposals for the system's junctions.
2. The proposals must identify all flashings, closers, and weathertight and air permeability seals between the system and adjacent building components.
3. The technical information and certification, referred to in clause H11:226, shall include, as a minimum:
 - 3.1. Details of the time/temperature regime for the heat soaking of toughened glass, with information on the method for the control and monitoring of the regime.
4. **Include, as a minimum:** The certification, reports and calculations, referred to in clause H11:226:
 - 4.1. Calculations to justify the design wind pressure used as the basis of the design.

230 Information to be provided during detailed design stage

1. **Submit the following curtain walling particulars**
 - 1.1. A schedule of detailed drawings and dates for submission for comment.
 - 1.2. A schedule of loads that will be transmitted from the curtain walling to the structure.
 - 1.3. Proposed fixing anchor details relevant to structural design and construction.
 - 1.4. A detailed testing programme in compliance with the main contract master programme.
 - 1.5. A detailed fabrication and installation programme in compliance with the main contract master programme.
 - 1.6. Proposals to support outstanding applications for Building Regulation consents or relaxations.

231 Information on glass types to be provided during detailed design stage

1. **Risk assessment:**
 - 1.1. The specialist glazing contractor shall carry out risk assessments confirming that the composition and buildup of glazed panels is suitable for use in applicable locations and all relevant forms of loadings.
 - 1.2. The selection of glass types and thickness will be undertaken to meet the performance requirements of this specification and to minimise the risk to persons both during construction and during the service life of the Cladding in normal service conditions.
 - 1.3. The risk of failure in normal service conditions and the consequences of failure will be documented in a glass risk assessment prepared in accordance with CIRIA C632 publication 'Guidance on Glazing at Height' and the Technical Notes prepared by the CWCT.
2. **Risk Assessment schedule:** Submit a schedule of risk assessments carried out in accordance with the above, to confirm the choice of glass type in each and every location and for all glass types proposed as components of the Curtain Walling System.

3. **CWCT compliance:** All requirements shall comply with the guidance of relevant CWCT documentation including but not limited to, Technical Notes 61-69, dependent on applicable scenario and locations.

232 Quality plan

1. **Requirement:** Submit during detailed design.
2. **Content:** In accordance with BS EN ISO 9001 and including the following:
 - 2.1. Name of the quality manager.
 - 2.2. Quality assessment procedures.
 - 2.3. Inspection procedures to be adopted in checking the work.
 - 2.4. Stages at which check lists will be used and samples of the lists.
 - 2.5. List of work procedures on the correct use of materials or components, both off site and on site.
 - 2.6. List of product information with latest revisions.
 - 2.7. Subcontractors involved in the work.
 - 2.8. Subcontractors' quality plans.
 - 2.9. Storage, handling, transport and protection procedures.
 - 2.10. Procedure for registering and reporting non compliances.
 - 2.11. Maintenance procedures and calibration records.
 - 2.12. Certification that completed work complies with specification.
 - 2.13. Check list register to ensure all items have been inspected and non compliances discharged.

235 Information to be provided before commencement testing or fabrication of curtain walling

1. **Submit the following curtain walling particulars**
 - 1.1. Detailed drawings to fully describe fabrication and installation.
 - 1.2. Detailed calculations to prove compliance with design/ performance requirements.
 - 1.3. Project specific fabrication, handling and installation method statements.
2. Certification for incorporated components manufactured by others confirming their suitability for proposed locations in the curtain walling.
 - 2.1. Recommendations for spare parts for future repairs or replacements.
3. Recommendations for safe dismantling and recycling or disposal of products.

236 Detailed drawings

1. Referred to in clause H11:235, to include, as a minimum:
 - 1.1. Setting-out and control points.
 - 1.2. Toleranced dimensions indicating both the location of components and the width of all joints.
 - 1.3. Identification of components.
 - 1.4. Details of isolation, packing, and shimming.
 - 1.5. The locations of all sealants, with details of position, type, and size of backing rods, bond release tapes, and the like.
 - 1.6. Embedment, spacing and edge distances for fixings.
 - 1.7. The type, size, and spacing of all welds.

237 Detailed calculations

1. Referred to in clause H11:235, to include as a minimum:

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2. **Structural Calculations:** For all sections, connections, anchorages, support assemblies and the like.
3. **Acoustic Calculations:** To support the claimed acoustic values of vision panels, spandrel panels, frame sections, and other components.
4. **Thermal Calculations:** To support the claimed insulation values of all vision panels, spandrel panels, frame sections, and other insulated components.
5. **Calculations: Condensation Prediction:** Assess the risk of surface or interstitial condensation forming on/in the works specified in this Section, based on the worst case environmental conditions specified in accordance with the following:
 - 5.1. BS EN ISO 13788.
 - 5.2. The Centre for Window and Cladding Technology's Guide to Good Practice for Assessing Heat Transfer and Condensation Risk for a Curtain Wall.
 - 5.3. Thermal Assessment of Window Assemblies, Curtain Walling and Non-traditional Building Envelopes.
 - 5.4. Contractor to identify the probability of internal, external, or interstitial condensation forming and where the calculations indicate that condensation is likely to occur, the quantitative rate of formation together with an explanation as to how the proposed design eliminates any damage or inconvenience caused by the condensation so formed.

