



Defence
Infrastructure
Organisation



AECOM

Architectural Specification

Counter Insurgency Terrorism and Stability Operations,
Kenya

Headquarters and Medical Centre

Defence Infrastructure Organisation

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Quality information

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Commentary

The following notations identify project specific systems/components as referenced within the Specification and as indicated on Drawings.

Specification Section Type (Design Responsibility):

D = Descriptive (Contractor completes the Design)

P = Prescriptive (Architect completes the Design)

Revision/ Issue	Reference (i.e. Code/ Tag)	CAWS Reference	Brief System Description	Design Responsibility
	BAL		BALUSTRADES/ HANDRAILS/ GUARDRAILS	
	BAL-300 Series		BALUSTRADES/ GUARDRAILS	
001	BAL-301	L32	Metal Balustrade	P
	CLG		CEILINGS	
	CLG-100 Series		PLASTERBOARD MONOLITHIC CEILINGS	
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	CLG-500 Series		GLASS WOOL TILE CEILINGS	
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	DRS		DOORS	
	DRS-200 Series		DOORS - GLAZED (EXTERNAL)	
001	DRS-201	H11	Glazed Doorset (Integrated)	P
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001	DRS-212	L25	Glazed Framed Door	P
	DRS-400 Series		DOORS - METAL (EXTERNAL)	
001	DRS-401	L25	Metal Doorset	P
001	DRS-421	L13	Metal Louvred Doorset	P
	DRS-500 Series		DOORS - TIMBER (INTERNAL)	
002	DRS-501	L20	Paint Grade Timber Doorset	P
002	DRS-531	L20	Solid Timber Doorset	P
002	DRS-532	L20	Solid Timber Doorset - Vent	P
	EWS		EXTERNAL WALL SYSTEMS	
	EWS-100 Series		GLAZED SYSTEMS	
001	EWS-101	H11	Capped Stick Built Curtain Walling System	P
001	EWS-152	L10	Window - Aluminium	P
	GLP		GLAZED-IN PANELS	
	GLP-100 Series		CLEAR/ TRANSLUCENT PANELS	
001	GLP-101	L40	Insulating Glass Unit	P
	GLP-200 Series		OPAQUE PANELS	
003	GLP-201	L42	Aluminium Faced Infill Panel	P

Revision/ Issue	Reference (i.e. Code/ Tag)	CAWS Reference	Brief System Description	Design Responsibility
	EWS-300 Series		BUILT-UP, FRONT WEATHERED SYSTEMS - SELF SUPPORTING	
002	EWS-331	H51	Natural Stone Cladding	P
	EWS-400 Series		BUILT-UP, FRONT WEATHERED SYSTEMS - FULLY SUPPORTED	
002	EWS-402	H31	Aluminium Coping	P
002	EWS-403	H31	Aluminium Flashing/ Trim	P
001	EWS-481	G20	PVC Fascia	P
001	EWS-491	G20	PVC Soffit - Vented	P
	EWS-600 Series		EXTERNAL RENDER COATINGS	
001	EWS-601	M20	Sand/ Cement Render	P
	EWS-700 Series		LOUVRE/ SCREEN SYSTEMS/ BRISE SOLEIL/ VENTILATORS	
004	EWS-701	L13	Louvre	P
004	EWS-731	L13	Metal Mesh Fence	P
	EXT		EXTERNAL WORKS	
	EXT-400 Series		STREET FURNITURE AND EQUIPMENT	
001	EXT-471	Q50	Canopy	P
004	EXT-475	Q50	Car Parking Shade	P
	FLH		FLOOR FINISHES - HARD	
	FLH-100 Series		FLOOR TILING	
001	FLH-101	M40	Porcelain Floor Tiling	P
	FLS		FLOOR FINISHES - SOFT	
	FLS-100 Series		VINYL FLOORING	
001	FLS-111	M50	Hygienic Vinyl Sheet Flooring - Anti-Slip	P
	FLS-600 Series		BARRIER MATTING	
002	FLS-601	M50	Barrier Matting	P
	FPS		FIRE/ SMOKE PROTECTION	
	FPS-100 Series		GENERAL FIRE/ SMOKE STOPPING	
001	N/A	P12	General Fire Stopping	D
	FFE		FIXTURES, FITTINGS AND EQUIPMENT	
	FFE-100 Series		BLINDS/ CURTAINS/ TRACKS	
002	FFE-101	N10	Roller Blind	P
	FFE-400 Series		MIRRORS	
004	FFE-401	N10	Mirror	P
	FFE-600 Series		FITTED FURNITURE	
001	FFE-601	N11	Teapoint	P
001	FFE-611	N20	Reception Desk	P
	IRN		IRONMONGERY (Refer to schedule)	
	IRN-100 Series		IRONMONGERY	
	N/A	P21	Refer to the Ironmongery Schedule and Section P21	P
	IWS		INTERNAL WALL SYSTEMS	

Revision/ Issue	Reference (i.e. Code/ Tag)	CAWS Reference	Brief System Description	Design Responsibility
	IWS-100 Series		PLASTERBOARD LININGS	
001	IWS-101	K10	Plasterboard Dry Lining	P
	IWS-500 Series		INTERNAL GLAZED SCREENS	
001	IWS-501	L12	Internal Glazed Screen	P
	LIN		LININGS TO WALLS/ CEILINGS	
	LIN-100 Series		PORCELAIN/ CERAMIC WALL TILING	
	LIN-101	M40	Ceramic Wall Tiling	P
	LIN-500 Series		HYGIENIC WALL LININGS	
001	LIN-501	K13	Hygienic Wall Lining	P
	MAC		MASONRY WALLING - ACCESSORIES	
001	N/A	F30	Refer to Section F30 for Performance Requirements	P
	MAC-900 Series		CILLS/ COPINGS/ FEATURES/ DRESSINGS/ LINTELS	
003	MAC-951	F31	Precast Concrete Cill	D/P
	MBL		MASONRY WALLING - BLOCKWORK	
	MBL-100 Series		BLOCKWORK	
001	MBL-121	F10	Common Blockwork	P
	PAN		PANELLING/ CUBICLES	
	PAN-200 Series		PLUMBING ENCASEMENTS/ ACCESS PANELS	
001	PAN-201	K32	Duct Access Panel	P
	PAN-300 Series		VANITY TOPS/ COUNTERS	
	PAN-301	K32	Vanity Unit	P
	PLS		PLASTERING/ INTERNAL RENDER COATINGS	
	PLS-100 Series		PLASTERING	
001	PLS-101	M20	Board Finish Plaster	P
001	PLS-111	M20	Hardwall Plaster	P
	PTS		PAINT FINISHES/ SEALERS	
	PTS-100 Series		PAINT FINISHES	
001	PTS-101	M60	Emulsion Paint	P
001	PTS-171	M60	Exterior Paint	P
	PTS-200 Series		STAIN/ VARNISH/ SEALER	
003	PTS-231	M60	Concrete Sealer	P
	RFS-200 Series		BUILT-UP METAL/ STANDING SEAM/ SHEET SYSTEMS	
001	RFS-251	H31	Profiled Metal Sheet Roofing	P
	RWS		RAINWATER GOODS/ SYSTEMS	
	RWS-100 Series		RAINWATER GOODS/ SYSTEMS	
002	RWS-111	R10	External Rainwater Downpipe	P
	SAN		SANITARY APPLIANCES/ FITTINGS	
			SANITARY APPLIANCES/ FITTINGS (Refer to Schedule)	
002	N/A	N13	Refer to the Sanitaryware Schedule and Section N13	P

Revision/ Issue	Reference (i.e. Code/ Tag)	CAWS Reference	Brief System Description	Design Responsibility
	SAN-100 Series		DISABILITY PROVISION (Refer to Schedule)	
002	SAN-101	N/A	Wheelchair Accessible WC (Doc M WC Pack)	P
	SAN-200 Series		WC PANS AND CISTERNS (Refer to Schedule)	
002	SAN-201	N/A	WC - Concealed Cistern (Floor Mounted)	P
002	SAN-202	N/A	WC - Concealed Cistern (Floor Mounted) - Healthcare	P
	SAN-300 Series		URINALS (Refer to Schedule)	
002	SAN-301	N/A	Urinal	P
	SAN-400 Series		WASHBASINS (Refer to Schedule)	
002	SAN-401	N/A	Washbasin - Wall Mounted	P
002	SAN-402	N/A	Washbasin - Wall Mounted - Back Outlet	P
002	SAN-403	N/A	Washbasin - Wall Mounted - Rectangular	P
002	SAN-411	N/A	Washbasin - Countertop Mounted	P
	SAN-500 Series		SINKS (Refer to Schedule)	
002	SAN-501	N/A	Stainless Steel Single Bowl Sink with Single Drainer - 1200mm x 600mm	P
002	SAN-502	N/A	Stainless Steel Single Bowl Sink with Single Drainer - 600mm x 600mm	P
002	SAN-503	N/A	Stainless Steel Double Bowl Sink with Single Drainer	P
002	SAN-504	N/A	Stainless Steel Single Bowl Sink with Single Drainer - Teapoint	P
002	SAN-511	N/A	Ceramic Cleaners' Sink	P
	SAN-600 Series		BATHS/ SHOWERS (Refer to Schedule)	
002	SAN-611	N/A	Shower Tray - 1200mm x 760mm	P
002	SAN-612	N/A	Shower Tray - 900mm x 760mm	P
	SAN-700 Series		TAPS/ WASTES/ FITTINGS (Refer to Schedule)	
002	SAN-701	N/A	Bib Taps	P
002	SAN-711	N/A	Mixer Tap	P
002	SAN-712	N/A	Mixer Tap - Healthcare	P
002	SAN-721	N/A	Pillar Tap	P
	SGN		SIGNAGE	
	SGN-100 Series		STATUTORY SIGNAGE	
004	SGN-101	N15	Illuminated Statutory Sign	P
004	SGN-151	N15	Non-illuminated Statutory Sign	P
	SGN-200 Series		DIRECTIONAL/ WAYFINDING SIGNAGE	
004	SGN-251	N15	Non-illuminated Directional/ Wayfinding Sign - Internal	P
004	SGN-252	N15	Non-illuminated Directional/ Wayfinding Sign - External	P
	TRM		TRIMS/ SKIRTINGS/ SUNDRY ITEMS	
	TRM-100 Series		SKIRTINGS	
004	TRM-101	M40	Porcelain Skirting	P

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A GENERAL REQUIREMENTS

A.1000 FORMAT, DEFINITIONS AND USE OF THE ARCHITECTURAL SPECIFICATION

A.1001 Architectural Specification Format

- a) The Architectural Specification comprises Sections A to Z, following the Uniclass (Common Arrangement) classification system and constitutes a single document.
- b) Sections A and Z provide general requirements applicable to the Sections.
- c) The Sections form part of the Architectural Specification with design responsibility and specification type indicated for each as follows:
 - i) Descriptive (D): The Section, when read with the Design Drawings, indicates the requirements with which the Contractor shall comply when undertaking the Detailed Design. The Contractor retains full responsibility for completing the Design and execution of the Works and for achieving the specified requirements.
 - ii) Prescriptive (P): The Section is a detailed materials and workmanship Architectural Specification reflecting the Employer's design solution. The Contractor may be required to submit some drawings and technical information but design responsibility remains with the Employer.
- d) Read the Architectural Specification in conjunction with the Conditions of Contract, Preliminaries, Design Drawings, instructions to tenderers, supplemental information and other relevant documents.
- e) Performance criteria where specified shall be considered as minimum standards with which the Contractor's Proposals shall comply.
- f) Unless stated otherwise, all requirements of the Architectural Specification (and any related document) indicate the work to be provided by, and obligations of, the Contractor so all clauses are addressed to, and refer to, the Contractor.

A.1002 Supplemental Information

Refer to the requirements of the following drawings, reports and supplemental information as relevant:

- a) Fire Strategy Report.
- b) Geotechnical Report.
- c) Services Engineer's documentation.
- d) Site Investigation Report.
- e) Structural Engineer's documentation.

A.1003 Definitions

The following definitions apply to the Architectural Specification:

- a) 'Architectural Specification': This document, comprising Sections A-Z inclusive.
- b) Technical Reference Sheet (T Sheet): A directory of references for building elements/ systems that provides a link between the Architectural Specification and the Design Drawings.
- c) 'Contractor's Proposals': Drawings, detailed technical specifications, method statements, risk assessment, calculations and any other relevant information prepared by the Contractor and submitted with the tender response, maintaining the design and visual intent, functional, performance criteria and technical requirements as stated in the tender documents.
- d) 'Design':
 - i) Descriptive (D): The design intent prepared by the Employer for tender purposes, represented by the Design Drawings and the Architectural Specification.

- ii) Prescriptive (P): The design solution prepared by the Employer for tender purposes, represented by the Design Drawings and the Architectural Specification. This may be supplemented by drawings and technical information, prepared by the Contractor on behalf of the Employer, after the tender.
- e) 'Detailed Design': That prepared by the Contractor, for work specified descriptively (D), represented by the Working Drawings and Contractor's specifications, undertaken to complete the Design.
- f) 'Design Drawings':
 - i) Descriptive (D): Drawings issued by the Employer, which may include associated Schedules, representing the Design for tender purposes, showing the visual and design intent, scope, layout, principal dimensions, visual and aesthetic requirements.
 - ii) Prescriptive (P): Drawings issued by the Employer, which may include associated Schedules, representing the Design.
- g) 'Working Drawings': Drawings representing the Detailed Design, prepared by the Contractor (or their specialist subcontractor) based upon the Design Drawings while maintaining the design intent. The Working Drawings shall comprise plans, elevations, sections and full size details of fabrication, assembly, installation and fixings, with the information necessary to fabricate, manufacture and install/ construct the Works.
- h) 'As-built information': Information produced by the Contractor, where required, to show the Works as finally constructed.
- i) 'Contract Drawings': The drawings listed in the Contract, comprising Design Drawings and Contractor's tender response drawings agreed with the Employer with which Working Drawings shall comply.
- j) 'Evaluation': Reviews carried out by the Employer and Contractor between tender return and Contract award to consider systems, products, materials, performance criteria, typical details and critical interfaces to establish specifications and drawings for Contract purposes. (Similar reviews may be required at other times during the procurement process.)
- k) 'Inspection': Inspection of the Works carried out by the Employer limited to an inspection of the visual appearance only. The Detailed Design, selection of systems, products and materials; and construction of components and equipment shall remain the sole responsibility of the Contractor for work specified descriptively. Such inspections by the Employer shall not relieve the Contractor from compliance with the Contract Documents.
- l) 'A(a)ccepted, A(a)cceptance or A(a)cceptable': Systems, products, materials, components, equipment and installations accepted by the Employer after evaluation and with due regard to responsibilities as defined in the Contract Documents and stated in the Architectural Specification.
- m) 'acceptable equivalent': Systems, products and materials proposed by the Contractor as alternatives, which are, in every respect, equal to or an enhancement of those specified. Such alternatives shall be subject to acceptance by the Employer following evaluation and with due regard to responsibilities as defined in the Contract Documents and stated in the Architectural Specification.
- n) 'Contractor's Supplemental Information': Documentation produced after Contract award, by the Contractor, demonstrating that the Detailed Design complies with the Contract Documents.
- o) 'Inspecting Body': Competent independent body or association, which verifies compliance with the Architectural Specification.
- p) 'Testing Body': Competent accredited independent testing body or association, which provides appropriate testing equipment, testing environment and independent testing results which will be used to verify conformance with the Architectural Specification. The Testing Authority shall be subject to acceptance by the Employer.
- q) 'Detailed Design Programme': Provided by the Contractor, prior to Contract award, showing the Detailed Design drawing submission dates, sample submissions, prototyping and testing activities prior to manufacture.
- r) 'Service conditions': Conditions that affect systems and materials when in use, including (but not limited to) function, usage, location, loads and climate.

A.1004 Copyright

The copyright in any designs or installation details developed for this project by the Architect shall be vested in the Architect and may not be reproduced elsewhere without the Architect's written permission. This will not apply to standard products and designs already in existence before the date of tender.

A.1005 Disclosure

The nature of the design and construction work performed and any information belonging to the Architect, with which the Contractor may become familiar, will be treated as confidential and may not be disclosed without the written consent of the Architect. Do not publish any drawings, sketches or photographs of the Works or building or its construction without the prior written consent of the Architect.

A.2000 DESCRIPTION OF THE PROJECT

A.2001 Project Description

The project, on behalf of the Kenyan Defence Forces (KDF) and British Defence Infrastructure Organisation (DIO), is the Kenyan Counter Insurgency Terrorism and Stability Operations (CITSO) facility in Kenya and comprises two new single-storey buildings, a new Headquarters Building and Medical Building and an ambulance parking structure.

A.3000 DETAILS OF THE CONTRACTOR'S RESPONSIBILITIES

A.3100 CONTRACTOR'S GENERAL RESPONSIBILITIES

A.3101 General

- a) Interfaces:
 - i) Co-ordinate with the work of others including interfacing as required.
 - ii) Performance shall be maintained at interface conditions.
- b) Construct the Works such that the performance requirements specified are achieved for the full service life.
- c) Be responsible for fixings and other aspects not fully detailed or specified on the Design Drawings and/ or Architectural Specification.
- d) Be responsible for the carrying out of testing as specified.
- e) Bring to the attention of the Employer for consideration, any matters within the Architectural Specification, which the Contractor considers to be in conflict with the requirements of the Architectural Specification or any other Project Design document.
- f) Comply with relevant Codes of Practice, Standards, Building Regulations and local Building Codes, Safety Regulations and any other regulations applicable to the installation, together with relevant Statutory Rules, Regulations, Bye-laws and other enforceable instruments applicable to the execution of the Works.
- g) The Architectural Specification shall not be altered without the Employer's prior written consent.
- h) No portion of the Works shall commence without acceptance of the required submittals by the Employer.
- i) Provide to the Employer one digital copy and two paper A3 reduction copies of production information. Information shall be legible when reduced to A3 paper size.
- j) Finalise manufacturing, interface and installation details via Working Drawings, where required.
- k) Make any necessary amendments in a timely manner, and submit copies of amended drawings and other documents.
- l) Incorporate movements and tolerances at any necessary support structure.
- m) Provide warranties as required.

- n) Comply with the requirements of Planning Permission.
- o) Set out the Works and co-ordinate related work.
- p) Provide information to demonstrate that the requirements of the Architectural Specification have been achieved.
- q) The Employer's review of Working Drawings shall relate to visual performance and functional matters only.

A.3102 Submission of Supplemental Information

- a) Provide all supplemental information required by the Employer after Contract award.
- b) Supplemental information shall comply fully with the Design.
- c) Where required, provide relevant information sufficient to demonstrate compliance with the Architectural Specification to the relevant authorities.

A.3103 Manufacturing and Installation Tolerances

- a) The Architectural Specification together with the corresponding Design Drawings indicate the dimensional tolerances (hereafter referred to as 'tolerances') to which the Contractor shall work (where relevant) for the Detailed Design, manufacture, sub-assembly, setting out and installation of the Works.
- b) Where required, the Working Drawings shall clearly demonstrate how manufacturing and construction tolerances are to be accommodated.
- c) Take account of various specified tolerances and their effect on the Works. Inform the Employer of any apparent tolerance omissions, inconsistencies or incompatibilities.
- d) Check dimensions on Site, confirming dimensions that are critical to the Works. Undertake Site measurements in sufficient time to enable corrective action to be taken to the Works, or the work of others, so that there is an accurate fit within agreed or implied tolerances.
- e) Refer to and take account of the Structural Engineer's documentation.
- f) Confirm common reference points and agree with the Employer. Carry out dimensional checks prior to the commencement of manufacture as necessary.
- g) Dimensions on the Working Drawings shall be compatible and consistent with other relevant design dimensions and accumulated tolerances and movements. State and/or show, on the Working Drawings, the provisions to accommodate the accumulated tolerances of adjoining or adjacent trades.
- h) Inform the Employer of any work that does not achieve the specified tolerances.
- i) Provide details for acceptance by the Employer of the proposed method for achieving and monitoring the fabrication and erection tolerances during all stages of the Works. Provide detailed records of the control and tolerances achieved.
- j) In the event of there being any discrepancy in the values of existing datum reference points, datum levels, buildings, foundations or other features to which the Works are related, determine and report such a discrepancy to the Employer and obtain written instructions before proceeding.
- k) Check the permissible tolerances stated in the Architectural Specification up to handover. Where two or more different tolerances can be derived by calculation and/or from the Design Drawings for the same dimension, the most onerous tolerance shall apply; which shall be confirmed by the Contractor to the Employer.
- l) Tolerances shall not be cumulative.

A.3104 Substitutions

- a) A Substitute is any change or alternative to the Design or Architectural Specification. Requests for Substitutions shall be in accordance with the Contract conditions.
- b) Substitutes, including for systems, products and materials, may be proposed but such proposals shall be subject to acceptance by the Employer following evaluation. Any request for substitutions or alternatives shall be at the sole discretion of the Employer and may be rejected.

- c) Proposed substitutions shall not be incorporated in the Works until the Contractor's proposal has been accepted by the Employer.
- d) Provide full technical literature, drawings, samples and other supporting documentation in respect of the complete installation to demonstrate that the proposed substitutions are of a standard at least equal to that specified and compatible with the requirements of the Design.
- e) Clearly identify any deviations from the Design Drawings and Architectural Specification.
- f) A request for a substitution is deemed to be a warranty by the Contractor to the Employer that such substitutions achieve the requirements of the Design and Architectural Specification. It shall be confirmed in writing as equal by the Contractor and accepted in writing by the Employer.
- g) Substitutions shall not alter aesthetic parameters of the Design.
- h) Substitutions shall maintain the functional requirements of the Design and shall equal or improve the specified performance requirements.
- i) In the case that any substitution alters the Design or Architectural Specification requirements, provide sufficient information on the substitution to allow evaluation by the Employer on any deviations from the Design and Architectural Specification.
- j) Include in the Tender return a list of proposed substitutions and supporting details for the Employer's evaluation.

A.3200

DESCRIPTIVE ELEMENTS OF THE WORKS (D)

A.3201

General Requirements

- a) Take responsibility for the Contractor Design work as identified herein, and comply with the requirements of the Contract and Architectural Specification.
- b) Design and general performance requirements shall be as stated herein. Specific performance requirements are provided in each Section of the Architectural Specification.
- c) Undertake the Detailed Design, supply, install and warrant the Works to comply with the design intent indicated on the Design Drawings and criteria stated in the Architectural Specification.
- d) Where no material, product or manufacturer is indicated in the Architectural Specification, propose suitable materials and systems which comply with the design intent and performance criteria stated and remain fully responsible for the Detailed Design of the Works.
- e) Where a material, product or manufacturer is indicated in the Architectural Specification, such material, product or manufacturer shall be deemed indicative representing the Employer's design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Employer in writing, but shall remain fully responsible for the Detailed Design and performance of the Works.
- f) Complete the Detailed Design of interfaces with adjoining trades prior to commencement of manufacture.

A.3202

Contractor Responsibilities

- a) Complete the Design of the Works maintaining the function, visual requirements, performance and design intent, which shall be achieved for the required service life.
- b) In addition to the performance and design intent requirements indicated in the Architectural Specification or on the Design Drawings, design the Works to take into account any additional criteria which an experienced designer with specialist knowledge would deem to be relevant.
- c) Provide detailed proposals, demonstrating compliance with the design intent and confirm the provision of fully warranted systems in accordance with the Contract conditions.
- d) The Contractor's proposals shall include drawings, calculations, methods, technical specifications, life cycle costing and risk assessment detailing the proposed materials and systems in order that a technical appraisal can be made by the Employer.

- e) The Contractor's own preferred design solution may be offered for acceptance by the Employer provided that the performance and visual requirements are achieved. Alternative solutions shall maintain the performance, appearance and design intent of the Design Drawings and the Architectural Specification.
- f) The design and visual character of the project is important and shall be maintained. There shall be no variation in the final surface finish of similar materials, which shall remain visually consistent, including colour and texture, regardless of orientation or natural grain within agreed tolerances and agreed samples.
- g) Provide submittals outlined within this Section and each Section of the Architectural Specification.
- h) Provide Working Drawings and technical information to demonstrate compliance with the Design Drawings and the Architectural Specification. The Contractor's final Detailed Design shall be based on the Design Drawings which indicate generic solutions and may not cover all conditions.
- i) Provide a design risk assessment, including any residual risk information identified during the design risk management process.
- j) Where proprietary products are to be installed, be responsible for providing any modification, additional bracing, reinforcing, suitable fixings, etc. so that the products achieve the requirements of the Architectural Specification and suit the service conditions. Convey any concerns that the manufacturers may have expressed regarding the suitability of products for the purpose intended.
- k) Do not commence any portion of the Works without acceptance of the required submittals by the Employer.
- l) Be responsible for the final selection and submittal for approval of products and associated components, which shall achieve the requirements of the Architectural Specification.
- m) Submit relevant documents to local and national building regulation and legislation approval authorities as required to comply with the requirements of the Architectural Specification.
- n) Make submissions to local and national building regulation and legislation approval authorities:
 - i) Provide details, calculations and any other relevant information to the Employer for submission to and approval by the relevant authorities.
 - ii) Make any adjustments required by the authorities, following submissions, to the acceptance of the Employer.
 - iii) Make submittals to the authorities in good time so that there is no programme delay caused by awaiting such approvals.
- o) In addition to submissions to the local and national building regulation and legislation approval authorities, be responsible for submitting structural, deflection and other calculations and technical information, where required (as requested in the Architectural Specification) for review by the Employer. Such submissions shall demonstrate compliance with the Architectural Specification.

A.3203

Contractor's Proposals

- a) Attend Evaluation meetings as required and make adjustments and alterations to the Contractor's Proposals to agree the major Design principles to the acceptance of the Employer prior to the possible contract award.
- b) Provide the Employer with access to the design office and personnel during the Design Evaluation.
- c) The Contractor's Proposals as a minimum shall include:
 - i) Full details of systems, materials and manufacturers.
 - ii) Pre-contract proposals.
 - iii) Details of any 'Specialist' involvement.

- iv) Details of Working Drawings programme.
- v) Samples of proposed materials as required by the relevant Sections.
- vi) Full details of systems, materials and manufacturers where different from those specified.
- vii) Comprehensive technical specifications of the Contractor's Proposals.
- viii) Relevant supplementary information.
- ix) Drawings as required by the Architectural Specification or as deemed necessary to explain the Contractor's Proposals.
- x) Technical statements confirming performance compliance.
- xi) Details of guarantees and warranties including details of predicted service lives for primary and secondary components.
- xii) Interfaces.
- xiii) Summary of deviations from the Design Drawings and Architectural Specification.
- xiv) Commissioning information as relevant.

A.3204

The Detailed Design

- a) Although the Design Drawings may show considerable detail and dimensions, no warranty or representation is given by the Employer as to the accuracy of such dimensions or the adequacy or buildability of such details. Should the Contractor adopt the details or configurations indicated on the Design Drawings, check their buildability and performance in terms of this Architectural Specification, relevant Regulations and Codes of Practice, and manufacturers' recommendations for any products referred to.
- b) Prepare a programme for the Detailed Design showing tasks and submissions and submit for acceptance by the Employer.
- c) Produce Working Drawings to represent the Detailed Design, supported by calculations for review by the Employer.
- d) Select suitable materials, sizes, thicknesses, types and locations of fixings and sealants, in accordance with specified standards and use for the purpose intended by the manufacturer.
- e) Include descriptions of relevant structural performance principles of the Works, including how and where loads are transmitted to the primary structure and the accommodation of movements and tolerances.
- f) Show details of fixing requirements to interfacing elements of the Works, which shall be agreed with the Employer prior to commencement of the installation.
- g) Co-ordinate interfaces.
- h) Be responsible for compiling the Working Drawings and Technical Specifications of any chosen subcontractors to achieve the contractual obligations to the acceptance of the Employer.

A.3205

Systems, Products and Materials Preferences

- a) Where the Architectural Specification identifies preferred or indicative systems, products and materials, confirm these as being suitable for their specified and intended purpose with the tender return. If no such specific confirmation is received, then the submission of the tender return constitutes such a confirmation. If the indicative systems, products and materials are considered unsuitable, confirm at the time of tender.
- b) Acceptance of alternative proposals by the Employer shall not relieve the Contractor from responsibility to provide suitable systems, materials, components and assemblies, which shall be used as intended by the manufacturer and in compliance with the Contract Documents.

- c) If, with the tender return, the Contractor submits no such alternative proposal to any of the preferences indicated in the tender documents, then the preferred/ indicative systems, products and materials stated in the Architectural Specification, or on the Design Drawings shall be deemed to be acceptable and be warranted by the Contractor. In such circumstances, the Contractor will complete the Detailed Design on the basis of the preferred/ indicative system, product or material and demonstrate to the Employer that the requirements of the Design and Architectural Specification can and have been achieved.
- d) Post Contract Award changes to accepted preferences/ indicative products shall be agreed through the established Substitutions process.

A.3300 PRESCRIPTIVE ELEMENTS OF THE WORKS (P)

A.3301 General Requirements

- a) Supply, deliver, install and warrant the Works in compliance with the requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components, systems, etc. indicated on the Design Drawings, necessary to demonstrate their safe installation.

A.3302 Contractor Responsibilities

- a) Achieve the material and workmanship standards as specified in the Sections of the Architectural Specification.
- b) Provide everything which is necessary for the execution and completion of the Works and deliver up the Works complete in every particular to the acceptance of the Employer.
- c) Where necessary, provide drawings and technical information to demonstrate compliance with the Design Drawings and Architectural Specification and comply with the approvals process specified.
- d) Systems shall include necessary additional bracing, reinforcing and fixings so that the Works are installed safely to suit the service conditions. Inform the Employer (in writing) of any concerns that the manufacturers may have expressed regarding the suitability of products for the purpose intended.
- e) Be responsible for the final selection of products and associated components, which shall achieve the requirements of the Architectural Specification where manufacturer details are not specified.

A.3400 SAFETY

A.3401 Safety, Health and Welfare Regulations

- a) Comply with the latest safety, health and welfare regulations. Give full consideration to the health and safety of operatives when completing the Detailed Design, manufacturing, installing or operating and maintaining the Works.
- b) The Working Drawings shall only incorporate methods of manufacture, installation, maintenance and use that are safe and comply with health and safety regulatory requirements.
- c) Provide safety risk assessments.

A.4000 SUBMITTALS

A.4001 Procedure

- a) Do not commence any portion of the Works without acceptance of the required submittals by the Employer.
- b) Provide a schedule of submittals for agreement with the Employer:
 - i) Schedule shall indicate the dates on which the Employer will receive the required submittals.
 - ii) Correlate the schedule with the master programme and allow a reasonable amount of time for the review of each submittal.

- iii) Indicate critical decision dates for selection of finishes and colours.
- iv) Revise the schedule of submittals and resubmit as necessary.
- v) Common requirements of Submittals of various sections may be combined and shared as one submittal where agreed. Include details of sections combined.
- c) Identification of submittals:
 - i) Identify each submittal individually on a self-adhered printed label with the project name, respective specification reference, manufacturer's name and product reference as appropriate.
 - ii) Include a transmittal form with each submittal containing similar information; together with the purpose for which the submittal is being made.
 - iii) Provide space on the identification label of each item submitted for marking of acceptance and/ or comment by the Employer.
 - iv) Number the submittals consecutively and retain the numbering system throughout all revisions and resubmittals.
- d) Submittals register:
 - i) Issue submittals with a full register linked to the submittal schedule and submittal history.
 - ii) Maintain the submittals register and reissue each time a submission is made.
- e) Include relevant information with each submittal to define and explain each system.
- f) Identify submittals that differ from the requirements indicated on the Design Drawings and in the Architectural Specification.
- g) Submission and return of Working Drawings/ documents:
 - i) Allow for a minimum of 10 working days between the first submission of a drawing/ document and receipt of comments. This period of time shall also apply for resubmissions for each item to achieve an 'A' or 'B' status.
 - ii) Submit a list of Working Drawings proposed.
 - iii) Provide information specifically requested for each element of the Works. Additional information may be required by the Employer on inspection of the Contractor's submittals to allow for accurate comments to be made.
- h) The Contractor's submittals will be reviewed by the Employer during the Evaluation, and any alteration and/ or agreements reached will be incorporated into the Contract documentation.

A.4002

Tender Submittals

Provide submittals at the time of tender as listed in the Architectural Specification.

A.4003

Post Contract Award Submittals

Provide Post Contract Award Submittals as listed in the Architectural Specification in addition to the following minimum requirements:

- a) Submit a design response, to include profiles of typical conditions, with dimensions.
- b) The post contract award design response shall include:
 - i) List of Tests included.
 - ii) Quality management programme.
 - iii) List of proposed/ accepted drawings.

- iv) Summary of deviations from the Design Drawings and Architectural Specification.
- v) Technical specifications reflecting accepted materials/ systems.
- vi) A list of accepted manufacturers and subcontractors intended to be used.

A.4004

Samples Generally

- a) Samples shall include various products, natural materials, fabricated items, equipment, devices, appliances or components thereof, as may be required to achieve the visual appearance and technical requirements of the Design.
- b) The Employer will review samples for their visual characteristics. Where moving or operating elements are involved, give the Employer the opportunity to review working samples.
- c) Submit ranges of samples where variation of colour, graining, texture, smoothness and other characteristics may be anticipated in the Works.
- d) Where bespoke colours are specified, submit samples that illustrate precise colours, textures, patterns and finishes for review by the Employer.

A.4005

Pre-contract Samples

- a) Submit samples with the tender or during the Evaluation prior to Contract award.
- b) Samples which are required to verify the visual appearance of such items for compliance with the requirements of the Design Drawings and Architectural Specification to be as indicated in the Sections.
- c) Label pre-contract samples, which shall be kept by the Employer as a record of materials agreed for Contract until completion/ handover.

A.4006

Post Contract Award Samples

- a) At the appropriate time, submit the samples indicated in Sections to the Employer. These will be kept as a record of materials to be incorporated in the Works and used as references for controlling consistency.
- b) Post contract award samples shall comprise materials in their final form.
- c) Samples to include relevant trade literature and technical specifications.

A.4007

Mock-ups

Not required.

A.4008

Prototypes

Not required.

A.4009

Quality Benchmarks

- a) Upon commencement of installation, erect complete sections of elements of the Works, where described in the Sections, for acceptance of the Employer. These will be used as a quality benchmark for the remainder of the Works until Practical Completion.
- b) Do not commence installations in other areas of that particular trade until the Employer has examined and accepted the quality benchmark. Carry out immediately any alterations or adjustments required by the Employer to achieve the quality of installation required.
- c) Upon receipt of the Employer's acceptance, fully protect the quality benchmark. It will be used, from time to time, by the Employer to check and monitor quality of materials and workmanship incorporated in the remaining areas of the Works, or where specifically stated for the purpose of further testing. Remove and replace protection when requested by the Employer for such purposes.