238 Project specific method statements

1. Referred to in clause H11:235, to include as a minimum: Assess the risk of surface or interstitial condensation forming on/in the works specified in this Section, based on the worst case environmental conditions specified in accordance with the following:
 - 1.1. Manufacturer's recommendations for the use of proprietary fixings.
 - 1.2. Information on all bolts and fixings requiring specific torques together with details of the required torque levels.
 - 1.3. Information on the location and use of locking nuts and washers, engagement of serrations and the like.
 - 1.4. Information for glazing procedures, including the position of setting blocks, orientation of glass and any specific requirements of the glazing supplier.
 - 1.5. Information on the cleaning and if required, priming procedures for all sealants.
 - 1.6. Details of points which are susceptible to damage, or which should not be loaded during installation.

240 Information to be provided before commencement of structural sealant/bonded glazing

1. Submit structural bonding sealant manufacturer's project specific approval for
 - 1.1. Compatibility and adhesion of products and finishes.
 - 1.2. Full details of structural sealant/ bonded glazing design.
 - 1.3. Structural sealant dimensions.
 - 1.4. Project specific sealant application method statement.

250 Product samples

1. General: Before commencing detailed design, submit labelled samples of: Refer to Mock Up and Samples Schedule .
2. GRC samples: Before general manufacture obtain approval of appearance of fully tested compliant control samples of H11:112 item 12
 - 2.1. Finish: Include all variations of face mix and applied surface finish

251 Product control samples - procedure GRC units

1. GRC Types: H11: 111 & 112
2. With the Tender:
 - 2.1. Submit 3no samples in the specified finish. One sample shall be the 'median' sample with typical characteristics and the other two samples shall show the extreme limits and maximum range of variation in colour, texture, etc., from the 'median' sample.
 - 2.2. Sample size: Min 200x200mm
 - 2.3. Particular characteristics: As H11:112 item 12
 - 2.4. Submit written certification from the supplier that sufficient quantities of the GRC products are available, within the range of variation of the submitted samples, to complete the Works to the Contract
3. Programme: Within four weeks of signing of the Contract:
4. Submit 2no sets each of three samples. One sample of each set shall be the 'median' sample with typical characteristics and the other two samples of each set shall show the extreme limits and maximum range of variation in colour, texture, etc., from the 'median' sample.
5. Sample size: Same profile of GRC component - 500mm wide
6. Particular characteristics: As H11:112 item 12 and as agreed with Architect
7. After acceptance, one set of three samples shall be returned to the supplier. The supplier shall provide written certification with each load of GRC products leaving the works, that all the GRC products have been checked for compliance with the approved samples.
8. The second set of three samples shall be retained on site. The Contractor shall check every load delivered, as soon as practicable, and notify the design team of any GRC products which are outside the approved range of variation.
9. The Contractor shall be entirely responsible for the costs of replacing any GRC products that are outside of the approved range of variation.

252 Panel accuracy GRC units

1. Finished dimensions of completed panels: Within the permissible deviations given in BS 8297, Table 6.
2. Accuracy of moulds: Check overall dimensions, straightness, squareness, twist and flatness of moulds immediately before each reuse, and of each unit as soon as possible after demoulding. Make adjustments to moulds as necessary.

260 Samples of fixings

1. General: During detailed design, submit labelled samples of each type of fixing anchor, including casting-in restraints and shims, together with manufacturers' recommended torque figures.

270 Fabrication samples

1. General: During detailed design, submit samples of: All cladding types, door types and windows .
 - 1.1. Obtain approval of appearance before proceeding.

280 Mock-Up

1. General: Construct during detailed design work in an approved location. Obtain approval of appearance before proceeding. Retain undisturbed until completion of curtain walling installation.
2. Extent: Refer to Architect's documents. Series 214000 drawings
 - 2.1. VMU: For mock up/VMU, please refer to drawing 7025-SRA-ZZ-XX-DR-A-214910
3. Purpose: To serve as an installation reference panel, to study interfaces, to validate the design and act as a approved benchmark.

Design/ performance requirements

305 CWCT 'Standard for systemised building envelopes'

1. General: Unless specified or agreed otherwise comply with:
 - 1.1. Part 2 - 'Loads, fixings and movement'.
 - 1.2. Part 3 - 'Air, water and wind resistance'.
 - 1.3. Part 4 - 'Operable components, additional elements and means of access'.
 - 1.4. Part 5 - 'Thermal, moisture and acoustic performance'.
 - 1.5. Part 6 - 'Fire performance'.
 - 1.6. Part 7 - 'Robustness, durability, tolerances and workmanship'.
2. Project performance requirements specified in this subsection: Read in conjunction with CWCT performance criteria.

311 Integrity

1. Requirement: The curtain walling must resist wind loads, dead loads and design live loads, and accommodate deflections and movements without damage.
2. Design wind pressure: Refer to Structural Engineers documents
3. Impact performance: At all levels
 - 3.1. Safety impact requirements: To CWCT TN 75, negligible risk
 - 3.2. Serviceability impact requirements: To CWCT TN 75, serviceability class 1
 - 3.3. External impact exposure: In accordance with CWCT TN 75: All walls adjacent to footpaths Exposure Category B.
 - 3.4. Hard and soft body impact loads - curtain walling to BS EN 14019: Exposure Category A (Class 5) to areas below 1.5m above ground and Exposure Category E (Class 4) to areas more than 1.5m above ground..
 - 3.5. Hard and soft body impact loads - glass to BS EN 12600: 1 (B) 1
 - 3.6. Hard body impact tests - In accordance with CWCT 'Standard test methods for building envelopes' and TN 76 (curtain wall).
 - 3.7. Soft body impact tests: In accordance with CWCT Standard test methods for building envelopes and TN 76 (curtain wall)
4. Permanent imposed loads: Refer to Structural Engineer's documents
5. Temporary imposed loads: Maintenance loads.
Refer to Service's Consultant, Structural Engineers and Access Consultants documents

320 Deflection under dead loads

1. Requirement: Framing members parallel to the curtain walling plane must not:
 - 1.1. Reduce glass bite to less than 75% of design dimension.
 - 1.2. Reduce edge clearance to less than 3 mm between members and immediately adjacent glazing units, panel/ facing units or other fixed units.
 - 1.3. Reduce clearance to less than 2 mm between members and movable components such as doors and windows.

325 Deflection under wind load

1. Requirement: To CWCT 'Standard for systemised building envelopes' clause 3.5 2 and the following additional requirements: Normal to plane deflection not to exceed 10 mm for framing members between 2500 mm and 3000 mm long. Normal to plane deflection not to exceed 15 mm for framing members between 3000mm and 7500mm long..
2. Additional stiffness to CWCT 'Standard for systemised building envelopes' clause 3.5 4.2: Not allowed

330 General movement

1. Requirement: Curtain walling must accommodate anticipated building movements as follows: refer to Structural Engineer's documents .

332 Appearance and fit

1. Requirement: Design curtain walling system:
 - 1.1. To ensure position and alignment of all parts and features as shown on preliminary design drawings.
 - 1.2. To accommodate deviations in the primary support structure.
2. Primary support structure: Before commencing installation of curtain walling system, carry out survey sufficient to verify that required accuracy of erection can be achieved.
 - 2.1. Give notice: If the structure will not allow the required accuracy or security of erection.
 - 2.2. Design tolerances: Refer to the Structural Engineer's documents.
3. Curtain wall envelope zone tolerances
 - 3.1. Width: Refer to the Structural Engineer's documents.
4. Maximum permitted component and installation tolerances: Refer to the Structural Engineer's documents.

335 Thermal movement – service temperature ranges

1. Requirement: To CWCT 'Standard for systemised building envelopes' clause 2.7.2 amended and/or with the addition of the following: Refer to the Service Consultant's documents .

340 Air permeability

1. Requirement: Permissible air leakage rates of 1.5 m³/hr/m² for fixed lights/panels and 2.0 m³/hr/lin.m for opening lights must not be exceeded when the curtain walling is subjected to the peak test pressure.
2. Permeability class to BS EN 12152: A4
 - 2.1. Peak test pressure: 600 Pa

345 Air permeability exfiltration

1. Requirement: The maximum permissible air exfiltration rate through the curtain walling system must not exceed: 3.0 m³/hr/lin m.

350 Water penetration

1. Watertightness class to BS EN 12154: R7
 - 1.1. Peak test pressure: 600 Pa
2. Additional requirements: Underside of any transom not to be wetted at peak test pressure

370 Thermal properties

1. Method of calculating the thermal transmittance (U-value) of curtain walling/ each zone of curtain walling: Weighted U-value.
2. Average U-value of curtain walling: 0.15 W/m²K
3. Curtain wall zone interfaces: Co-ordinate to achieve required average U-value.
4. Method for assessing thermal transmittance (U-value) of assemblies: Method 2 - accurate method in accordance with CAB/CWCT publication 'The thermal assessment of window assemblies, curtain walling and non-traditional building envelopes'

380 Solar and light control

1. Total solar energy transmission
 - 1.1. Maximum g-value - glazing only: <0.33
 - 1.2. Maximum effective g-value - glazing with shading devices: <0.33
2. Visible light transmission
 - 2.1. Minimum light transmission - glazing only: 70%
 - 2.2. Minimum effective light transmission - glazing with shading devices: 70%

385 Thermal stress in glazing

1. Glass panes/ units: Must have adequate resistance to thermal stress generated by orientation, shading, solar control and construction.

390 Avoidance of condensation

1. Requirement: Notional psychrometric conditions under which condensation must not form on building interior surfaces of framing members or any part of infill panels/ facings are:
 - 1.1. Notional outdoor psychrometric conditions as BS 5250.
 - 1.2. Notional indoor psychrometric conditions
 - 1.2.1. Temperature: Refer to Services Consultant documents
 - 1.2.2. Relative humidity: Refer to Services Consultant documents
 - 1.2.3. Vapour pressure: Refer to Services Consultant documents

410 Sound transmittance

1. Minimum weighted sound reduction index (Rw) to BS EN ISO 717-1
 - 1.1. Between internal and external surfaces of curtain walling: Refer to Services Consultant documents
2. Minimum weighted standardized level difference (DnTw) to BS EN ISO 717-1
 - 2.1. Between adjacent floors abutting curtain walling: Refer to Services Consultant documents
 - 2.2. Between adjacent rooms on same floor abutting curtain walling: Refer to Services Consultant documents

420 Fire resistance of curtain walling - Door exits to atrium roof

1. Standard: To BS EN 13501-1.
 - 1.1. Minimum periods and criteria: Class EI 30
 - 1.2. Direction: 'O<>I' – Inside to outside and outside to inside
 - 1.3. Basis of verification: To BS EN 1364-3 and BS EN 1364-4

426 Reaction to fire of curtain walling

1. Standard: To BS EN 13501-1.
 - 1.1. Class: A2 or better

430 Fire stopping

1. Locations: At junctions of curtain walling with compartment or separating walls and floors.
2. Materials and methods of fixing: To ensure fire resistance not less than that specified for compartment or separating walls and floors when tested from both sides.