A.4010

Working Drawings

- a) Following Contract award, submit the required number of Working Drawings and relevant structural, thermal and acoustic calculations and other data, to the Employer for review in accordance with the Conditions of Contract.
- b) The Employer will review the Working Drawings for compliance with the Architectural Specification and the Design Drawings in visual and overall functional matters only. The Detailed Design and construction of components shall remain the responsibility of the Contractor.
- c) The Employer's review of the Working Drawings shall not relieve the Contractor of their responsibility for errors, or for supplying components and materials to the acceptance of the Employer.
- d) The Working Drawings shall be fully dimensioned in metric, to an agreed scale appropriate to the detail, and include:
 - i) Full size details and graphic representation describing materials, components and equipment, construction, finishes, provision for movements, fabrication and erection tolerances.
 - ii) Layouts, locations and assemblies of types of construction detail and junctions, details of materials, method of jointing, details of connections and fixing and sealing methods, finishes and pertinent information related to:
 - Method of fabrication and construction.
 - Proper relation to adjoining work.
 - Finishes.
 - Amplification of details.
 - Minor changes to the Design to suit actual conditions.
- e) Submit Working Drawings in accordance with the Conditions of Contract and do not commence fabrication of components until formally returned by the Employer with either 'A' or 'B' marked on each of the Working Drawings. Leave space clear on each of the Working Drawings for marking by the Employer. The following drawing inspection codes will be used when returning the Working Drawings to the Contractor:
 - i) Drawing marked 'A' - Fabrication, manufacture or construction may proceed in accordance with the drawing submitted.
 - ii) Drawing marked 'B' - Fabrication, manufacture or construction may not proceed until the Contractor has taken necessary action based on the Employer's comments and re-submitted documents to achieve 'A' status.
 - iii) Drawings marked 'C' - Do not fabricate, manufacture or construct any work. Submit new drawings to the Employer for review until re-submission is not required.
- f) The receipt of Working Drawings by the Contractor from the Employer marked 'A' or 'B' shall not constitute agreement of a variation.
- g) When preparing the Working Drawings consult the current Architectural, Structural and Services Design Drawings, adjusting the Working Drawings to allow for any changes to Site tolerances and/ or discrepancies where applicable.
- h) If, before commencing or during the preparation of the Working Drawings the design intent of the Design Drawings and/ or Architectural Specification may be affected, or where other elements of the Works may be affected, notify the Employer immediately.
- i) Where applicable, the Working Drawings may utilise the manufacturer's standard details provided that they comply with the design intent.
- j) The Employer shall have the right at reasonable times to visit the Contractor's (or their specialist subcontractor's) design office to check on progress.
- k) The Working Drawings shall be annotated in English and titled in the manner determined for the Contract, with the title block fully indicating the part of the Works to which they apply.

- l) Information contained in any of the Design Drawings shall be treated as confidential and shall not be utilised for any purpose other than for the Works. Such information shall not be communicated to third parties for other purposes without the specific acceptance of the Employer.
- m) Maintain on Site a full set of Design Drawings, Working Drawings and technical specifications.
- n) Upon completion of the design, manufacture and installation phases, provide the Employer with the required As-built information, in accordance with the Conditions of Contract.
- o) No Working Drawings will be accepted if produced to a reduced size.
- p) The Working Drawings shall be fully co-ordinated with those of interfacing trades.

A.4011

As-built Information

- a) Upon completion of the Works and when deemed necessary by the Employer, submit As-built information in a digital format, agreed with the Employer, showing the Works as finally fabricated and erected in accordance with the Category 'A' status Working Drawings.
- b) The As-built information shall include any Site variances or installation adjustments or variations and any actual Site or setting-out dimensional modifications as installed.
- c) As-built information shall be produced to a relevant and agreed level of detail and shall be used to complement the Maintenance Manual for the specific purpose of locating the elements within the overall structure.

A.4012

Other Submittals

- a) Product data: Submit technical information detailing the characteristics of each system, system component or material incorporated in the Works. This shall include material schedules and manufacturer's literature.
- b) Certifications: Submit independently certified reports verifying compliance of each element or component with the requirements of the Architectural Specification.
- c) Quality management programme: Submit a programme to achieve the requirements of A.6000 of the Architectural Specification, the Contract conditions or any other documents referred to in the Contract documentation.
- d) Test reports/ results:
 - i) Within five working days of tests, as described in Part 2 of the Work Sections, submit result reports to demonstrate that the performance requirements have been achieved.
 - ii) These reports shall state compliance with the technical requirements of the Architectural Specification and include, where appropriate, test certificates.
- e) Maintenance/ operation manuals: Manuals prepared by the Contractor for the Client/ building user's maintenance and operation of the various building systems and/ or components thereof.
- f) Prior to Contract award submit to the Employer a replacement strategy in the event of damage and/ or defective work prior to Practical Completion and a similar replacement strategy post Practical Completion including procedures to be adopted, method statements and extent of disruption/ damage likely to occur to other areas of the Works.
- g) Supplementary product literature: Such literature may include manufacturer's catalogue information, product specifications, standard illustrations, diagrams and standard details. The supplementary product literature shall describe physical characteristics such as size, weight, finish, material analysis, electrical requirements and other information such as load tables, test results, assessments and industry quality standards.
- h) Manufacturer's recommendations: Manufacturer's recommendations shall be contained within a formal printed document in accordance with the quality management procedures. Oral recommendations received on site shall not be acted upon until formal documentation has been received.

- i) Technical calculations: These shall consist of technical engineering calculations which document technical performance of the Works.
- j) Guarantees and warranties: Submit certified copies of relevant guarantees and warranties available for installed materials and products.
- k) Prepare and submit method statements and risk assessments for review.
- l) Written submittals provided shall be in the English language.

A.4013

Review of Submittals

- a) The Employer will review submittals for general and practical conformance with the requirements of the Design. Submittals which achieve these requirements shall be stamped or marked in accordance with the procedure described herein. Submittals which are incomplete or erroneous, or which are not required, will be returned and a new submittal made as necessary. The Employer's review is not exhaustive and does not relieve the Contractor of the responsibility for any omission or deficiencies or from the responsibility to co-ordinate the work with that of others (which includes the taking of relevant Site dimensions as necessary).
- b) Submittals which provide supplementary information to substantiate the technical performance of building systems, components and materials including, but not necessarily limited to, supplementary product literature, certifications, statements of manufacturer's review and pre-construction testing and inspection reports, will be stamped 'Record Document' by the Contractor before submission.
- c) Resubmittals shall be made under the procedure for initial submittals; identifying changes made since previous submittals.

A.5000

PERFORMANCE REQUIREMENTS AND DATA

A.5100

GENERAL

A.5101

Regulations and Standards

- a) The Works shall comply with the latest edition of the Building Regulations.
- b) British Standards including those adopted or implemented by the UK, such as BS EN/ Eurocodes/ BS EN ISO, shall be the governing standards for the Works.
- c) Only where expressly stated in the Architectural Specification shall other standards be applicable to the Works.
- d) Reference to British and other standards, National Annexes and associated NCCI (Non-contradictory, Complementary Information), regulations and requirements of statutory bodies shall mean the latest published editions, including amendments and corrigenda, at the time of Contract award. Where such standards, regulations and requirements are amended after contract award and affect the Contractor's responsibilities during the course of the Works, immediately inform the Employer in writing.
- e) Reference to a standard shall include all its parts as applicable to the work, unless otherwise specified.
- f) Materials, components, equipment and workmanship shall comply with Local Authority Codes and Building Regulations, British Standards, and any other regulations applicable to the Works, together with relevant Statutory Rules, Regulations, Bye-Laws and other enforceable instruments in both the design and execution of the installation.

A.5102

Submissions to Authorities

- a) When required by the Statutory Authorities, submit to them any component part of the Works for appraisal, testing, stamping or certifying.
- b) After such component part has been approved, tested, stamped or certified, return the marked component or documentary evidence of its approval, as appropriate, to Site for reference purposes.
- c) If the Statutory Authority rejects components, replace the component part(s) with those that are acceptable.
- d) Obtain any approvals required from the Statutory Authorities.

A.5200 DESIGN AND SERVICE LIFE

A.5201 Design Life of Building

The design life of the building shall be 60 years in accordance with BS ISO 15686: Part 1 and with maintenance work carried out to a predetermined interval of time, number of operations and regular cycles.

A.5202 Service Life of Components

- a) The design life of the building shall be the period stated in A.5201 above; however, it is recognised that various elements/ components have varying 'service life' (i.e. actual period of time during which no excessive expenditure is required on operation, maintenance or repair of a component or construction - as recorded in use) for primary and secondary components.
- b) Primary components are components with a predicted service life not less than the design life of the element being specified without the need for maintenance, other than regular cleaning.
- c) Secondary components:
 - i) Secondary components are components that may require replacement during the design life of the building, assuming regular cleaning and maintenance have been carried out in accordance with information to be provided by the Contractor and the relevant manufacturers.
 - ii) Secondary components shall be capable of easy replacement without compromising the structural or weatherproof integrity of the element being specified.
 - iii) Secondary components shall be capable of replacement without progressive dismantling of adjacent elements.
- d) Submit detailed information on the predicted service life (i.e. the service life predicted from recorded performance or accelerated tests) and maintenance requirements of the components of the building as defined in BS 7543 and BS ISO 15686 for review by the Employer and provide detailed information at tender stage.
- e) Materials shall be used solely for the purpose intended by the manufacturer and which achieve the requirements of the Architectural Specification.

A.5300 STRUCTURAL

A.5301 General

Refer to the Structural Engineer's documentation for particular requirements.

A.5302 Movements and Tolerances

- a) Refer to the Structural Engineer's documentation.
- b) The Detailed Design, fabrication and installation shall take into account tolerances and movements of the building structure. Movements include the application of dead, live and wind loads plus moisture, shrinkage, creep and thermal effects.
- c) The Detailed Design shall take account of structural movement and tolerances, in permanent and temporary conditions, to avoid stress, deformation and material failure.
- d) The Detailed Design shall take into account the ambient temperature at the time of the respective operations of fabrication, assembly and erection, with appropriate allowances being made for any dimensional changes resulting therefrom.
- e) Torsional stresses shall be accommodated safely.
- f) The Works shall withstand movements of the building structure under design loads or combination of loads without damage or any reduction in performance.
- g) Fixings shall be capable of providing adequate adjustment to suit building movement and prevent system/ installation failure.

- h) Movement joints shall accommodate the maximum movement that can be derived from the specified and determined design loads and movements. Under maximum movements the joints shall achieve the performance requirements of the Architectural Specification.
- i) The Works shall resist specified static and dynamic design loads likely to be encountered without causing permanent deformation of components or the failure of systems, materials or seals and shall transmit such loads safely to the points of support.
- j) The Works shall not deflect under loading in any way that is detrimental to any adjacent trade.
- k) The Works shall accommodate the following movements without any permanent deformation or reduction in the performance:
 - i) Deflection under design loads.
 - ii) The effects of any wind or pressure loadings.
 - iii) Changes in dimension and shape of components arising from building movements, including settlement, creep, twisting and racking.
 - iv) Movement of any joint whether designed to permit movement or not.
 - v) Thermal and moisture related movements.

A.5303

Dead Loads

- a) The Works shall be capable of accommodating the following dead loads without any reduction in performance:
 - i) The component and final assembly dead load which shall be accommodated locally without causing deflections or movements which adversely affect any component.
 - ii) The dead loads derived from any permanent fixtures or services attached to the surfaces of the Works.
- b) When calculating loads the worst combination shall be considered.

A.5304

Imposed Loads

- a) The Works shall be capable of accommodating the following imposed loads without any reduction in performance:
 - i) Loads resulting from movements of the building structure and support structure.
 - ii) Impact loads, or transferred impact loads, that occur during the service life of the Works, without deterioration in performance and without sustaining non-repairable damage.
 - iii) Loads imposed during replacement of system components and components of interfacing systems.
- b) When calculating loads the worst combination shall be considered.

A.5305

Exceptional Loads

- a) The Works shall be capable of accommodating exceptional loads as indicated in the Structural Engineer's documentation.
- b) The anticipated levels of damage shall be defined and a report shall be produced inclusive of assumptions, calculations and other forms of analysis to support the claims.

A.5306

Deflections

- a) The Works when carrying full design loads shall not exceed the deflection limits specified within the relevant Section.
- b) The Works shall not deflect under loading in any way that is detrimental to the appearance or performance of the Works or of any adjacent material, system or product.

- c) Components, couplings and fixings shall be capable of accommodating deflections without permanent distortion, deformation or failure.
- d) The Works shall accommodate differential structural movements arising from any loads imposed by adjacent structures.
- e) The magnitude of the allowable deflections shall be reduced if they are detrimental to any part of the Works, its support structure or finishes.

A.5307

Wind Loads

- a) Refer to the Structural Engineer's Documentation.
- b) The Works shall withstand without permanent deformation, the effects of wind loads where appropriate (e.g. external conditions or internal areas subject to external wind pressure).
- c) Design wind pressures:
 - i) Precise wind load values shall be determined in accordance with the geographical location of the Site, the topographical conditions and the type of building in accordance with BS EN 1991: Part 1-4.
 - ii) When assessing the wind pressure allowances, account shall be taken of the shape of the building and its location in relation to the layout of any adjacent structures.
 - iii) Pay attention to areas subject to increased pressures, i.e. eaves, canopies and external corners. Take special care to identify and design for any situation not clearly defined in BS EN 1991: Part 1-4 where it is believed that the geometry of the building shall cause increased pressure due to vortex or eddy conditions. Calculate maximum gust wind pressure in accordance with BS EN 1991: Part 1-4.
 - iv) When calculating loads consider the worst combination of load cases and, in particular, that the governing wind pressure coefficients may be determined by more than one wind regime. Where design wind pressures are indicated in the Structural Engineer's Documentation use the more onerous information.

A.5308

Seismic Conditions

Seismic conditions shall be in accordance with the Structural Engineer's documentation.

A.5309

Vibration

The Works shall withstand vibration caused by traffic, aircraft, equipment effects or any other shocks, slamming, strains, stresses and movement imposed, so avoiding deterioration or fracture of any element, both during construction and after installation.

A.5400

ENVIRONMENTAL CONDITIONS AND REQUIREMENTS

A.5401

Environmental Conditions

- a) Refer to the Services Engineer's documentation for particular requirements.
- b) The Works shall conform to the Architectural Specification, taking into account local environmental conditions prevailing at Site.
- c) Refer to the Sections for specific performance data.
- d) Obtain any additional meteorological and climate data considered necessary to fulfil contractual and statutory obligations.
- e) Allow for the fact that the Works will be erected in all extremes of weather conditions throughout the year and that the building may not be climatically controlled during construction. Damage to materials as a result of Site conditions shall be the Contractor's responsibility.
- f) Select material grades, manufacturing methods and standards to suit the internal and external environmental conditions as set out below (to achieve the relevant British Standards and other relevant standards) and as contained in the Services Engineer's documentation.

- A.5402 Climatic Data
- Refer to the Services Engineer's documentation.
- A.5403 Solar Performance
- Exposure to sunlight during the service life of the Works shall not reduce the performance, or prematurely reduce the visual appearance, of any element/ component.
- A.5404 Local Factors
- Make an assessment of micro-climatic conditions with due allowance for any factors likely to have an adverse effect on materials intended for the Works. Propose more appropriate materials if adverse effects are predicted.
- A.5405 Excessive Rainfall
- Identify risks of flooding of finished Works due to excessive rainfall events and propose means to avoid this to the Employer.
- A.5406 Unheated Spaces
- Carry out a Condensation Risk Analysis on unheated spaces and submit a report to the Employer to include:
- a) Identification of areas at risk of condensation forming.
 - b) Conditions that will cause condensation to form.
 - c) How the risks of condensation have been reduced.
- A.5407 Environmental Requirements
- Refer to clause series A.7300 for sustainability/ environmental requirements.
- A.5500 SECURITY**
- A.5501 General
- Security shall be in accordance with the Security Report.
- A.5600 FIRE AND SMOKE**
- A.5601 Generally
- a) Design and execute the Works in accordance with the following:
 - i) The Governing Regional Building Regulations.
 - ii) The performance requirements indicated in the Fire Strategy Report.
 - iii) The recommendations of the Association for Specialist Fire Protection (ASFP).
 - iv) Any recommendations or conditions from Statutory Authorities, Fire Services and the Building Insurers.
 - b) Unless otherwise stated in the Fire Strategy Report, compliance with the Building Regulations shall be achieved by the application of the principles laid out in Approved Document B of the Building Regulations, BS 9997, BS 7974 and BS 9999.
 - c) Submit test certificates, calculations and reports to demonstrate that materials/ systems achieve the fire performance requirements.
- A.5602 External Walls
- Materials used in external walls and specified attachments shall be Class A2-s1, d0 or Class A1, in accordance with BS EN 13501: Part 1, with the following exceptions:

- a) Cavity trays when used between two leaves of masonry.
- b) Any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) if that part is connected to an external wall.
- c) Door frames and doors.
- d) Electrical installations.
- e) Fibre optic cables.
- f) Insulation and water proofing materials used below ground level or up to 300mm above that level.
- g) Intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1.
- h) Membranes, which shall achieve minimum Class B-s3 d0 in accordance with BS EN 13501: Part 1, when tested in accordance with BS EN ISO 1182 and BS EN ISO 1716.
- i) Seals, gaskets, fixings, sealants and backer rods.
- j) Components associated with a solar shading device, excluding components whose primary function is to provide shade or deflect sunlight, such as the awning curtain or slats.
- k) Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1.
- l) Window frames and glass (Note: Laminated glass may be used for general glazing. However, do not use laminated glass in spandrel panels, infill panels, balcony balustrades or other attachments unless it can be demonstrated that it can achieve Class A2-s1, d0 or better).
- m) Materials which form the top horizontal floor layer of a balcony which are of European Classification A1fl or A2fl-sl (classified in accordance with the reaction to fire classification) provided that the entire layer has an impermeate substrate under it.