434 Doors and other access facilities

1. In addition to the requirements found elsewhere in this specification, the following shall apply also to doors.
2. **General Requirements:**
 - 2.1. Door thresholds:
 - 2.1.1. For accessible doors shall satisfy the requirements of BS 8300.
 - 2.1.2. They shall be slip-resistant grade 1.44 stainless steel.
 - 2.1.3. The design and construction of accessible balcony thresholds shall incorporate a door threshold with an upstand of not more than 15mm.
 - 2.1.4. The 15mm threshold upstand is measured at the door position.
 - 2.1.5. Additional sloping transition elements, such as a small internal ramp and external sill, may be provided either side of the upstand.
 - 2.1.6. The maximum slope on ramps and sills shall be 15 degrees.
 - 2.1.7. Door thresholds shall have a minimum 45mm projecting sill and drip.
 - 2.1.8. The sill shall have a minimum 45mm overhang and drip to shed rainwater away from the interface between the waterproofing layer and the sill and to avoid reliance on exposed joint sealants and their limited design life.
 - 2.2. Door opening force:
 - 2.2.1. The door opening force for manually operated, non-powered accessible swing doors shall comply with BS 8300-2.
 - 2.2.2. Where the opening force is not sufficient to keep the door closed against external conditions, a door closing system shall be used in accordance with Clause 2.8 of Approved Document M.
 - 2.3. **Locking system:** Door locking systems shall be in accordance to the Architect's ironmongery schedule.
 - 2.4. **Wireways:** Doors shall include wireways concealed in the framing for the access control systems.
3. **Operation/ hardware:**
 - 3.1. **Sliding and folding doors:** Powered sliding and folding doors shall comply with BS 7036 and BS EN 16005.
 - 3.2. **Emergency exit devices:** Emergency exit devices operated by lever handle or push pad shall comply with BS EN 179.
 - 3.3. **Panic exit devices:** Panic exit devices operated by a horizontal bar shall comply with BS EN 1125.
 - 3.4. **Door closing devices:** Controlled door closing devices shall comply with BS EN 1154.
 - 3.5. **Hold-open devices:** Electrically powered hold-open devices for swing doors shall comply with BS EN 1155.
 - 3.6. Sliding doors:
 - 3.6.1. Hardware for sliding doors and folding doors shall comply with BS EN 1527.
 - 3.6.2. External sliding doors shall be secured by way of multi-point locking system with a minimum of three locking points incorporating mushroom headed bolts, hook-bolts or shoot bolts.
 - 3.6.3. Where shoot bolts are fitted they shall engage into the head and sill of the door frame. An anti-lift device shall also be fitted so that doors cannot be lifted from their frame from the outside.
 - 3.6.4. All sliding doors shall be secured by a key operated locking mechanism.
 - 3.7. **Escape doors:** Escape doors shall comply with BS EN 1634.
4. **Performance Requirements:**

- 4.1. CE Marking:
 - 4.1.1. Provide certified evidence, in the form of a product conformity certificate or engineering assessment, that each door/ door-set/ assembly supplied shall comply with the specified requirements to BS EN 14351-1.
 - 4.1.2. Such certification shall cover door and frame materials, glass and glazing materials and their installation, essential and ancillary ironmongery, hinges and seals.
- 4.2. **Wind Resistance:** Classified in accordance with BS EN 12210 and commensurate with the calculated design wind pressure for the building.
Refer to Structural Engineer's documents
- 4.3. Air Infiltration:
 - 4.3.1. **Sliding doors:** The permissible air infiltration rate through fully-rebated and sliding doors shall not exceed 2.5m³/hr/m² at the peak test pressure.
 - 4.3.2. The peak test pressure shall be as required to achieve Class 4 in accordance with BS EN 12207.
 - 4.3.3. **Doors at Ground Level:** Non-fully rebated doors at Ground Level shall have an airtightness performance commensurate with the architectural design of the door.
- 4.4. **Watertightness:**
 - 4.4.1. Fully rebated and sliding doors:
 - 4.4.2. There shall be no water leakage onto the internal face of the door, frame or threshold at all pressures up to and including the peak test pressure.
 - 4.4.3. The peak test pressure shall be as required to achieve Class 9A in accordance with BS EN 12208.
 - 4.4.4. **Doors at Ground Level:** Non-fully rebated doors at Ground Level, with level or near level thresholds for compliance with Approved Document M/ BS 8300, shall have a watertightness performance commensurate with the architectural design of the door.
- 4.5. Impact:
 - 4.5.1. **Hard and soft body impact:** Classification shall be in accordance with BS EN 1192:
 - 4.5.2. **Doors:** Not accessible to the public: Class 2.
 - 4.5.3. **Doors:** Accessible to the public: Class 3.
 - 4.5.4. **Service access doors:** Class 4.
- 4.6. Robustness:
 - 4.6.1. **Strength and durability:** To CWCT 'Standard for systemised building envelopes' clause 4.3.3.
 - 4.6.2. **Doors:** Shall comply with BS 6375-2 Section 6 and meet the following requirements found in Table A2 of Annex A of BS 6375-2:
 - 4.6.3. **Doors:** Not accessible to the public: Medium Duty Class.
 - 4.6.4. **Doors:** Accessible to the public: Heavy Duty Class in Table A.2.
 - 4.6.5. **Service access doors:** Severe Duty Class in Table A.2.
 - 4.6.6. **Assembly:** Fabrication tolerance: Doors shall be Tolerance Class 3 and 4 in accordance with BS EN 1529 and BS EN 1530 respectively.
5. **Security:**
 - 5.1. Doors at Ground Floor shall comply with LPS 1175 (Loss Prevention Standard) Minimum Security Rating 3.
 - 5.2. Doors at Ground Floor shall comply with BS PAS 24.

435 Opening lights (Windows)

1. **Performance criteria:** To CWCT 'Standard for systemised building envelopes', part 3
2. **Security**
 - 2.1. **Applicable opening lights:** All

- 2.2. Security rating: To LPS 1175 security rating classification (C5) SR3
3. Opening lights restrictive catches to CWCT 'Standard for systemised building envelopes' clause 4.2.5: To all opening lights
4. Ventilation requirement: Refer to Services Consultant's documents
5. Fasteners: Concealed multipoint, operated by an internal handle.
To manufacturer's recommendations
6. Integral locks: To manufacturer's recommendations

436 Doors and other access facilities

1. Performance criteria: To CWCT 'Standard for systemised building envelopes', part 3
2. Access facilities designated for use by disabled persons:
3. Strength and durability: To CWCT 'Standard for systemised building envelopes' clause 4.3.3.
 - 3.1. Forces and tests: Class 4 to BS EN 1192, test 4 (hard body impact of 8 J) Class 4 to BS EN 1192, test 4 (hard body impact of 8 J)
4. Security
 - 4.1. Applicable doors:
 - 4.2. Security rating: To LPS 1175 security rating classification SR3

437 Louvres

1. Performance classification to BS EN 13030.
 - 1.1. Discharge operation: Inlet and Outlet
 - 1.2. Water penetration class: A
 - 1.3. Discharge/ entry loss coefficient class: 2

440 Durability

1. Relevant agents or degradation mechanisms: Urban environment
2. Design life of the curtain walling system: Not less than 30 years
3. Secondary components: Submit details together with required maintenance regime, replacement periods and methods of replacement.

445 Lightning protection system

1. Curtain wall components used as part of lightning protection system: None

450 Safety

1. Finished surfaces of curtain walling: Accessible internal and external areas must not:
 - 1.1. Have irregularities capable of inflicting personal injury.
 - 1.2. Release irritant or staining substances.

460 Structural sealant/ bonded glazing requirements

1. Structural sealant/ bonded glazing units: Installable, removable and replaceable without site application of structural bonding sealant.
2. Structural sealant/ bonded glazing design: Must limit design tensile stress of sealants to 138 kPa.

Breeam performance requirements

475 Daylight performance

1. Daylight calculations: In accordance with BS 8206-2, CIBSE 'Lighting guide LG10' and BRE 'Site layout guide'.

2. BREEAM requirements

- 2.1. Submit the following: Refer to Services Consultant's documents

480 View out

1. Glazed areas/ opening sizes and position: Designed to meet BREEAM 'View out' criteria for relevant building type.
2. Submit design plan and elevation drawings showing the following
 - 2.1. All BREEAM defined 'relevant areas' dependant on building type and room depths.
 - 2.2. Actual or notional workstation/ desk layouts.
 - 2.3. Glazed areas/ open areas.
3. Submit site plan showing: Building location and proximity to external obstructions.

Testing**510 Comparison (type) testing**

1. Requirement: To CWCT 'Standard for systemised building envelopes', part 8.
2. Test results and reports: Before commencement of curtain walling fabrication and installation, submit proof of compliance with this specification.

515 Project testing (laboratory)

1. Test results and reports: Before commencement of curtain walling fabrication and installation, submit proof of compliance with this specification.

520 Project testing (site)

1. Test results and reports: Before installation of general areas of curtain walling, submit proof of compliance with this specification.

535 Testing authority

1. Requirement: Project testing must be carried out by the curtain walling manufacturer/ contractor and is to be witnessed and certified by UKAS accredited authority .

540 Test specimen

1. Arrangement and overall dimensions: Refer to Architect's documents
2. Features: Refer to Architect's documents

550 Test sequence – standard laboratory tests

1. Requirement: To CWCT 'Standard for systemised building envelopes', Standard sequence A, clause 8.12.1, and as follows:
2. Air permeability (infiltration): To CWCT clause 8.6.
 - 2.1. Peak test pressure: As clause 340.
 - 2.2. Method of identifying areas of concentrated air leakage: Hot wire anemometers
3. Air permeability (exfiltration): To CWCT clause 8.6.
 - 3.1. Peak test pressure: As clause 340.
 - 3.2. Allowable exfiltration rates: As clause 345.
 - 3.3. Method of identifying areas of concentrated air leakage: Hot wire anemometers
4. Water penetration resistance - static: To CWCT clause 8.7.1.
 - 4.1. Peak test pressure: As clause 350.
5. Wind resistance - serviceability: To CWCT clause 8.8.