A.5700

ACOUSTIC PERFORMANCE

A.5701

General

- a) Where acoustic values are stated, these shall be deemed to be based on laboratory derived results, in accordance with BS EN ISO 10140.
- b) The specified acoustic performance shall be achieved on Site, inclusive of services penetrations and interfaces with other elements.
- c) The Weighted Sound Reduction Index (R_w) and the Weighted Apparent Sound Reduction Index (R'_{w}) shall be defined in accordance with BS EN ISO 717.

A.5800

CORROSION PROTECTION

A.5801

General

- a) Take protective measures to avoid any corrosion or any deleterious effects caused by manufacturing, finishing, transportation, storage and installation of materials.
- b) Provide full resistance to any corrosion for components that are secured or bolted to each other, paying particular attention to the surface damage caused by such bolting or securing.
- c) Provide full resistance in repair of corrosion protection to cope with the Site cutting of components, especially at boundary and external conditions.
- d) The minimum requirements for the corrosion protection system for secondary structural steelwork shall conform with BS 5493, BS EN ISO 12944: Parts 1-8 and BS EN ISO 14713 as appropriate. For primary structural steelwork refer to the Structural Engineer's documentation.
- e) The environmental category in accordance with BS EN ISO 12944: Part 2 shall be:
 - i) External corrosion: Category C2.

ii) Internal corrosion: Category C1.

- f) Allow for protection against corrosion arising from exposure to seawater, non-saline water, soil, high humidity, low or high temperatures, chemical acids and alkalis, abrasion and impact, fungi and bacteria.

A.5802 Galvanising Corrosion Protection

The interval to first maintenance shall be no less than 'Very high (VH) (equal to or greater than 20 years)' as defined in BS EN ISO 14713: Part 1. Refer also to the requirements for design and service life.

A.5803 Electrolytic Protection

At locations where different metals are assembled together, electrolytic corrosion shall not occur and the necessary protection shall be provided where needed, in both temporary and permanent conditions.

A.5900 EARTH BONDING AND LIGHTNING PROTECTION

A.5901 General

- a) Unless specified otherwise, earth bonding and lightning protection requirements shall be achieved using concealed or inconspicuous methods, which shall be clearly indicated on the Working Drawings, for acceptance by the Employer. Methods shall not impair the performance or the visual characteristics of the interfacing work.
- b) Electrical continuity shall be achieved between conductive parts such that the Works shall be electrically continuous as required by BS 7671.
- c) Extraneous conductive parts of the Works shall be effectively bonded to earth. An extraneous conductive part is defined as being that part which is liable to transmit a potential, including earth potential, and not forming part of the electrical installation. Each component shall constitute an extraneous conductive part.
- d) Provide equipotential bonding. The various exposed conductive parts and extraneous conductive parts, as defined by BS 7671, shall be at a substantially equal potential.
- e) Earthing connections shall be in accordance with the Services Engineer's documentation and/ or comply with BS EN 62305: Parts 1-4 and BS 7430.

A.6000 QUALITY MANAGEMENT, MATERIALS AND WORKMANSHIP

A.6100 GENERAL QUALITY MANAGEMENT AND TESTING

Quality Management

A.6101 General

- a) Establish, document and maintain a quality management system capable of verifying to the acceptance of the Employer that materials and workmanship, whatever their sources, conform to the requirements of the Architectural Specification. Should the Contractor or any subcontractors be certified to the BS EN ISO 9000 family of standards then these parts of the work shall be monitored accordingly.
- b) The quality programme shall be defined in a quality management manual or similar document in which the organisation systems, inspection and test plan procedures are fully described so that all essential inspection requirements are determined and achieved throughout all phases of the Works.
- c) Establish a tolerance quality management manual to cover tolerance compliance relating to the Works. Prepare a quality management proposal for submission to the Employer for acceptance. This shall describe, in detail, the various types of quality management checks that shall be carried out during each stage of the Works; what means and methods shall be used; which personnel shall be employed, together with their qualifications; and how each type of tolerance check shall be recorded and kept for future reference.

- d) The Contractor's proposals for the quality management manual shall achieve the requirements of this Section as a minimum and be submitted to the Employer. Provide facilities in the event that the Employer wishes to examine these proposals at the Works. Include details of any formal approvals held for the Contractor's or any subcontractor's quality system or any evaluations or assessments carried out by independent third parties.
- e) Within 30 days of the written order to commence the Works, submit a comprehensive quality management manual to the Employer for review, amendment where appropriate and acceptance.
- f) Include with the quality management manual an inspection and test plan for each major item of work or type of fabrication which shall detail, in sequential order:
 - i) The principal activities to be carried out.
 - ii) The type, method and frequency of inspections and tests to be carried out.
 - iii) The inspecting authority.
 - iv) The acceptance criteria.
 - v) The records to be kept.
- g) The inspection and test plan shall contain sufficient space for the Employer to indicate on it the activities they wish to inspect as either 'hold' or 'witness' points.
- h) A 'hold' point is defined as a point on the inspection and test plan beyond which the process may not continue until it has been accepted by the Employer.
- i) A 'witness' point is defined as a point on the inspection and test plan where the Contractor shall give reasonable notice that a particular part of the process has been reached although the process may continue without acceptance being notified by the Employer.
- j) The inspection and test plan shall provide the basis of inspection for the item of work and shall be submitted to the Employer for acceptance prior to commencement of the Works.
- k) During the Contract period, make available at the Works necessary resources and facilities and implement any reviews and amendments of the quality management manual deemed necessary or desirable by the Employer.
- l) As a minimum the quality management manual shall include information and procedures as defined below:
 - i) Organisation and Management.
 - ii) Facilities, Measuring and Test Equipment.
 - iii) Personnel Training and Certification.
 - iv) Documentation.
 - v) Receipts, Storage, Handling and Transportation.
 - vi) Materials.
 - vii) Welding.
 - viii) Fabrication and Erection.
 - ix) Tolerance Control.
 - x) Prototypes.
 - xi) Painting and Coating.
 - xii) Inspection and Testing of Materials and Workmanship.

- xiii) Non-conforming Items.
- xiv) Detailed Design.
- xv) Control of Purchased Materials and Services.
- xvi) Completed Item, Inspection and Test Results.
- xvii) Records.
- xviii) Review of the Quality System.

A.6102

Means of Auditing

- a) Nominate a senior member of the technical organisation as Quality Manager who shall be independent of the other functions and be held responsible for matters relating to the production and implementation of the quality management manual.
- b) At any stage during the Contract period, including those times prior to fabrication, make facilities available to the Employer such that quality audits, according to the BS EN ISO 9000 family of standards or any other established system, may be carried out.
- c) Keep and maintain, at an agreed location, a copy of relevant check certificates for inspection by the Employer upon request.
- d) If the Employer detects any deficiencies, either in the Works or the Contractor's quality management system, these matters will be reported to the Contractor. Items affected by said deficiencies shall be considered as being of suspect quality and shall be physically quarantined in a separate holding area. No work shall be carried out on these items until the Employer instructs to either rework or repair the affected item, or demonstrates that it is not compliant with the Architectural Specification and therefore rejected.

A.6103

Quality Management Methods

- a) Do not appoint subcontractors, or carry out work at any place other than the Contractor's nominated principal workplace, without the acceptance of the Employer. Carry out work only under equivalent conditions of quality management to those at the nominated principal workplace. Demonstrate to the acceptance of the Employer that the methods used to select, control, inspect and verify that the work carried out conforms to the requirements of the Architectural Specification.
- b) Make available to the Employer copies of each purchase order for any item or service wished to be included within the Works if requested. Each purchase order shall fully detail the item or service in terms of quality, grade, type, appropriate British or other Standard applicable, inspection, test and documentation requirements.
- c) Confirm that the organisation and management of the Contractor's quality management programme is comprehensive and effective for the provision of work in accordance with the Architectural Specification requirements. Fully describe such details in a document, referred to as the quality management manual, which shall be submitted for acceptance by the Employer.
- d) Calibrate and check measuring and test equipment against standards at whatever frequency is determined appropriate by the equipment manufacturer. Where such items are not considered by the Employer to give sufficient accurate readings or results, or are not able to produce consistent results, they shall not be used on this Contract.
- e) Personnel training and certification shall be subject to the acceptance of the Employer.
- f) Documentation of materials and processes shall only be considered adequate when, having been checked by the Employer, they are deemed by the Employer to verify that the Architectural Specification requirements are achieved.
- g) Control the receipt and storage of incoming materials such that, in the opinion of the Employer, it can be readily confirmed that the correct materials have been employed at the correct locations within the Works as described in the Architectural Specification.
- h) Confirm, upon request by the Employer, that materials used comply with the Architectural Specification requirements.
- i) Provide progress photographs on a monthly basis.

- j) Monitor construction of the Works so that they are as indicated on the Design Drawings/ Working Drawings and in accordance with the Architectural Specification.
- k) Make available to the Employer a detailed programme of work so that they may witness significant stages in the fabrication process.
- l) Check painting and coatings materials and processes, which will be monitored by the Employer, at such intervals necessary to confirm that the fabricator is carrying out this work to the required levels of quality.

A.6104

Summary

- a) Items referred to above shall primarily be controlled and implemented by the Contractor according to their own devised methods and procedures.
- b) The Contractor shall undertake whatever steps are necessary to confirm to the Employer that the Contractor is discharging their responsibilities in this respect.
- c) On dispatch of each finished item from the point of manufacture, confirm in writing that said items, as far as is known, have been fabricated according to the requirements of the quality management manual and achieve the Architectural Specification.

Testing

A.6105

Testing and Inspection

- a) Where required, engage an accredited independent testing specialist, as agreed with the Employer, to verify that the requirements of the Contract have been achieved.
- b) Allow for testing on samples and materials incorporated in the Works as necessary.
- c) Approach to testing:
 - i) Off-Site testing:
 - The Contractor may submit data from previous independently certified tests and Agrément certificates to demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification. The information shall be to the acceptance of the Employer. Where applicable, tests shall include static and dynamic results.
 - Tests shall comply with the rules and standards laid down by the appropriate testing authorities, unless it can be demonstrated that the final design solution has been previously tested and certified to the acceptance of the Employer. In any event, the performance of the Works when complete shall remain the Contractor's responsibility.
 - If suitable data to demonstrate compliance with the performance requirements is not available, provide prototypes of each type and have them independently tested in accordance with the testing criteria indicated in the Architectural Specification.
 - ii) On-Site testing: The Contractor shall include on-Site testing specified herein.
- d) Include and supply detailed proposals of tests that demonstrate compliance with the requirements of the Architectural Specification and the Design Drawings.
- e) Make the following minimum provisions available to the Employer at all times:
 - i) Suitably qualified personnel using appropriate validated equipment.
 - ii) Necessary access and facilities for inspection and testing in fabrication shops and on Site.
 - iii) Regularly calibrated equipment for the purposes of load measuring.
- f) Maintain the following:
 - i) Tests and inspection results during all stages of manufacture, assembly and installation of components.

- ii) Certificates relating to the materials used in the Works, as confirmation of tests carried out in accordance with the relevant standards and codes.
- iii) Records of inspections and tests performed to substantiate conformity with the Architectural Specification, including those carried out by subcontractors and manufacturers.
- g) Should any test reveal defective material and/ or workmanship, immediately carry out any remedial work and retest, including that of a special nature, under instruction from the Employer.
- h) Indicate on the Contract Programme the exact timing of testing, procedural trials and trial assemblies, to allow the Employer the opportunity of attending.
- i) If the Employer is of the opinion that the Works do not conform to the requirements of this document, or to the details indicated on the Working Drawings, then the Employer shall give instructions for tests to be carried out to establish the case.

A.6106

Results and Certificates

- a) Submit tests and inspection results immediately they are available.
- b) Submit certificates relating to the materials used in the Works as confirmation of tests carried out in accordance with the relevant British Standards, and/ or other national standards as appropriate.
- c) Maintain, until the end of the defects liability period, records of inspections and tests performed, material certification, inspection and test plans, drawings, and any other documentation to substantiate conformity with the Architectural Specification, including those carried out by subcontractors.
- d) Store records in such a way that they are identifiable to the component to which they refer and are retrievable.
- e) Make the records available for inspection by the Employer and submit copies of records to the Employer upon request. At the end of the defects liability period submit them to the Employer.

A.6200

MAINTENANCE, TRAINING AND REPLACEMENT MATERIALS

A.6201

General

- a) Maximise the use of replaceable materials/ components.
- b) Materials shall be capable of simple maintenance/ repair and integration with other maintenance systems.

A.6202

Maintenance Manual

- a) One month before programmed completion of the Works/ Practical Completion prepare and submit, to the acceptance of the Employer, three copies of a Maintenance Manual required to maintain the Works.
- b) Content:
 - i) The Maintenance Manual shall incorporate maintenance systems and give details of the safe operation and required maintenance of items, components and systems comprising the Works.
 - ii) Supply this information for the Employer's review in the following format:
 - Specially written information shall be on A4 size pages with typed text using double spacing and in a format agreed prior to submission.
 - Drawn information generally shall be on A1 size sheets.
 - Standard published information shall be selected and edited to include only those items installed. Where editing is not appropriate, the relevant items shall be typed out and included.
- c) Component Information: Supply the following information for every item, component and/ or system:

- i) Certified manufacturing certificate.
- ii) Full description giving any special features. A full breakdown of the parts and the catalogue number of the constituent parts.
- iii) The guarantee period of any element or material where in excess of the warranty required by the Contract Documents.
- d) Maintenance Procedures: The Maintenance Manual shall include fully comprehensive details in respect of:
 - i) Safe cleaning procedures for elements of the Works.
 - ii) Safe replacement procedures.
 - iii) Regular cyclical maintenance procedures (avoiding damage).
 - iv) Safe repair procedures in the event of damage.
 - v) Washing methods, including the frequency and method of washing required to maintain performance and appearance. Provide details in respect of the maximum time during which performance of components can be maintained, together with the frequency and method of washing required to achieve this.

A.6203

Training of User's Personnel

- a) Prior to Practical Completion of the Works provide skilled staff/ operatives to instruct the user's staff on the correct, safe and efficient operation and maintenance of systems, components, plant, equipment and controls as detailed in the Maintenance Manual.
- b) Submit a programme and schedule of training requirements, prior to completion of the Works, stating the minimum amount of time which is required for the skilled staff to train the user's staff.
- c) Throughout the training period remain responsible for the operation and maintenance of the Works.
- d) Where such training cannot be carried out prior to Practical Completion of the Works due to the nature of the equipment, return to Site at a later mutually agreed date to complete the training period.

A.6204

Replacement Materials

- a) Where required by the Contract, provide replacement materials upon completion of the Works.
- b) Replacement materials to be of identical quality to those installed in the Works.
- c) In addition, supply a list of recommended replacement materials, together with unit prices for specialist elements of the Works. (Note: This shall not form part of the tender price but shall form the basis for costing of materials as required by the user.)
- d) Hand over replacement materials provided as part of the Works in crates, boxes or cabinets, each individually marked with the words 'Replacement Parts for . . .' and the component or equipment name and reference number stencilled on. Such materials shall be identified within the Contract Documents.

A.6205

Project Completion Records

- a) Submit necessary Maintenance Manual information for inclusion in the Health and Safety File.
- b) Agree with the Employer suitable cross-referencing in the Maintenance Manual so that it is fully co-ordinated with the Health and Safety File and other contractors' O & M manuals.

A.6300

GENERAL MATERIALS AND WORKMANSHIP REQUIREMENTS

Materials

A.6301

Standard of Materials and Quality

- a) Materials shall be new, unless otherwise specified, carefully selected, of the best merchantable quality and supplied by established and reputable suppliers/manufacturers.
- b) Materials shall be to the acceptance of the Employer.
- c) Materials used shall be compatible with other materials used, in conjunction with each other and at interfaces, and shall remain compatible throughout the service life.
- d) Materials/ components shall not be stored or used beyond the manufacturer's expiry date.
- e) Proprietary systems/ components shall generally be British Board of Agrément (BBA) certified or certified by an equivalent internationally recognised body acceptable to the Employer. Where systems/ components do not have such certification, or where the certification does not clearly demonstrate compliance with the requirements of the Architectural Specification, suitable testing shall be carried out.
- f) Materials/ products shall comply with the European Union (EU) Construction Products Regulation (CPR).
- g) Materials/ products shall be CE marked.

A.6302

Health Hazards

Proposed materials shall not in any way be a potential health hazard. Maintain a full, up-to-date knowledge of current published research and legislation in this respect. The Contractor shall also accept the exclusions contained in the Contract documents.

Workmanship

A.6303

Skilled Personnel

Execute the Works using persons skilled in the processes to be adopted. Where requested, submit such documentation necessary to demonstrate an individual's ability to carry out the work to which they have been assigned.

A.6304

Suitability of Structure

Before commencing any part or element of the Works, survey the structure, checking line, level and fixing points and report immediately to the Employer if the structure is considered to be unsuitable. If the structure is unsuitable, propose remedial action.

A.6305

Setting Out

- a) Base reference datum:
 - i) Establish a physical base reference datum on Site from which all primary plan positioned grids and principal levels are subsequently set out.
 - ii) The base reference datum point shall be strategically placed such that it can be referred to as necessary for the duration of the Works.
 - iii) The datum shall be physically robust and located in ground that is not prone to movement or vibration during the Works so that it is spatially fixed for the duration of the Works.
 - iv) The base reference datum shall be located to within $\pm 2\text{mm}$ accuracy of the design dimension to the designated reference point.
- b) Provide suitably qualified personnel to carry out primary setting out. It shall be done using instruments and methods appropriate for achieving the necessary precision and accuracy.
- c) Prior to commencing the installation, submit to the Employer the proposed method of setting out, how grid lines will be marked on Site and how their positions will be checked and maintained for the duration of the Works.
- d) The plan position of any designated mark (measured to its centre) defining a Primary Positional Grid Line shall be located to within $\pm 2\text{mm}$ of its design dimension from the Base Reference Datum.