- 5.1. Peak test pressure: Equal to design wind pressure specified in clause 311.
- 5.2. Position of displacement measuring devices: As drawing by contractor
- 5.3. Allowable elastic and residual deformation: Maximum allowable residual deformation of framing members as 1/500 of the span, measured between points of attachment to the building, one hour after the loading has been removed
6. Air permeability (infiltration): Repeat as above.
7. Air permeability (exfiltration): Repeat as above.
8. Water penetration resistance - static: Repeat as above.
9. Hose test: To CWCT clause 8.16.2.
 - 9.1. Joints to be tested: All major corner interfaces with glazing and rainscreen/unitised panel
10. Wind resistance - safety: To CWCT clause 8.8.
 - 10.1. Peak test pressure: Equal to 1.5 times design wind pressure specified in clause 311.
 - 10.2. Position of displacement measuring devices: As drawing by contractor
 - 10.3. Allowable residual deformation:
11. Impact - safety: To CWCT clause 8.10
 - 11.1. Location, sequence and number of impacts to be applied: To be advised. Middle of panel
 - 11.2. Type of soft body impactor: Double tyre to BS EN 12600
 - 11.3. Required hard body impact load category: As clause 311
 - 11.4. Required soft body impact classification: As clause 311
12. Dismantle inspect and record.

635 Site hose test REVISED

1. Requirement: To CWCT 'Standard for systemised building envelopes' Section 8.16.2, 'Standard test methods for building envelopes' Section 9.
 - 1.1. Joints to be tested: Major junctions, lower window corners and seals.
To follow Performance Mock-up findings and base test areas of known concern or failure.
Areas to be confirmed by Architect and Contractor prior to testing.

655 Wind load fatigue test, small specimen

1. Requirement: To CWCT 'Standard for systemised building envelopes', 'Standard test methods for building envelopes' Section 14.
 - 1.1. Test sequence: As CWCT 'Standard for systemised building envelopes' Table 8.1

660 Structural sealant/ bonded glazing tests

1. Product samples: Provide the structural bonding sealant manufacturer with framing profiles, glass, gaskets, assembly/ weathering sealants and other curtain walling products that are proposed for contact with structural bonding sealant.
2. Testing: By sealant manufacturer to determine compatibility and adhesion of structural bonding sealant under specified design loadings.
3. Modification of product to enable compliance with test criteria: Details must be recorded in the sealant manufacturer's project specific approval.

Products

710 Aluminium alloy framing sections

1. Standard: To relevant parts of BS EN 515, BS EN 573, BS EN 755 and BS EN 12020.
2. Alloy, temper and thickness: Suitable for the application and specified finish.

3. **Structural members:** To BS EN 1999-1-1.

712 Aluminium alloy sheet

1. **Standards:** To relevant parts of BS EN 485, BS EN 515 and BS EN 573.
2. **Alloy, temper and thickness:** Suitable for the application and specified finish.

715 Carbon steel framing sections/ Reinforcement

1. **Standards:** To relevant parts of BS 7668, BS EN 10029, and BS EN 10210.
2. **Thickness:** Suitable for the application, and for galvanizing or other protective coating.

717 Carbon steel sheet

1. **Standards:** To relevant parts of BS 1449-1, BS EN 10048, BS EN 10051, BS EN 10111, BS EN 10131, BS EN 10132, BS EN 10139, BS EN 10140, BS EN 10149, BS EN 10209 and BS EN 10268.
2. **Grade and thickness:** Suitable for the application, and for galvanizing or other protective coating.

720 Stainless steel sheet

1. **Standards:** To relevant parts of BS EN 10029, BS EN 10048, BS EN 10051, BS EN 10095 and BS EN ISO 9445.
2. **Grade:** To BS EN 10088-2, austenitic 1.4301 (304) generally, 1.4401 (316) when used externally or in severely corrosive environments.
3. **Thickness:** Suitable for the application.

730 Mechanical fixings

1. **Stainless steel:** To BS EN ISO 3506, grade A2 generally, grade A4 when used in severely corrosive environments.
2. **Carbon steel:** To BS 4190 and suitable for galvanizing or other protective coating.
3. **Aluminium brackets, rivets and shear pins:** To relevant parts of BS EN 755.

732 Adhesives

1. **General:** Not degradable by moisture or water vapour, or exposure to UV light.

735 Fixing anchors

1. **Type and use:** Reviewed and approved by fixing manufacturers. Submit confirmatory information on request.
2. **Dimensions:** Not less than recommended by their manufacturers.
3. **Adjustment capability:** Sufficient in three dimensions to accommodate building structure and curtain walling fabrication/ installation tolerances.

737 Glass generally

1. **Standards:** To BS 952 and relevant parts of:
 - 1.1. BS EN 572 for basic soda lime silicate glass.
 - 1.2. BS EN 1096 for coated glass.
 - 1.3. BS EN 1748 for borosilicate glass.
 - 1.4. BS EN 1863 for heat-strengthened soda lime silicate glass.
 - 1.5. BS EN 12150 for thermally toughened soda lime silicate glass.
 - 1.6. BS EN 13024 for thermally toughened borosilicate glass.
 - 1.7. BS EN ISO 12543 for laminated glass.

2. Selection of glass type and thickness in accordance with recommendations of CIRIA publication 'Guidance on glazing at height'.
3. **Glass quality:** Clean and free from obvious scratches, bubbles, cracks, rippings, dimples and other defects.
4. **Glass edges:** Generally undamaged. Shells and chips not more than 2 mm deep and extending not more than 5 mm across the surface are acceptable if ground out.