A.6306

Project Tolerances Definitions

- a) Tolerance: The defined maximum allowable dimensional deviation from a prescribed or agreed value or position.
- b) Dimension: Any prescribed dimension, or any dimension which can be determined from a set of prescribed dimensions, for any element or part thereof as defined by the designer responsible for that element.
- c) Primary Positional Grid Line: Any setting-out grid line used to define the spatial layout of the project and to which the local setting out of elements may be referenced.
- d) Location Reference Point: A specified point that is used to define the position of certain other points and/ or elements.
- e) Location Reference Plane: A specified plane that is used to define the position of certain other planes and/ or elements. The reference plane shall typically be defined by a specified set of reference points.
- f) Location Reference Surface: A specified surface that is used to define the position of another surface and/ or surfaces. The reference surface may be defined mathematically (e.g. as part of a cylinder or as part of a sphere) where it is spatially fixed in relation to specified reference points.
- g) Reference Element: A specified element that is used to define the position of other elements. Typically a specific point on the reference element shall be defined to any other element to which it refers.

A.6307

Manufacturer's Recommendations

- a) Build or install the Works in accordance with the manufacturer's recommendations, with copies of such documentation being supplied to the Employer prior to commencement of the Works.
- b) Store materials and associated components in a clean dry area, in accordance with the manufacturer's recommendations.

A.6308

Manufacturers

Be responsible for materials, components and equipment supplied or manufactured by subcontractors or manufacturers, until the end of the warranty period defined in the Contract.

A.6309

Covering Up

Do not cover up work without agreement by the Employer. Afford reasonable notice and full opportunity for the examination and measurement of any work that is about to be covered up.

A.6310

Cutting

- a) Submit to the Employer for review methods, principles, details, etc. for Site cutting of components as part of the Contractor's method statement. No manufacture shall commence until it can be demonstrated that proposed techniques have been reviewed by the Employer.
- b) Cutting of metal products shall be straight and free from burrs and joints shall be flush, without gaps or imperfections. If base metal is exposed, the surface shall be protected to the same level of protection as stated in the Architectural Specification.
- c) Edges, unless specifically required otherwise by the Architectural Specification, shall be lightly arrised and smooth, free from sharp surfaces, snags or points.

A.6311

Deterioration

- a) Treat/ select materials to prevent any damage from possible combinations of atmospheric conditions, corrosion, wet rot, dry rot, fungi, mould and other deleterious effects including atmospheric pollution and pH factor of the adjacent elements.
- b) Chemical or electrolytic action shall not take place where dissimilar metals and/ or materials are used together.
- c) No materials shall discolour, crack or otherwise be damaged by the worst possible combination of environmental conditions identified herein.

- d) Where materials are to receive finishes or other surface treatment, prepare and maintain them in a suitable condition to receive such finishes or surface treatment.
- e) Remove superficial dust and friable materials. Provide protection during the process of the surface treatment and finishes to prevent contamination by dust and other debris.
- f) Materials used in the manufacture of the Works shall not be liable to infestation attack by micro-organisms, fungi, insects or other vermin, nor provide harbourage for same.

A.6312 Line and Level

Install components such that they are plumb or horizontal and shall line up with adjacent components, in all directions, taking account of the allowable tolerances as defined in the Architectural Specification and the Structural Engineer's documentation.

A.6313 Method Statements

Submit detailed method statements describing the sequence and methods to be employed in carrying out the Works identifying proposed solutions and processes with regard to workmanship, fabrication, fixing, securing, storing and handling, setting out, Site assembly and protection.

Protection

A.6314 Damage Anticipation

Other than damage through terrorist attack or similar activity, anticipate the possible sources of damage to the Works and take active and positive protective measures to maintain them in pristine condition until full Practical Completion. The acceptance of responsibility for making good in the event of damage shall not be considered adequate.

A.6315 Protective Devices

Provide necessary protective devices to protect goods and materials incorporated into the Works, at all stages through to Practical Completion, against damage arising from but not limited to weather conditions, construction, other contractors, warping, distortion, abrasion and other conditions which could have an adverse effect on any goods and/ or materials used in the Works.

A.6316 Protective Measures

Submit details of proposed protective measures at each of the following stages:

- a) Manufacture and packaging of goods and materials at off-Site locations.
- b) Shipment to Site and unloading.
- c) Storage on Site and movement to point of installation or construction.
- d) Installation/ construction.
- e) Completion to handover.

A.6317 Packing and Crating

- a) Materials shall be delivered to Site in their original packaging and clearly marked with their batch number.
- b) Where components are delivered to the Site in packages or crates, then each package or crate shall be labelled on the outside giving the reference and quantity of the contents so that deliveries can be accepted at the Site without the necessity of breaking open any package.
- c) Remove protection from the Works before Practical Completion and leave the Works clean and ready for immediate use.

A.6318 Protection

- a) Store elements of framework and associated components on Site such that they shall not be damaged, distorted or weathered unevenly.

- b) Finished components shall be packed in stillages or crates such that they are suitably separated and protected to prevent scratching, scuffing or other surface damage.
- c) Store materials on-Site in accordance with the manufacturer's written recommendations.

A.6319

Pest Infestations

- a) Carry out the Detailed Design, manufacture and installation of the Works to protect against and not contain or provide harbourage for the infestation by pests.
- b) Carry out the recommendations and take account of Digest 415 produced by the Building Research Establishment (BRE).
- c) Protect against damage caused by any other pests not included in BRE Digest 415.

A.7000

SUSTAINABILITY AND ENVIRONMENTAL REQUIREMENTS

A.7100

CLIENT'S ENVIRONMENTAL POLICY

A.7101

General

The Works and Detailed Design shall comply with the Employer's Environmental Policies and Objectives that set out their commitment to environmental good practice and how it is applied in relation to acquisition, development and management activities, as well as the conduct of their own business, to minimise adverse effects on the natural environment.

A.7200

SCOPE, REQUIREMENTS AND RESPONSIBILITIES

Scope

A.7201

Definitions

For the purpose of the Architectural Specification, the following meanings shall apply:

- a) 'Sustainability': As defined originally in the Our Common Future Report published in 1987 by the World Commission on Environment and Development, now renamed as the Brundtland Commission, sustainability is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.
- b) 'Environment':
 - i) Where the term Environment and its derived terms such as Environmental, are used within the Section A.7000 series clauses of the Architectural Specification, it shall be considered within the context of Sustainability. It therefore refers to the impact the Works have on the surrounding environment.
 - ii) Where the term Environment and its derived terms such as Environmental, are used within the Section A.5000 series clauses of the Architectural Specification and the 1400 series clauses within Sections of the Architectural Specification, it shall be considered within the context of Performance. It therefore refers to the prevailing environmental conditions and the requirement for the Works to withstand the impact of such conditions.

A.7202

Reference

The clauses in Section A.7000 contain general information; read them in conjunction with the following:

- a) The Architectural Specification.
- b) Other Contract documents.

Requirements and Responsibilities

A.7203

Environmental Standards/ Assessment Methodologies

Environmental Standards/ Assessment Methodologies shall be judged for compliance in accordance with Governing Regional Building Regulations.

A.7300 PERFORMANCE REQUIREMENTS

Internal Air Quality

A.7301 General

Materials used in the Works shall have low or zero volatile organic compound (VOC) content or as defined in the associated standard. Where this is not possible, submit written justification to the Employer. Refer to the following Standards as applicable:

- a) BS EN ISO 11890: Part 1 'Paints and varnishes. Determination of volatile organic compound (VOC) content. Difference method'.
- b) BS EN 13300 'Paints and varnishes. Waterborne coating materials and coating systems for interior walls and ceilings. Classification'. Refer also to the requirements of the Decorative Paint Directive 2004/ 42/ CE.
- c) BS EN 13986 'Wood based panels for use in construction. Characteristics, evaluation of conformity and marking'.
- d) BS EN 14080 'Timber structures. Glued laminated timber and glued solid timber. Requirements'.
- e) BS EN 14342 'Wood flooring and parquet. Characteristics, evaluation of conformity and marking'.
- f) BS EN 14041 'Resilient, textile, laminate and modular multilayer floor coverings. Essential characteristics'.
- g) BS EN 13964 'Suspended ceilings. Requirements and test methods'.
- h) Flooring adhesive (and if relevant adhesives for rigid wall coverings) in accordance with BS EN 13999 'Adhesives. Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application'.

A.7400 PRODUCTS AND MATERIALS

A.7401 Sourcing Materials

- a) Refer to the Section A.6300 series clauses, of the Architectural Specification.
- b) The supply chain shall comply with all applicable legal requirements including but not limited to the Modern Slavery Act 2015.
- c) Maintain an effective environmental management system (EMS) in accordance with BS ISO 20400, BS EN ISO 14005, BS EN ISO 14001, BS ISO 26000, BS ISO 28000 and PAS 7000 as relevant.
- d) Building elements and their main constituent materials shall be produced under the certification of the EMS in accordance with BS EN ISO 14001 or BES 6001 at the manufacture stage.

A.7402 Deleterious Materials

- a) Do not use products or materials which at the time of use are generally known to be deleterious to the environment, health and safety and/ or durability of the building.
- b) Do not use any substances, or products containing substances, indicated in the European Chemicals Agency (ECHA) Candidate List of Substances of Very High Concern (SVHC).
- c) In particular, do not use the following materials unless it can be demonstrated, to the satisfaction of the Employer, that they are safe during manufacture, installation and use and that they are suitable for use within the Works:
 - i) Asbestos or asbestos-containing products, as defined in the United Kingdom's The Control of Asbestos Regulations 2012, or any statutory modification or re-enactment thereof.

- ii) Lead, where the metal or its corrosive products may be directly ingested, inhaled or absorbed. Applications of lead such as roofing, flashings, rainwater goods and copper alloy fittings containing lead which are specifically required will be acceptable, until equal or better alternatives are available.
- iii) Lead based paints and primers.
- iv) Hexavalent chromium (chromium VI).
- v) Urea formaldehyde foam or materials which may release formaldehyde beyond British Standard limits.
- vi) Expanded polystyrene and polyurethane.
- vii) Pitch polymer DPC.
- viii) Materials which generally comprise mineral fibres, either man-made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less.
- ix) Chlorofluorocarbons or hydrochlorofluorocarbons or any goods and/ or materials containing the same (e.g. materials in which CFCs, HCFCs or HFAs have been used as blowing agents).
- x) High alumina cement in structural elements.
- xi) Wood wool slabs in permanent formwork to concrete or in structural elements.
- xii) Calcium chloride and sodium chloride in admixtures for use in reinforced concrete.
- xiii) Aggregates for use in reinforced concrete that do not comply with BS EN 12620 and aggregates for use in concrete that do not comply with the provisions of BS EN 1992.
- xiv) Calcium silicate bricks or tiles.
- xv) Polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or any goods and/ or materials containing the same.
- xvi) Sea dredged aggregates that do not comply with the chloride limits specified in BS EN 206, BS EN 12620, BS EN 1744: Part 1 and BS 8500.
- xvii) Lindane - wood treatment/ insecticidal spray.
- xviii) Pentachlorophenol (PCP) or timber treated with Pentachlorophenol - biocide/ wood preservative.
- xix) Chromated Copper Arsenate (CCA) timber preservative treatment.
- xx) Tributyltin (TBT).
- xxi) Medium density fibreboard (MDF) that is neither zero formaldehyde nor conforms to class E1 according to BS EN 13986.
- xxii) Magnesium oxide board (MgO) products for external envelope applications.
- xxiii) Contaminated gypsum board containing high levels of sulphur.
- xxiv) Halon fire suppression systems.
- xxv) Vermiculite containing fibrous dust.
- xxvi) Radioactive materials.
- xxvii) Particleboards not compliant with BS EN 312.

A.7403 Insulation

Foam insulation used in the Works shall be manufactured using HFC-, CFC- and HCFC-free processes, i.e. zero ODP and a global warming potential of less than 5.

A.7404 Sustainable Sources of Timber

- a) Timber and wood based products for both temporary and permanent uses within the Works shall be procured only from proven sustainable sources.
- b) Timber and timber-based products shall carry the Forest Stewardship Council's (FSC) Trademark or other label from an equivalent internationally recognised, globally applicable, independent certification system for good forest management.
- c) Tropical hardwoods in timber or timber-based products shall not be listed on any of the CITES appendices for endangered or threatened species (Appendix I, II, or III).
- d) Provide information to the Employer in respect of timber products proposed for use in the Works for review and acceptance by the Employer. Do not use timber products prior to acceptance of the proposed timber products by the Employer. Present the information to the Employer in tabular form under the following headings:
 - i) Country of Origin.
 - ii) Trade Name.
 - iii) Botanical Name.
 - iv) Wood Product Volume Category A (from an FSC certified forest) (m³).
 - v) Wood Product Volume Category B (from a known certifiable forest) (m³).
 - vi) Wood Product Volume Category R (recycled material) (m³).
 - vii) Total Volume (m³).
- e) Supply proof of the source of supply and chain of custody certificates, including full shipping documents to confirm the chain of custody from the concession/ plantation to Site, for retention by the Employer.

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F10 BLOCK WALLING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

F10.1000 TYPE, SYSTEMS AND MATERIALS

F10.1100 ARCHITECTURAL SPECIFICATION TYPE

F10.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

F10.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

F10.1201 General

- a) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and to achieve the performance requirements.
- b) The Works shall include masonry accessories required to complete the work, achieve performance requirements and suit service conditions. Refer also to Section F30 of the Architectural Specification.
- c) Blockwork that is to receive a rendered or plastered finish shall have a recessed mortar joint to provide a key.
- d) There shall be no colour difference between exposed mortar above or below the DPC.

Blockwork

F10.1202 Type MBL-121 Common Blockwork

Common blockwork laid in half lap stretcher bond.

- a) Blocks:
 - i) Manufacturer: Kenya Builders & Concrete Co. Ltd.
 - ii) Type: Solid.
 - iii) Face size: 390mm x 190mm.
 - iv) Thickness: 100mm.
 - v) Compressive strength: 7.3N/ mm².
- b) Mortar:
 - i) Type: Cement:lime:sand mortar.
 - ii) Compressive strength class/ designation:
 - M4/ (iii) above DPC.
 - M6/ (ii) below DPC.

iii) Colour: Natural as-mixed colour.

c) Joints: Flush.

F10.1300

MATERIALS

Blocks

F10.1301

Concrete Blocks

Concrete blocks shall be manufactured in accordance with BS EN 771: Part 3.

Mortars

F10.1302

Mortar for Walling

In addition to the requirements of Section Z21, the following shall apply:

- a) Mortar shall be in accordance with BS EN 1996.
- b) Sand for facework mortar shall be in accordance with BS EN 13139 and be from one source of consistent colour and texture. Submit samples of sand proposed in accordance with the requirements of the Architectural Specification and identify:
 - i) Name of manufacturer.
 - ii) The pit the material came from.
 - iii) Sieve analysis.
 - iv) Maximum aggregate size: To be agreed with the Employer.
- c) Ready-mix mortar may be submitted as an alternative to that specified, subject to the acceptance of the Employer.

F10.2000

SUBMITTALS AND TESTING

F10.2100

SUBMITTALS

Tender Submittals

F10.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

F10.2102

Pre-contract Samples

Not required.

F10.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 3 No. samples of each accepted block type.

F10.2104

Mock-up Requirements

Not required.

F10.2105

Prototype Requirements

Not required.

F10.2106 Quality Benchmark Requirements

Quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First 10m² of each type including accessories.

F10.2200 TESTING

F10.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

Off-Site Testing

F10.2202 Testing Masonry

- a) Sampling and testing shall be carried out in accordance with BS EN 1052 and BS EN 772 as applicable. Additional testing and sampling shall be performed if the materials do not comply with the Architectural Specification.
- b) As soon as the masonry has been accepted, validated documentary evidence of testing shall be submitted or the testing authority shall be instructed to carry out the following tests:
 - i) Compressive strength.
 - ii) Absorption percentage.
 - iii) Soluble salt content.
 - iv) Drying shrinkage or moisture expansion.
 - v) Density and tolerance in dimensions.
 - vi) Durability.

On-Site Testing

F10.2203 Testing Mortar

Refer to Section Z21 for testing of mortars.

F10.2204 Acoustic Testing

- a) The Works shall be tested in accordance with BS EN ISO 10140 to demonstrate that the minimum sound reduction requirements have been achieved.
- b) Acoustic tests shall commence at a time agreed with the Employer, with results being submitted in writing to the Employer within three weeks of the completion of the tests.
- c) Site sound insulation measurements shall be carried out to determine the installed sound level difference and apparent sound reduction index in one-third octave bands in accordance with BS EN ISO 10140.
- d) The acoustic tests shall be witnessed by the Employer.

F10.3000 EXECUTION

F10.3100 WORKMANSHIP

Fabrication

F10.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.

Workmanship

F10.3102

General

- a) Workmanship shall generally be in accordance with BS EN 1996, BS 8000: Part 0 and BS 8000: Part 3.
- b) The Works shall be built uniform, plumb and level within the tolerances specified and to achieve the indicated design intent.
- c) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- d) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Laying

F10.3103

General

- a) No cut faces of masonry units shall be visible in the finished work unless agreed with the Employer.
- b) Where areas of the Works incorporate service openings, the reveal edges to these openings shall be treated as fair-faced.
- c) Courses shall be maintained to uniform widths. Vertical and horizontal joints shall be equal and of uniform thickness.
- d) Mortar shall be applied to obtain full vertical perpend joints. Slushing of perpend joints or furrowing of bed joints is not permitted.
- e) Intersections, external corners and internal corners shall be fully bonded, except where indicated otherwise.
- f) Units shall not be shifted or tapped after mortar has taken initial set. Where adjustment is necessary, mortar shall be removed and replaced.
- g) Excess mortar shall be removed as work proceeds.
- h) Overhand laying shall be avoided unless dictated by the confines of the Site and accepted by the Employer.
- i) Cellular blocks shall be laid with the cavities as recommended by the manufacturer for the proposed application.
- j) Wall cavities shall be kept clear of mortar and debris.
- k) Walls shall be racked back when raising quoins and other advanced work. Toothing is not permitted.
- l) No portion of the Works shall be raised by more than 1200mm above another at any time.
- m) Each lift of facework shall be completed in one period of operation.
- n) One leaf of a wall shall not be built more than 1500mm high in one day, unless permitted by the Employer.

F10.3104

Vertical Control Joints

- a) The Design Drawings shall be referred to for the standard joint details and locations.
- b) The Works shall be divided into panels separated by vertical control joints, which shall be located such that the length of each panel is generally 6m, or where as indicated on the Design Drawings.

- c) Vertical control joints shall coincide with the structural support elements where possible, and shall utilise proprietary sleeved tie anchors, as specified in Section F30. Those not indicated on the Design Drawings shall be at junctions with a column or different material. Restrict control joints to the corner of abutting walls where possible.
- d) Control joint fillers, sealants and/ or fire stops shall be in accordance with the respective manufacturer's recommendations.

F10.3105

Joints in Mortar

- a) Generally, masonry shall be well buttered with mortar before being laid and filled at each course.
- b) Mortar joints shall be of a thickness consistent in appearance and density.
- c) Tooling of joints shall be carried out while the mortar is thumbprint hard.
- d) Any excess mortar that extrudes from the joints of mortar units shall be cut away as work proceeds and not smeared onto the face of the Works.
 - i) Do not permit any mortar to set on the face of the masonry.
- e) To avoid staining of the surface of the Works, smears shall be removed by gentle brushing off with a soft brush and water only.

F10.3106

Keyed Finish

Joints shall be recessed to a depth of 10mm to receive render/ plaster where indicated on the Design Drawings.

F10.3107

Fair-faced Finish

Where indicated on the Design Drawings, the Works shall have a fair-faced finish with joints pointed as described.

F10.3108

Fire and Smoke Stopping

Fire and smoke stopping shall be securely fixed in position such that the fire performance of the wall is maintained.

F10.3109

Putlog Scaffolding

Putlog scaffolding to facework shall not be permitted.

F10.3110

Lintel Bearings

Predetermine setting out so that full-length masonry units occur immediately below lintel ends.

Protection and Completion

F10.3111

General

- a) Do not use the Works for any purpose, except testing, until Practical Completion.
- b) Before Practical Completion, check the Works for damage and defects.
- c) Replace damaged or defective materials/ components.

F10.3112

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

F10.3113

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.

- b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

F10.3200

TOLERANCES

F10.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The maximum permitted/ acceptable deviation from the required dimension of the masonry shall be in accordance with BS 8000: Part 3, unless specified otherwise below.
- b) Permissible deviations for facework:
 - i) Position in plan of any point in relation to the specified building reference line and/ or point at the same level: $\pm 7\text{mm}$.
 - ii) Straightness in any 5m length: $\pm 5\text{mm}$.
 - iii) Verticality up to 3m in height: $\pm 7\text{mm}$.
 - iv) Verticality up to 7m in height: $\pm 9\text{mm}$.
 - v) Overall thickness of walls: $\pm 7\text{mm}$.
 - vi) Level of bed joints up to 5m (block masonry): $\pm 9\text{mm}$.
 - vii) Window and door openings:
 - Width along wall up to 3m: $\pm 5\text{mm}$.
 - Height up to 3m: $\pm 5\text{mm}$.
- c) Gauging: The gauge shall be based on the combined height of four courses of masonry unit plus bed joint with a tolerance of $\pm 2\text{mm}$.
- d) Notwithstanding the provisions of BS 8000 and the tolerances above, tolerances shall be reduced when, for the purposes of fit and/ or appearance, the tolerances within BS 8000 would fail to achieve the design intent and dimensional criteria required by the Works.
- e) Tolerances shall not be cumulative.
- f) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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F30 MASONRY ACCESSORIES

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

F30.1000 TYPE, SYSTEMS AND MATERIALS

F30.1100 ARCHITECTURAL SPECIFICATION TYPE

F30.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

F30.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

F30.1201 General

- a) Refer to the Design Drawings for specific components and product references.
- b) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and in Section F10.
- c) Where not specified or indicated on the Design Drawings, agree colours/ finishes of exposed accessories with the Employer.

Restraints, Ties and Support Systems

F30.1202 General

Tie sizes shall be in accordance with the manufacturer's recommendations and selected from their standard range to suit installation conditions and achieve performance requirements.

Lintels

F30.1203 General

Lintels shall be of lengths to suit opening sizes and minimum bedding requirements recommended by the manufacturer.

Damp-proofing

F30.1204 General

Installation shall provide a free draining and watertight installation, any laps shall be sealed with DPCs or cavity trays.

F30.1300 MATERIALS

Metalwork and Finishes

F30.1301 Metalwork

Refer to Section Z11.

F30.1302 Finishes

Refer to Section Z30 for general finishes to metalwork.

Sealants and Gaskets

F30.1303 Sealants

Refer to Section Z22.

F30.1304 Gaskets

Refer to Section Z23.

Wall Ties

F30.1305 General

- a) Wall ties shall be in accordance with BS EN 845: Part 1.
- b) Wall ties shall be Agrément certified.
- c) Wall ties shall maintain the stability of the Works in accordance with BS EN 1996.
- d) Where required, ties shall include stainless steel insulation fixing roses/ retention clips.

Masonry Hangers

F30.1306 General

- a) Masonry hangers shall be in accordance with BS EN 845: Part 1.
- b) Masonry hangers shall be Agrément certified.
- c) Masonry hangers shall maintain the stability of the Works in accordance with BS EN 1996.

Lintels

F30.1307 General

- a) Lintels shall be in accordance with BS EN 845: Part 2.
- b) Fabricated steel lintels shall be in accordance with BS 5977: Part 1 and BS EN 845: Part 2.
- c) Precast concrete lintels shall be in accordance with BS 5977: Part 1 and BS EN 845: Part 2.
- d) Pre-stressed concrete lintels shall be in accordance with BS 5977: Part 1 and BS EN 845: Part 2.

Movement Joints

F30.1308 Sealant Movement Joints

Refer to Section Z22 of the Architectural Specification.

Damp-proofing

F30.1309 Material

- a) Materials generally shall be in accordance with BS 743.
- b) Polymeric materials shall be in accordance with BS 6398.
- c) Polyethylene damp-proof courses shall be in accordance with BS 6515.
- d) Elastomer based (EPDM) materials shall be in accordance with BS 6014.

- e) Where specified, bitumen damp-proof courses shall be in accordance with BS 6398.

F30.1310

Requirements

- a) Damp-proofing shall achieve the requirements of BS 8215.
- b) The membrane shall be impermeable, rot-proof and resistant to specified extremes of movement and environmental temperatures. The membrane shall be moisture resistant, vapour permeable and airtight where necessary.
- c) Membranes shall be compatible with, and maintain the performance requirements of, interfacing damp-proofing and gas resistant systems.

Fire Stopping

F30.1311

General

- a) Materials shall be non-combustible when tested in accordance with BS 476.
- b) Fire stopping materials shall be compatible with contiguous material.
- c) Fire stopping materials shall be stable at ambient temperatures, shall not harden or crack with age and shall accommodate building movements and live load deflections without loss of seal or reduction in fire performance.

Cills/ Copings/ Dressings

F30.1312

Solid Cills

Solid cills shall be in accordance with BS 5642: Part 1.

F30.1313

Solid Coping Units

Solid coping units shall be in accordance with BS 5642: Part 2.

Fixings

F30.1314

General

- a) Refer to Section Z20 of the Architectural Specification.
- b) Fixing components shall comply with statutory requirements (and be to the acceptance of the Structural Engineer) both as to strength and type and shall be designed to achieve the requirements of the Architectural Specification. Select suitable components and fixings in accordance with the requirements of the Architectural Specification.
- c) Fixing bolts, nuts, screws, washers, etc. shall be manufactured from austenitic stainless steel complying with BS EN ISO 3506: Parts 1 and 2. Screw fixings and attachments shall be secured against vibrating loose.

F30.1315

Binders and Binder Constituents

- a) Cement binders shall be in accordance with BS EN 197.
- b) Ground granulated blastfurnace slag and fly ash/ pulverised fuel ash binder constituents shall be in accordance with BS EN 15167 and BS EN 450.

F30.1316

Aggregates

- a) Natural aggregates shall be in accordance with BS EN 12620.
- b) Lightweight aggregates shall be in accordance with BS EN 13055.
- c) Ground granulated blastfurnace slag shall be in accordance with BS EN 15167.
- d) Fly ash/ pulverised fuel ash shall be in accordance with BS EN 450.

F30.1317

Admixtures

Concrete admixtures shall be in accordance with BS EN 480.

F30.1318 Pigments

Pigments for Portland Cement and Portland Cement products shall be in accordance with BS EN 12878.

F30.2000 SUBMITTALS AND TESTING

F30.2100 SUBMITTALS

Tender Submittals

F30.2101 Tender Response

Not required.

Samples and Quality Benchmarks

F30.2102 Pre-contract Samples

Not required.

F30.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 1 No. of each accessory.

F30.2104 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) The first installation of each element. Co-ordinate with requirements for quality benchmarks in Section F10 and F31.

F30.2200 TESTING

F30.2201 General

Refer to Section A clause series A.6000 for the general requirements for testing.

F30.3000 EXECUTION

F30.3100 WORKMANSHIP

Fabrication

F30.3101 General

Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.

Workmanship

F30.3102 General

- a) Workmanship shall generally be in accordance with BS EN 1996, BS 8000: Part 0 and BS 8000: Part 3.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

F30.3103

Cleanliness

- a) Masonry accessories shall be kept free from debris and excess mortar. DPCs and cavity trays shall be installed in accordance with the guidelines set out in BS 8215 and BS 8000: Part 3.
- b) Any insulation shall be kept dry and free from mortar droppings, grout and other debris during the course of construction in accordance with BS 8000: Part 3.

Restraints, Ties and Support Systems

F30.3104

Restraint Ties

Where the restraint tie does not have a proprietary debonding sleeve, one half of the length shall be debonded by wrapping with polyethylene sheet before building into the joint.

F30.3105

Joint Reinforcement

- a) Joint reinforcement shall be laid on an even bed of mortar in a continuous strip.
- b) Laps shall be a minimum 225mm at joints including full laps at angles.
- c) Reinforcement shall be kept back 20mm from a visible face of the masonry, 12mm back from a concealed face.
- d) The mortar joint thickness shall be the same as the rest of the Works.

F30.3106

Lintel Installation

Bed on mortar used for adjacent work with a bearing of not less than 150mm unless specified otherwise.

F30.3107

Trough Lintels

- a) Trough lintels shall be laid on a full bed of mortar as used for adjacent work. If packing is required, slate shall be used.
- b) When building trough lintels, temporary shuttering shall be used, with polystyrene gaskets or similar, to separate blocks.
- c) Shutter ends and install the reinforcing using plastic spacers, or similar, and pour concrete, in accordance with the manufacturer's recommendations.
- d) Hand tamp in accordance with the trough lintel block manufacturer's recommendations. When the concrete has set, remove gaskets and point joints to match adjacent walls.
- e) Units shall be positioned true to line and level.
- f) Hollow section trough concrete blockwork units shall be cut to match the wall thickness and the blockwork bond. The quality and finish of trough lintel blocks shall match the blockwork in all respects.
- g) Trough lintel construction shall be in accordance with the block manufacturer's recommendations.
- h) Concrete infill and reinforcement shall be as recommended by the block manufacturer.
- i) Provide 190/ 220mm end bearings on walls, or in accordance with the manufacturer's recommendations.
- j) Where openings are positioned against concrete walls or columns, suitably sized galvanised mild steel angles bolt fixed to the concrete wall or column shall be provided to receive the trough lintel.

Joints

F30.3108

Movement Joint with Sealant

- a) Build in filler as work proceeds. There shall be no projections into cavities and the depth of joint to receive the sealant system shall be correct. The thickness of filler shall match the design width of the joint.

- b) Joints shall be prepared and sealant applied in accordance with Section Z22 of the Architectural Specification.

F30.3109

Movement Joint without Sealant

- a) Build in filler as work proceeds, completely filling the joint but without projecting into cavities. The thickness of filler shall match the design width of the joint.
- b) Fire resistant filler shall be compressed and slid into place in the open joint. It shall be installed with accessories or adhesives where recommended in writing by the manufacturer.

Damp-proofing

F30.3110

Cavity Trays/ DPCs

- a) Laps of, and interfaces with DPCs or cavity trays shall be sealed using adhesive/ mastic/ torching in accordance with the manufacturer's recommendations.
- b) DPCs and cavity trays shall be sealed to interfacing work and other membranes in accordance with the manufacturer's recommendations to maintain the performance requirements of the interfacing work/ membranes.
- c) DPCs/ cavity trays shall be bedded on an even bed of fresh mortar and shall not be bedded dry.
- d) DPCs/ cavity trays shall extend through the full width of the wall, including any external surface finishes and shall not be bridged by mortar. DPCs/ cavity trays shall not extend through internal finishes.
- e) The width of DPCs/ cavity trays shall allow for a 5mm projection either side of the masonry, unless otherwise described. DPCs/ cavity trays shall not extend through internal finishes.
- f) DPCs/ cavity tray projections:
- i) The width of DPCs/ cavity trays to the internal leaf, non visible external leaf, copings and other overhang units shall allow for a 5mm projection either side of the masonry, unless otherwise described.
- ii) The width of external leaf visible DPCs/ cavity trays shall finish flush with the outer side of the masonry whilst maintaining the performance requirements, unless otherwise described.
- iii) DPCs/ cavity trays shall not extend through internal finishes.
- g) Joints between cavity trays shall be fully sealed. Preparatory support/ jointing boards shall be obtained from the cavity tray manufacturer and shall be put across the joint both during and after its formation.
- h) At changes in direction and to terminate all discontinuous cavity trays above and below openings, high frequency welded, factory fabricated preformed cloaks/ profiles shall be used.
- i) Projections within the cavity that occur at the same level as continual cavity trays (e.g. columns, windposts, cavity barriers) shall be fully sealed using preformed cloaks/ profiles.
- j) Submit confirmation from manufacturers of preformed DPCs/ cavity trays that the detailing is in accordance with the Building Regulations.

Ventilation

F30.3111

Ventilating Ducts

- a) Ventilating ducts shall be installed across the cavity, sloping downward away from the inner leaf, bedding fully in the mortar to seal cavity.
- b) A stepped DPC cavity tray shall be formed above the duct, extending 150mm on each side and with stop ends.

Cills/ Cast Stone

F30.3112 Cill Installation

Bed joints shall be left open under one-piece cills except under end bearings. On completion, they shall be pointed with mortar to match adjacent work.

F30.3113 Cast Stone Dressings

Cast stone dressings shall be laid on a full bed of mortar. Joints shall be filled and finished flush.

F30.3200 TOLERANCES

F30.3201 General

Refer to Section(s) that include the System Types into which the masonry accessories will be incorporated.

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F31 PRECAST CONCRETE CILLS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

F31.1000 TYPE, SYSTEMS AND MATERIALS

F31.1100 ARCHITECTURAL SPECIFICATION TYPE

F31.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

F31.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

F31.1201 General

- a) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings.
- b) Components for lightning protection and earth bonding shall be concealed.

F31.1202 Fixing to Structure

- a) Mechanical fixing devices shall be austenitic stainless steel of a suitable grade.
- b) The Works shall include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
- c) Fixing to the primary structure shall be co-ordinated with the Structural Engineer's documentation.
- d) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

Cills

F31.1203 Type MAC-951 Precast Concrete Cill

Proprietary precast concrete cills.

- a) Manufacturer: Kenya Builders & Concrete Co. Ltd.
- b) Reference: Window Cill.
- c) Dimensions: As indicated on the Design Drawings.

F31.1300 MATERIALS

Concrete

F31.1301 General

Constituent materials shall be in accordance with BS 8500: Parts 1 and 2 and BS EN 206.

F31.1302 Aggregates

- a) Aggregates shall be in accordance with BS EN 12620.
- b) Aggregates shall achieve a drying shrinkage of concrete not exceeding 0.075% when tested in accordance with BS EN 1367: Part 4.

F31.1303 Chlorides

- a) The total chloride ion content of the constituents of each mix, expressed as a percentage by weight of cement (including GGBS or PFA if used) in the mix, shall not exceed 0.4.
- b) Admixtures containing calcium chloride shall not be used.

F31.1304 Reinforcement

- a) Steel reinforcement shall be in accordance with BS 4449, BS 4482 and/ or BS 4483, cut and bent in accordance with BS 8666.
- b) Reinforcement shall be of metal compatible with the metal of any fixings and accessories that may make contact.
- c) Reinforcement shall be clean and free of corrosive pitting, loose millscale, loose rust, ice, oil, and other substances which may adversely affect the reinforcement, concrete or bond between the two at time of placing concrete.
- d) Reinforcement shall be fixed and secured using tying wire, accepted steel clips, or tack welding if permitted. Wire or clips shall not encroach into the concrete cover.

Mortars

F31.1305 General

Refer to Section Z21.

Finishes

F31.1306 Facing Mixes

- a) Exactly the same ingredients and batch proportions shall be used for components required to have the same finish.
- b) Control materials, batching and mixing to achieve consistency of colour and appearance.

F31.1307 Quality of Finish

- a) The quality of finishes shall match the accepted samples and shall be consistent throughout the Works.
- b) Components having arrises or faces, which are broken, chipped, cracked, crazed, honeycombed, irregular, inconsistent, stained or otherwise marred such that their appearance or performance is significantly impaired shall not be accepted.