739 Dimensional tolerances on glass

1. Description:
2. Measurement of tolerances: Before any thermal toughening/ heat-strengthening.
3. Pane dimensions less than 1500 mm
 - 3.1. For 3 to 6 mm-thick glass: ± 1.0 mm.
 - 3.2. For 8 to 12 mm-thick glass: ± 1.5 mm.
 - 3.3. For 15 mm-thick glass: ± 2.0 mm.
 - 3.4. For 19 mm and 25 mm-thick glass: ± 2.5 mm.
4. Pane dimensions more than 1500 mm
 - 4.1. For 3 to 6 mm-thick glass: ± 1.5 mm.
 - 4.2. For 8 to 12 mm-thick glass: ± 2.0 mm.
 - 4.3. For 15 mm-thick glass: ± 2.5 mm.
 - 4.4. For 19 mm and 25 mm-thick glass: ± 3.0 mm.
5. Pane squareness: Not more than 4 mm difference in diagonal measurements.

741 Distortional tolerances on glass

1. Description:
2. Measurement of tolerances: After any thermal toughening/ heat-strengthening.
3. Maximum bow: 0.2% of pane dimension.
4. Maximum roller wave
 - 4.1. For 3 to 5 mm-thick glass: 0.5 mm.
 - 4.2. For 6 to 10 mm-thick glass: 0.3 mm.
 - 4.3. For 12 mm and thicker glass: 0.15 mm.
5. Maximum edge dip
 - 5.1. For 3 to 5 mm-thick glass: 0.8 mm.
 - 5.2. For 6 to 10 mm-thick glass: 0.5 mm.
 - 5.3. For 12 mm and thicker glass: 0.25 mm.

742 Heat-soaked thermally toughened glass

1. Standard: To BS EN 14179.
 - 1.1. Holding period: 2 hours
2. Locations of heat-soaked glass: Rooflights at Clause H11:146

745 Insulating glass units

1. Standard and labels for hermetically sealed units: To BS EN 1279.
2. Label: Each pane.
3. Colour of aluminium perimeter spacers:
4. Perimeter taping: Not to be used.
5. Perimeter seals

- 5.1. Resistant to UV light degradation on exposed edges.
- 5.2. Compatible with structural, assembly and weather sealants.

747 Glass edge condition for structural sealant/ bonded glazing

1. **Bonded, unframed outer edges:** Flat ground with a small arris suitable for open jointing or for weatherseal jointing.

750 Infill panels/ Facings

1. **Tolerances**
 - 1.1. Deviation in size (maximum): ± 1 mm.
 - 1.2. Deviation in flatness from plane per 2 m length (maximum): ± 1 mm.
2. **Rigidity:** Adequate to comply with design/ performance requirements.
3. **Fire performance:** BS EN 13501-1, Class A2-s1, d0 or better

760 Gaskets

1. **Material**
 - 1.1. Noncellular rubber to BS 4255-1.
 - 1.2. Cellular rubber to ASTM-C509-06.
2. **Continuity:** Outer gaskets of single front sealed curtain walling systems and inner gaskets of drained and ventilated or pressure equalized curtain walling systems must be formed in a complete frame with sealed joints. Vulcanized rubber gaskets must have factory moulded corner joints.
3. **Durability:** Resistant to oxidation, ozone and UV degradation.

765 Weatherstripping of opening units

1. **Material**
 - 1.1. Noncellular rubber to BS 4255-1.
 - 1.2. Cellular rubber to ASTM-C509-06.
 - 1.3. Polypropylene woven pile, silicone treated.
2. **Attachment:** Fixed in undercut grooves in framing sections using preformed corners, with any joints in the length.

770 General sealants

1. **Selection:** In accordance with BS 6213 from:
 - 1.1. Silicone.
 - 1.2. One part polysulfide.
 - 1.3. Two parts polysulfide.
 - 1.4. One or two parts polyurethane.
2. **Classification and requirements:** To BS EN ISO 11600.
3. **Reaction to contact products and finishes:** Stable and compatible.

772 Curtain walling joint assembly sealants

1. **Material:** One part, low modulus silicone to BS EN ISO 11600, type F or G. Neutral curing where in contact with or close proximity to other products that may be adversely affected by acetoxycuring.
2. **Manufacturer:** Submit proposals

775 Bonding sealants for structural sealant/ bonded glazing

1. **Material:** Silicone, neutral curing, designed and manufactured for bonding of structural sealant/ bonded glazing. Compatible with contact and close proximity products and finishes.
2. **Manufacturer:** Submit proposals

777 Weathersealing for structural sealant/ bonded glazing

1. **Material:** Silicone, one or two parts, neutral curing. Designed and manufactured for weathersealing of structural sealant/ bonded glazing. Compatible with contact and close proximity products and finishes.
2. **Manufacturer:** Sika or equivalent
 - 2.1. **Product reference:** Submit proposals
3. **Colour:** Black - Submit proposals

780 Thermal insulation

1. **Material:** Mineral wool boards to BS EN 13162
 - 1.1. **Recycled content:** 50% (minimum) to BS EN ISO 14021
 - 1.2. **Properties:** Durable, rot and vermin proof and not degradable by moisture or water vapour.
2. **Fixing:** Attached to or supported within the curtain walling so as not to bulge, sag, delaminate or detach during installation or in situ during the life of the curtain walling.