F31.2000 SUBMITTALS AND TESTING

F31.2100 SUBMITTALS

Tender Submittals

F31.2101 Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

F31.2102 Pre-contract Samples

Not required.

F31.2103 Post Contract Award Samples

Submit post contract award samples of the following in accordance with Section A.4000:

- a) 1 No. full size straight and corner cill.

F31.2104 Mock-up Requirements

Not required.

F31.2105 Prototype Requirements

Not required.

F31.2106 Quality Benchmark Requirements

Submit the following quality benchmarks, in locations to be agreed with the Employer, in accordance with Section A.4000:

- a) First precast concrete cill of each type to be incorporated into the Works.

F31.2200 TESTING

F31.2201 General

Refer to Section A clause series A.6000 for the general requirements for testing.

F31.3000 EXECUTION

F31.3100 WORKMANSHIP

Fabrication

F31.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Fabrication shall be based on Site measurements to accommodate construction tolerances.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with Site work restricted to fixing.
- d) Fabricate the Works using proven methods of construction, to comply with the design requirements.
- e) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects, to profiles indicated on the Design Drawings.

F31.3102 Moulds

- a) Moulds shall be constructed to give straight, square and true components.
- b) Permissible deviations on length 0 to +6mm, other dimensions ± 3 mm.
- c) Moulds shall be maintained in clean, sound condition and inspected for defects before each reuse.
- d) Moulds shall be discarded rather than repaired and reused if this would impair the surface appearance of the components.
- e) Moulds shall be constructed to prevent loss of grout.
- f) Moulds shall be manufactured to permit demoulding without damage to the components.
- g) Moulds shall be coated evenly with a suitable release agent, which shall not be allowed to touch the reinforcement.

F31.3103 Casting and Curing

- a) Concrete shall be thoroughly compacted by vibration.
- b) Components shall not demould prematurely.
- c) Damage to and distortion of immature components from movement, vibration, overloading, physical shock, rapid cooling and thermal shock shall be prevented.
- d) Components shall be protected from sun and drying winds until they are at least five days old.
- e) Components shall not be delivered to Site until at least 14 days after casting.

Workmanship

F31.3104

General

- a) Workmanship shall be generally in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

F31.3105

Inspection

- a) Before commencing installation, survey the structure.
- b) Check dimensions, line, level and fixing points.
- c) Report immediately to the Employer if the structure/ substrate is unsuitable to receive the Works.
- d) If the structure/ substrate is unsuitable, propose remedial action to make the structure/ substrate suitable.

F31.3106

Suitability of Structure/ Substrate

- a) Structures/ substrates shall be rigid, dry, sound, with no loose material or significant cracks or gaps, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the structure/ substrate, or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation/ Application

F31.3107

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) The Works shall be set out and installed square, true to line, level and plane and free from undulations with lines and joints aligned, straight and parallel, unless specified otherwise. The Works shall be within stated tolerances and in the correct relationship with the building structure.
- c) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.

- iii) Keep cut edges to a minimum.
- d) Inspect each material/ component of the Works immediately before installation.
- e) The Works shall be installed using materials/ components that are free from marks, defects, flaws, steps, waves or damage of any nature.
- f) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- g) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- h) Do not drill, cut or otherwise alter work of others to accommodate the system/ product installation, unless indicated on the Design Drawings, the Working Drawings or accepted by the Employer.
- i) The Employer shall be informed not less than 48 hours before commencing installation.
- j) Provide for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

F31.3108 Cill Installation

Leave bed joints open under one-piece cills except under end bearings and beneath masonry mullions. On completion, point with mortar to match adjacent work.

F31.3109 Laying of Lintels

- a) Precast concrete lintels shall be laid on a full bed of mortar used for adjacent work with a bearing of not less than 150mm, unless specified otherwise.
- b) Units shall be true to line and level.
- c) Faces exposed to view shall be kept as finished work, clean with no mortar encroachment. Rubbing to remove marks or stains shall not be permitted.

F31.3110 Support of Existing Work

Where new lintels are to support existing structures, the top joint shall be completely filled with semi-dry mortar, hard packed and well rammed.

F31.3111 Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.

Protection

F31.3112 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

F31.3113 Cleaning

- a) At completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

F31.3114

Completion

- a) Leave installed work clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects.

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G20 FIRST FIXING/ PVC FASCIA/ SOFFIT BOARDS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

G20.1000 TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

G20.1100 ARCHITECTURAL SPECIFICATION TYPE

G20.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

G20.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

G20.1201 General

- a) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and to achieve the performance requirements.
- b) Determine the required system build-ups and required components to suit the setting out and service conditions.
- c) Fixing zone dimensions indicated on the Design Drawings do not include applied finishes.
- d) Systems shall include timber sections, noggings, bracings, bearers, joists, fixings, metal fixing straps/ angles and other accessories/ components necessary to complete the Works.

G20.1202 Services

- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- b) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.
- c) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.

G20.1203 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Indicate the type, size and positioning of mechanical fixing devices on the Working Drawings.
- c) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

G20.1204 Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) The Works shall include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.

- c) Co-ordinate fixing with the superstructure design.
- d) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

G20.1205 Secondary Support

- a) Secondary support/ framing shall be configured as indicated on the Design Drawings, suitably fixed back to the primary structure using methods acceptable to the Employer.
- b) Where the Contractor deems that visible secondary support is required in addition to that indicated in the Structural Engineer's documentation and on the Design Drawings, the Contractor shall inform the Employer at tender return.

Soffits and Fascias

G20.1206 Type EWS-481 PVC Fascia

PVC fascia board system, configured as indicated on the Design Drawings.

- a) Board size(s): As indicated on the Design Drawings.
- b) Thickness: 18mm.
- c) Colour: White.
- d) Joints: Seamless appearance, to the acceptance of the Employer.
- e) Fixings: Suitable mechanical and adhesive fixings as agreed with the Employer.

G20.1207 Type EWS-491 PVC Soffit - Vented

Ventilated PVC soffit board system, configured as indicated on the Design Drawings.

- a) Board size(s): As indicated on the Design Drawings.
- b) Thickness: 18mm.
- c) Vents:
 - i) Provide vents/ apertures in the PVC soffit boards as required to achieve the performance requirements and refer to the Design Drawings.
 - ii) Aperture size and configuration shall be agreed with the Employer.
 - iii) Vents shall include bird guard/ insect mesh.
- d) Profile: Shiplap.
- e) Colour: White.
- f) Joints: Seamless appearance, to the acceptance of the Employer.
- g) Fixings: Suitable mechanical and adhesive fixings as agreed with the Employer.

G20.1300 MATERIALS

Metalwork and Finishes

G20.1301 Metalwork

Refer to Section Z11.

G20.1302 Finishes

Refer to Section Z30 for general finishes to metalwork.

Fixings

- G20.1303 General
- a) Refer to Section Z20.
 - b) Fixing components shall comply with statutory requirements.
 - c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- G20.1304 Clips/ Continuous Clips
- a) Aluminium clips shall be cut from sheets of the same code as the sheet being secured and dipped in solder if exposed to view.
 - b) Stainless steel clips shall be cut from sheet in accordance with BS EN 10095, BS EN 10029, BS EN 10048, BS EN 10051 and BS EN ISO 9445: Parts 1 and 2 and terne coated if exposed to view. Sheet thickness and grade shall maintain performance requirements.
- Sealants and Gaskets**
- G20.1305 Sealants
- a) Refer to Section Z22.
 - b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
 - c) Sealant shall not leak or bleed causing any discolouration or staining.
- G20.2000 SUBMITTALS AND TESTING**
- G20.2100 SUBMITTALS**
- Tender Submittals**
- G20.2101 Tender Response
- Not required.
- Samples, Mock-ups, Prototypes and Quality Benchmarks**
- G20.2102 Pre-contract Samples
- Not required.
- G20.2103 Post Contract Award Samples
- In accordance with Section A.4000, submit post contract award samples of the following:
- a) Minimum 300mm length of each accepted system.
 - b) Accepted insulation.
- G20.2104 Mock-up Requirements
- Not required.
- G20.2105 Prototype Requirements
- Not required.
- G20.2106 Quality Benchmark Requirements
- Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:
- a) First structural bay of work of each type.

G20.2200

TESTING

G20.2201

General

- a) Refer to Section A clause series A.6000 for the general requirements for testing and the approach to off-Site and on-Site testing.
- b) Submit independently certified tests and Agrément certificates that demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification.
- c) Where data from previous independently certified tests and Agrément certificates demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification, off-Site independent testing need not be undertaken.
- d) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

On-Site Testing

G20.2202

Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:
 - i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
 - ii) Apply a proof load of 1.5 times the unfactored design load.
 - iii) Test 10% of the installed fixings as a minimum.
- g) Torque Site testing:
 - i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
 - ii) Test 100% of the installed fixings.
 - iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.
 - iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
 - i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum.

G20.2203

Sealant Testing

Refer to Section Z22.

G20.3000 EXECUTION
G20.3100 WORKMANSHIP

Fabrication

G20.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

G20.3102 Metalwork

Refer to Section Z11.

Workmanship

G20.3103 General

- a) Fabricate and install the Works in accordance with BS EN 1995.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

G20.3104 Inspection

- a) Before commencing installation, survey the structure.
- b) Check dimensions, line, level and fixing points.
- c) Report immediately to the Employer if the structure is unsuitable to receive the Works.
- d) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

G20.3105 Suitability of Base/ Backing

- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and specified tolerances of the finished systems/ products.

Installation

G20.3106

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Installation shall accommodate the specified tolerances and differences between actual Site dimensions and dimensions indicated on the Design Drawings.
- d) Setting-out of cut materials/ components at the perimeter shall be of equal sizes, not smaller than one third of original size and to the acceptance of the Employer, unless otherwise indicated on the setting out drawings.
- e) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- f) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components being free from marks, defects, flaws, steps, waves, or damage of any nature.
- g) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- h) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- i) Timber members that are damaged, crushed or split beyond the limits of their grading shall not be used.
- j) Scarf joints, finger joints or splice plates shall not be used without the acceptance of the Employer.
- k) Notches and holes shall be positioned in relation to knots and other defects such that the strength of members shall not be reduced.

G20.3107

Cramp Fixing

- a) Stainless steel or galvanised steel strip cramps, with one end only split open and the other end bent, shall be used.
- b) Cramps shall be positioned a minimum of 150mm from each end of jambs and at a maximum of 600mm centres.

G20.3108

Powder Actuated Fixing Systems

Powder actuated fixing systems shall not be used without the acceptance of the Employer.

G20.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

G20.3110

Fire and Smoke Barriers

- a) Cut material to fit tightly, achieve correct compression and be securely fixed along the edges.
- b) Joints shall be wired or stapled together to provide a complete barrier to smoke and flame.
- c) Installation of proprietary systems/ products shall be in accordance with the manufacturer's recommendations.

G20.3111

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) If timber is proposed for use as packing, it shall have received the same preservative treatment as the adjacent timber and shall have the moisture content appropriate for either 'WET' or 'DRY' use as appropriate.
- d) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage.

G20.3112

Sealants

For general sealants refer to Section Z22 of the Architectural Specification.

Protection and Completion

G20.3113

Protection

- a) Finished areas shall be adequately protected from damage until Practical Completion.
- b) The finished work shall not be used as a working platform for other trades, or for the storage of materials, unless suitable protection has been provided.
- c) Should any work by other trades be unavoidable, protection shall be suitable for use as a working platform. Protection shall cover the whole accessible area.

G20.3114

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

G20.3115

Completion

- a) Repair defects without delay to minimise damage and nuisance.
- b) Do not use the Works for any purpose, except testing, until Practical Completion.
- c) On Practical Completion, check the Works for damage and defects. Replace damaged or defective materials/ components.

G20.3200

TOLERANCES

G20.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.

- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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H11 GLAZED CURTAIN WALLING/ CLADDING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

H11.1000 TYPE, SYSTEMS AND MATERIALS

H11.1100 ARCHITECTURAL SPECIFICATION TYPE

H11.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

H11.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

H11.1201 General

- a) Construct and install the Works in accordance with the Centre for Window and Cladding Technology (CWCT) Standard for Systemised Building Envelopes and CWCT Technical Notes.
- b) The Works shall be covered by a single source warranty.
- c) Components for lightning protection and earth bonding shall be concealed.
- d) Install systems as complete integrated systems, including components and accessories necessary to complete the Works.

H11.1202 Services

- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- b) Agree locations/ positioning of services with the Employer where not indicated on the Design Drawings.
- c) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.

H11.1203 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

H11.1204 Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) Mechanical fixing devices shall be austenitic stainless steel of a suitable grade.
- c) The Works shall include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
- d) Co-ordinate fixing with the superstructure design.

- e) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

H11.1205

Framing

- a) Framing profiles and other visible components shall be consistent and matching in appearance throughout the Works.
- b) Location and appearance of drainage slots shall be to the acceptance of the Employer.
- c) Framing shall accommodate tolerances in the glass and shall not cause deflections that would cause stress outside acceptable limits or optical distortion.

H11.1206

Joints

- a) Align joints/ framing with interfacing systems. Gaps within joints shall be uniform.
- b) Movement joints shall accommodate movements while maintaining the overall system performance. Movement joints shall appear as similar to the standard system joint as possible.

H11.1207

Gaskets

- a) Gaskets shall be black.
- b) Visible glazing gaskets shall have factory-formed corners. Other gaskets shall have overlapping joints with appropriate sealant in between.
- c) The internal gasket/ sealant line of the entire envelope system shall provide a continuous vapour and air seal. This shall include interfacing connections.

H11.1208

Opening Elements

- a) Opening elements shall be integrated into the systems with functionality as indicated on the Design Drawings.
- b) Opening elements shall not disengage from the fixed areas of the Works when open or closed under any of the specified loads.
- c) External dimensions and appearance of the framing for the opening elements shall correspond exactly to the frames for the fixed light glazing such that no visual distinction between fixed and opening elements can be made.
- d) Opening frames shall be mitred at the corners and cut with sufficient accuracy to prevent unfinished metal being visible.
- e) When in the closed position the vents shall not be removable except by deliberate action from the interior of the building or from actuation.
- f) Operation shall be by one or more of the following, or as indicated on the Design Drawings:
 - i) Manually operated.
 - ii) Manually operated by remote mechanism such as Teleflex.

H11.1209

Vapour Control

Where ventilation is not required, such as fully blanked-off zones, include suitable vapour control barrier(s) and associated protection to provide a continuous line of protection.

H11.1210

Maintenance Access Equipment Components

- a) System shall accommodate stainless steel restraint sockets, bracketry and other components, provided by the Maintenance Access Equipment specialist, in accordance with the requirements of applicable standards.
- b) Co-ordinate the locations, type and mounting of components with the Maintenance Access Equipment specialist, and as accepted by the Employer.

H11.1211

Pressed Metal Components/ Accessories

- a) Systems shall incorporate necessary pressed metal components/ accessories including flashings, copings, cappings, cills, reveals and returns.
- b) Components shall be formed from fully welded and/ or sealed pressed aluminium sheets, which shall be sufficiently thick to provide a visually flat surface free from distortion and permanent deformation.
- c) Systems shall include special prefabricated corner pieces for changes in direction. There shall be no cut corners at changes in direction.
- d) Components shall be of finish, colour and texture to the acceptance of the Employer where not specified.
- e) Systems shall include concealed support as required.
- f) Provide insulation as required, including anti-drumming insulation to the underside.
- g) Joints:
 - i) Joints shall be of profiles accepted by the Employer.
 - ii) Locations shall be as indicated on the Design Drawings, or to the acceptance of the Employer.
 - iii) Assemble joints centrally over support.
 - iv) Joints shall include concealed continuous sealed gaskets with recessed/ folded interconnecting joints to provide a neat flush external appearance.

H11.1212

Demountability

- a) Elements of the Works shall be individually and independently removable to provide access for maintenance and/ or replacement of glazing/ infill units and other components in the event of breakage/ damage.
- b) Systems shall enable maintenance and cleaning of components, while minimising progressive dismantling and associated disruption.
- c) The removal of glazing/ infill units shall not affect the performance or safety of adjacent work or any other part of the Works. A method statement for removal and replacement of components shall be submitted for acceptance by the Employer.

Stick Built Curtain Wall System

H11.1213

Type EWS-101 Capped Stick Built Curtain Walling System

Capped stick built curtain walling system configured as indicated on the Design Drawings and fixed back to the structural frame.

- a) Framing:
 - i) Extruded aluminium thermally broken and separated mullions and transoms forming the main framing.
 - ii) Powder coat finished to a colour and appearance (matt/ satin/ gloss) to be confirmed by the Employer.
- b) Glazing/ infill panels as, described in Sections L40 and L42, shall be accommodated by the framing, configured as indicated on the Design Drawings.
- c) Glazing panels shall receive applied finish(es) to locations indicated on the Design Drawings.
- d) Joints between glazing/ infill panels:
 - i) Externally both mullions and transoms shall include cover caps to sizes and profiles as indicated on the Design Drawings, finished to match the framing.
 - ii) Locations and appearance of joints to cover caps shall be to the acceptance of the Employer.

- iii) Methods of restraint for the cappings shall be concealed.
- e) Opening elements shall have methods of operation as indicated on the Design Drawings.
- f) Doors shall be integrated into the façade and accommodated by the curtain walling to locations indicated on the Design Drawings.
- g) System shall include necessary satin finished stainless steel ironmongery and hardware from the manufacturer's range to achieve the required functionality and suit the service conditions, to the acceptance of the Employer.