785 Air and vapour control layer

1. **Acceptable materials**
 - 1.1. Aluminium alloy.
 - 1.2. Carbon steel, galvanized or protective-coated.
 - 1.3. Stainless steel.
 - 1.4. **Reinforced membranes:** Foil, plastics or rubbers, protected both sides by rigid facings/ linings.
2. **Location:** Warm side of thermal insulation.
3. **Integrity:** Continuous, free from gaps and sealed at joints.

Finishes**810 Protective coating of carbon steel framing sections/ Reinforcement**

1. **Treatment:** One of the following to all surfaces:
 - 1.1. Hot dip galvanized to BS EN ISO 1461.
 - 1.2. An appropriate equivalent coating to BS EN ISO 12944-5 or BS EN ISO 14713-1, -2 and -3.

820 Protective coating of carbon steel mechanical fixings

1. **Treatment:** One of the following to all surfaces:
 - 1.1. Hot dip galvanized to BS EN ISO 1461.
 - 1.2. Sherardized to BS 7371-8, Class 30 coating thickness and passivated.
 - 1.3. Zinc plated to BS EN ISO 2081, coating designation Fe//Zn//C for an iridescent (yellow passivate) chromate conversion coating or Fe//Zn//D for an opaque (olive green) chromate conversion coating.

830 Powder-coating

1. **Requirement:** As section Z31.

840 Anodizing

1. Requirement: As section Z33.

860 Treatment of timber cut on site

1. Requirement
 - 1.1. Cutting and machining: Carry out as much as possible before full treatment of raw materials.
 - 1.2. Minor cutting drilling: Treat exposed timber surfaces with two flood coats of a solution recommended by main treatment solution manufacturer.
 - 1.3. Extensive processing should not be allowed.

Fabrication and installation

910 Generally

1. Electrolytic corrosion: Prevent. Submit proposed methods.
2. Fixings: Concealed unless indicated on detailed drawings. Where exposed they must match material and finish of the products fixed.
3. Fabrication: Machine cut and drill products in the workshop wherever possible.
4. Identification of products: Mark or tag to facilitate identification during assembly, handling, storage and installation. Do not mark surfaces visible in the completed installation.

912 Metalwork

1. Requirement: As section Z11, unless specified otherwise in this section.

915 Glazing

1. Requirement: As section L40, unless specified otherwise in this section.
2. Directional patterned/ wired glass: Generally fix parallel to surround and align adjacent panes where seen together at close quarters.

916 Accuracy of erection of GRC components

1. Joint widths: Within joint lengths, including in-line continuations across transverse joints, as follows:
 - 1.1. Tolerance: Greatest width not to exceed least width by more than 15% width of joint.
 - 1.2. Variations: Evenly distribute, with no sudden changes.
2. Offset in elevation: Between component edges across transverse joints not to exceed 10% width of joint.
3. Offset in plan or section: Between flat faces of adjacent units across joints not to exceed 10% width of joint.
4. Sealant joints width limitations: To recommendations of sealant manufacturer
5. Finished work: True to line and plane with satisfactory fit at junctions

917 Fixings/ Adhesives application

1. Requirement: As section Z20, unless specified otherwise in this section.

920 Sealant application

1. Requirement: As section Z22, unless specified otherwise in this section.

925 Structural sealant/ bonded glazing

1. **Curing:** Do not transport units until structural bonding sealant has adequately cured for the period stated in the project specific approval.

930 Assembly

1. **General:** Carry out as much assembly as possible in the workshop.
2. **Joints (other than movement joints):** Rigidly secured, reinforced where necessary and fixed with hairline abutments.
3. **Displacement of components in assembled units:** Submit proposals for reassembly on site.

955 Fixing anchor installation

1. **Site drilling or cutting into structure:** Submit proposals for positions other than shown on detailed drawings.
2. **Concrete supporting structure**
 - 2.1. **Cast-in inserts:** Provide detailed locational information. Protect cavities in inserts from entry of concrete.
 - 2.2. **Edge fixing distances:** Not less than recommended by fixing anchor manufacturers.
3. **Corrective fabrication:** Minimize. Where necessary, submit proposals.

965 Preliminary curtain walling installation REVISED

1. **Requirement:** Complete an area for inspection and approval of appearance as follows: To be agreed between Architect and Contractor.

970 Curtain walling installation

1. **Securing to fixing anchors:** Through holes formed during fabrication only.
2. **Tightening mechanical fasteners:** To manufacturer's recommended torque figures. Do not overtighten fasteners intended to permit differential movement.
3. **Protective coverings:** Remove only where necessary to facilitate installation and from surfaces that will be inaccessible on completion.

975 Welding

1. **In situ welding:** Not permitted.

978 Installing fire and smoke stops

1. **Fire and smoke stops:** To be located at all junctions between the curtain wall and compartment or separating walls and floors. To be installed strictly in accordance with manufacturers' guidelines and as recommended in CWCT Technical Note TN 98.
2. **Installer qualification:** To be a member of a UKAS-accredited installer scheme.

980 Interfaces

1. **Flashings, closers, etc:** Locate and form correctly to provide weathertight junctions with the curtain walling.

982 Ironmongery

1. **Assembly and fixing:** Accurately, using fasteners with matching finish supplied by ironmongery manufacturer.
2. **Completion:** Check, adjust and lubricate as necessary to ensure correct functioning.

985 Maintenance

1. **Maintenance manual:** Incorporate details within the Building Manual in accordance with CWCT 'Standard for systemised building envelopes' clause 7.6.1.
 - 1.1. **Materials certification and test reports to be included:**

Ω End of Section