Integrated Doors

- H11.1214 General
- a) Doors shall prevent unauthorised entry by removal of any component that would permit access.
 - b) The Employer shall confirm the lock mastering requirements.
 - c) Operation shall be manually operated.
 - d) Thresholds shall be thermally broken and drain water to the exterior of the building.
 - e) External doors shall be fully weatherstripped.
 - f) Finger-trap prevention measures shall be provided, as required.
 - g) Locations of fire escape doors shall be as indicated on the Design Drawings.

- H11.1215 Type DRS-201 Glazed Doorset (Integrated)
- Manually operated aluminium framed hinged glazed door with functionality as indicated on the Design Drawings, to match, and perform an integral part of, the surrounding curtain walling system.

H11.1300 MATERIALS

Metalwork and Finishes

- H11.1301 Metalwork
- Refer to Section Z11.
- H11.1302 Finishes
- a) Refer to Section Z30 for general finishes to metalwork.
 - b) Refer to Section Z31 for powder coatings.

Glass

- H11.1303 General
- Refer to Section Z25.

Fixings

- H11.1304 General
- a) Refer to Section Z20.
 - b) Fixing components shall comply with statutory requirements.
 - c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Sealants and Gaskets

- H11.1305 Sealants
- a) Refer to Section Z22.
 - b) Sealant shall not leak or bleed causing any discolouration or staining.
- H11.1306 Gaskets
- a) Refer to Section Z23.
 - b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

H11.2000 SUBMITTALS AND TESTING

H11.2100 SUBMITTALS

Tender Submittals

- H11.2101 Tender Response
- Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

- H11.2102 Pre-contract Samples
- Not required.

- H11.2103 Post Contract Award Samples
- In accordance with Section A.4000, submit post contract award samples of the following:
- a) 300mm length of each type of framing, with accepted finishes and colours, including the interface (method of attachment) with the glazing and opaque infill panel and joints.
 - b) Accepted gasket types, extrusions, caps, trims and flashings, including at least one joint and one corner joint and including accepted finishes and colours where applicable.
 - c) Accepted ironmongery and hardware.
 - d) Visible fixings (where visible fixings form part of the design intent).
 - e) Samples of fastening devices and anchors.

- H11.2104 Mock-up Requirements
- Not required.

- H11.2105 Prototype Requirements
- Not required.

- H11.2106 Quality Benchmark Requirements
- Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:
- a) First completed full height structural bay of each type of system.

H11.2200 TESTING

- H11.2201 General
- a) Refer to Section A clause series A.6000 for the general requirements for testing.
 - b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

- c) The Works shall be tested in accordance with the requirements of the CWCT Standard Test Methods for Building Envelopes.

On-Site Testing

H11.2202

Waterproofing and Weathertightness Testing

- a) The weathertightness of the Works shall be tested using the site hose test carried out in accordance with the recommendations of the CWCT Standard for Systemised Building Envelopes.
- b) If a different method is proposed, details of the testing system and a proposed method statement shall be submitted to the Employer for acceptance at least one month prior to the proposed testing on Site.
- c) Prior to testing, check that the Works have been completed to a stage where the integrity of the system can be tested, that obvious defects have been made good and that the Works have been cleared of materials, debris and dust.
- d) Testing shall be carried out when work is complete, including that of associated trades and interfacing trades.
- e) Performance under testing:
- i) There shall be no leakage through the Works at any time during the test.
- ii) If any leaks/ defects occur, mark the location on the Works and drain water completely. Prepare a report to be submitted to the Employer, together with proposals for remedial measures. Any part of the Works that is adversely affected shall be replaced or repaired; the design intent shall be maintained.
- iii) After making good any defects, retest locally to verify integrity of repair.
- iv) At completion of the test there shall be no standing water in locations intended to remain dry. Certify the waterproof integrity of the Works.
- v) Invite the Employer to witness the tests.

H11.2203

Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:
- i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
- ii) Apply a proof load of 1.5 times the unfactored design load.
- iii) Test 10% of the installed fixings as a minimum, or as indicated in the Structural Engineer's documentation, where the more onerous shall apply.
- g) Torque Site testing:
- i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
- ii) Test 100% of the installed fixings.
- iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.

- iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
 - i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum, or as indicated in the Structural Engineer's documentation, where the more onerous shall apply.

H11.3000

EXECUTION

H11.3100

WORKMANSHIP

Fabrication

H11.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly shall take place in equipped workshops with Site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

H11.3102

Metalwork

Refer to Section Z11.

H11.3103

Frames

- a) Framing profiles shall be assembled into unit frames by means of mitred or butted corners mechanically jointed with cleats and appropriate additional sealants. Cutting shall be sufficiently accurate to prevent the display of unfinished metal at mitre joints.
- b) Profiles shall be free of any rolling marks, imprints, scratches, distortions, flaws, steps, waves or other defects.

Workmanship

H11.3104

General

- a) The Works generally shall be fabricated and installed in accordance with the CWCT Curtain Wall Installation Handbook.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.
- d) The Works shall be true to detail with continuous profiles, free from marks, defects, flaws, steps, waves, or damage of any nature.

- e) The glazing work shall be set out such that framing members are installed in the correct position, within tolerance, and in the correct relationship to the building structure.
- f) Framing members shall be set out at evenly spaced centres, straight, parallel and truly aligned with other features where indicated on the Design Drawings.
- g) The finished work shall be square, regular, true to line, level and plane with a satisfactory fit at junctions.

H11.3105

Doors

- a) Doors shall be set out and installed with the head, jamb and bottom clearances required by the fittings/ ironmongery manufacturer.
- b) Fittings/ ironmongery shall be assembled and fixed using matching fastenings supplied by the manufacturer.

Inspection/ Preparation

H11.3106

Inspection

- a) Before commencing installation, survey the structure.
- b) Check dimensions, line, level and fixing points.
- c) Report immediately to the Employer if the structure is unsuitable to receive the Works.
- d) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

H11.3107

Suitability of Base/ Backing

- a) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- b) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and specified tolerances of the finished systems/ products.
- c) Surfaces to be covered shall be firmly fixed, dry, smooth, without depressions, voids or protrusions, clean and free from frost, unacceptable curing compounds, release agents and other surface contaminants.

Installation

H11.3108

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- c) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- d) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.

- e) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- f) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- g) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.

H11.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

H11.3110

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

H11.3111

Accessories

Closure pieces, flashings, trims, gutters, fillers, spacers, tapes, sealants and fixings, where not specified, shall be types recommended by and installed in accordance with the manufacturer's recommendations to suit the service conditions.

H11.3112

Sealants

For general sealants refer to Section Z22 of the Architectural Specification.

H11.3200

TOLERANCES

H11.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.

- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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H31 METAL PROFILED SHEET ROOFING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

H31.1000 TYPE, SYSTEMS AND MATERIALS

H31.1100 ARCHITECTURAL SPECIFICATION TYPE

H31.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

H31.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

H31.1201 General

- a) Design and execute the Works in accordance with:
 - i) BS 5427 'Code of practice for the use of profiled sheet for roof and wall cladding on buildings'.
 - ii) The Centre for Window and Cladding Technology (CWCT) Standard for Systemised Building Envelopes and CWCT Technical Notes.
 - iii) The recommendations of the Metal Cladding and Roofing Manufacturers Association (MCRMA) where applicable.
- b) The Works shall be covered by a single source warranty.
- c) Use single length sheets, end laps will not be accepted unless specified or indicated otherwise.
- d) Use tapered and/ or curved sheets, as required, to achieve the Design as indicated on the Design Drawings.
- e) Where applicable, use isolating tape, plastic washers or other suitable means to prevent bimetallic corrosion between dissimilar metals.
- f) Systems shall include closure pieces, flashings, trims, cills, gutters, fillers, spacers, tapes, sealants, fixings and other components/ accessories necessary to complete the Works. Where not specified, they shall be suitable for the service conditions and shall be to the acceptance of the Employer.

H31.1202 Drainage

- a) Roof covering systems shall be laid to falls indicated on the Design Drawings.
- b) Where required, provide drainage outlets at locations indicated on the Design Drawings and in accordance with the Services Engineer's documentation.
 - i) Outlets shall achieve drainage performance requirements and shall be compatible with the roof covering system.
 - ii) Outlets shall not thermally bridge the Works.
 - iii) Outlets shall be installed in accordance with the outlet and roof covering system's respective manufacturer's recommendations.

- iv) Outlets shall be set at levels to maintain drainage requirements, including raising pieces as required.
- v) Drainage outlets shall have bolt fixed or locked leaf/ gravel guards. Guard type and finish, where not specified, shall be to the acceptance of the Employer.

H31.1203 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Where necessary fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

H31.1204 Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) Mechanical fixing devices shall be austenitic stainless steel of a suitable grade.
- c) The Works shall include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
- d) Co-ordinate fixing with the superstructure design.
- e) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

H31.1205 Pressed Metal Components/ Accessories

Pressed aluminium copings and cappings shall be configured as indicated on the Design Drawings.

- a) Incorporate necessary pressed metal accessories including flashings, collars, copings, cappings, cills, reveals and returns.
- b) Form components from fully-welded and/ or sealed pressed aluminium sheets.
- c) Finish shall be powder coated.
- d) Colour shall be confirmed by the Employer.
- e) Thickness shall be a minimum of 3mm.
- f) Upper surface shall fall towards the building at not less 1:60, unless indicated otherwise on the Design Drawings.
- g) Provide concealed support frame and brackets as required.
- h) Include concealed mechanically secured fixings to substrate as required.
- i) Copings shall continue at building corners and junctions with a seamless continuous finish.
- j) Insulation shall be included as required to achieve the performance requirements, including anti-drumming insulation to the underside.
- k) Joints:
 - i) Joints shall be of profiles accepted by the Employer.
 - ii) Locations shall be as indicated on the Design Drawings, or to the acceptance of the Employer.
 - iii) Assemble joints centrally over support.
 - iv) Joints shall include concealed continuous sealed gaskets with recessed/ folded interconnecting joints to provide a neat flush external appearance.

H31.1206 Profile Fillers

- a) The type(s) supplied by the sheet manufacturer shall match the sheet profile.

- b) Where indicated on the Design Drawings and wherever necessary, corrugation cavities shall be closed off from the outside and inside of the building. Fit tightly and leave no gaps.

H31.1207 Vapour Control

Where ventilation is not required, such as fully blanked-off zones, include suitable vapour control barrier(s) and associated protection to provide a continuous line of protection.

Metal Copings

H31.1208 Type EWS-402 Aluminium Coping

Pressed aluminium copings and cappings to sizes and profiles indicated on the Design Drawings, with powder coat finish to colour(s) accepted by the Employer and inclusive of accessories as necessary to suit individual service conditions.

Metal Flashings and Trims

H31.1209 Type EWS-403 Aluminium Flashings/ Trims

Pressed aluminium flashings/ trims to sizes and profiles indicated on the Design Drawings, with powder coat finish to colour(s) accepted by the Employer and inclusive of accessories as necessary to suit individual service conditions.

Metal Profiled Sheet Roofing Systems

H31.1210 Type RFS-251 Profiled Metal Sheet Roofing

Built up sheet roofing system, configured as indicated on the Design Drawings.

- a) Manufacturer: MRM.
- b) Reference: Lifestyle Shingle Tile.
- c) Secondary support structure: Structural steel support, as indicated on the Design Drawings and Structural Engineer's documentation.
- d) Vapour control layer: As recommended by the manufacturer.
- e) External profiled weather sheeting:
 - i) Outer layer of pre-manufactured zinc coated mild steel sheets with shingle imprint, laid to profile of roof.
 - ii) The external finish shall be ceramic-coated stone chip surface finish.
 - iii) Colour shall be Forest Green, as accepted by the Employer through sampling.
 - iv) Joints as recommended by the manufacturer.
 - v) There shall be no through fixing of the outer sheet.
 - vi) Laps as recommended by the manufacturer.
- f) Proprietary ridge ventilation components to the acceptance of the Employer.
- g) Accessories:
 - i) Integral suitably backed PVC gutters as indicated on the Design Drawings with formed apertures for outlets and suitable connection to downpipes.
 - ii) System shall include signage, clips (at suitable heights), barrier pads, spacers, fixings, sealing strips, sealants, matching flashings, collars, soakers, aprons, upstands, valleys, weathering, cappings, profile fillers and accessories necessary to complete the installation.

H31.1300 MATERIALS

Metalwork and Finishes

H31.1301

Metalwork

Refer to Section Z11.

H31.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Fixings

H31.1303

General

- a) Refer to Section Z20.
- b) Fixing components shall comply with statutory requirements.
- c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Sealants and Gaskets

H31.1304

Sealants

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.

H31.1305

Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

H31.2000

SUBMITTALS AND TESTING

H31.2100

SUBMITTALS

Tender Submittals

H31.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

H31.2102

Pre-contract Samples

Not required.

H31.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x two full sheet widths of aluminium roof covering of each type. The sample shall include accepted joints.
- b) 300mm x 200mm colour sample of finish.
- c) Accepted methods for the mechanical sealing of penetrations through the Works.

H31.2104

Mock-up Requirements

Not required.

H31.2105 Prototype Requirements

Not required.

H31.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed structural bay of each type of system.

H31.2200 TESTING

H31.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).
- c) The Works shall be tested in accordance with the requirements of the CWCT Standard Test Methods for Building Envelopes.

On-Site Testing

H31.2202 Waterproofing and Watertightness Testing

- a) Test the watertightness of the Works using a simulated rain and hose test procedure, or as recommended by the system manufacturer, to the acceptance of the Employer. The results of each test shall be recorded and issued at the end of each test:
 - i) Subject the designated area of the Works to a 15 minute rain test using a spray rack containing sufficient hose nozzles to deliver the equivalent of 75mm of rain per hour. Check for leaks using endoscopy or other non-destructive methods, or by opening up the construction as directed. Perform repairs or replacements as necessary.
 - ii) Perform hose tests on 5% of sealed joints not subject to other testing regimes, in accordance with the procedures prescribed in the CWCT Standard for Systemised Building Envelopes. Check for any leaks and perform repairs, replacements and additional testing and inspections.
- b) Details of the system and a proposed method statement shall be submitted for acceptance at least one month prior to the proposed testing on Site.
- c) A schedule of the programme for testing to be carried out shall be submitted, giving forewarning to the Employer of when the tests are to be carried out.
- d) Prior to testing, check that the Works have been completed to a stage where the integrity of the system can be tested, that obvious defects have been made good and that the Works have been cleared of materials, debris and dust.
- e) Testing shall be carried out when work to the areas that are to be tested are complete, including that of associated and interfacing trades.
- f) Performance under testing:
 - i) There shall be no leakage through the Works at any time during the test or within 15 minutes of completion of the test.
 - ii) If any leaks/ defects occur, mark the location on the Works; where applicable, water shall be drained completely. Prepare a report to be submitted to the Employer together with proposals for remedial measures. Any part of the Works that is adversely affected shall be replaced or repaired; the design intent shall be maintained.
 - iii) At completion of the test there shall be no standing water in locations to remain dry. Certify the waterproof integrity of the Works.

- g) After making good any defects, retest locally to verify integrity of repair.

H31.2203

Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:
 - i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
 - ii) Apply a proof load of 1.5 times the unfactored design load.
 - iii) Test 10% of the installed fixings as a minimum, or as indicated in the Structural Engineer's documentation, where the more onerous shall apply.
- g) Torque Site testing:
 - i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
 - ii) Test 100% of the installed fixings.
 - iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.
 - iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
 - i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum, or as indicated in the Structural Engineer's documentation, where the more onerous shall apply.

H31.2204

Sealant Testing

Refer to Section Z22.

H31.3000

EXECUTION

H31.3100

WORKMANSHIP

Fabrication

H31.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.

- c) Where applicable and practical, fabrication and assembly shall take place in equipped workshops with site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

H31.3102

Metalwork

Refer to Section Z11.

Workmanship

H31.3103

General

- a) Fabricate and install the Works in accordance with the appropriate parts of CP 143, using proven methods of assembly to provide a secure, free draining and completely weatherproof installation.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.
- d) Sides and ends of sheets shall be lapped in accordance with the manufacturer's recommendations.
- e) Where required, materials shall be bent to the required profile without causing grain separation or other defects. Corners shall be formed to the smallest radius possible and curved components to radius as required.
- f) The system shall interface with pipes, ducts, structural members and other components that pass through it by mechanical means including seals, collars, sleeves, clips, welds, counter flashings and other such methods to maintain the requirements of the Architectural Specification.
- g) Sharp metal edges shall be folded under or removed as work proceeds.

Inspection/ Preparation

H31.3104

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

H31.3105

Suitability of Base/ Backing

- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.
- d) Surfaces to be covered shall be firmly fixed, dry, smooth, without depressions, voids or protrusions, clean and free from frost, unacceptable curing compounds, release agents and other surface contaminants.
- e) The base shall have even falls with no areas subject to ponding.

- f) Preliminary work including formation of upstands, kerbs, box gutters, sumps, grooves, chases, pipe sleeves and expansion joints and fixing of battens, fillets and anchoring plugs/ strips shall be complete and satisfactory.
- g) Sweep the substrate thoroughly prior to application of the Works.

Installation

H31.3106

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- d) Setting out shall be centred between walls so that cut materials/ components at the perimeter are of equal sizes and not smaller than one third of original size.
- e) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- f) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- g) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- h) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- i) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- j) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

H31.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

H31.3108

Breather Membrane

- a) Breather membranes shall be installed in accordance with the manufacturer's recommendations.
- b) Before fixing, the moisture content of substrate shall be checked and shall be below 20%.
- c) Fix material to create a fully sealed membrane free from tears, punctures and sagging to provide a complete barrier to water, snow and wind blown dust/ particles.
- d) The membrane shall be secured at reveals/ perimeters of openings.
- e) Joints and edges, including around pipes, window openings and ducts, shall be sealed and secured in accordance with the manufacturer's recommendations.
- f) Immediately before covering over, check membranes for tears and perforations. Repair any damage found or replace the membrane in accordance with the manufacturer's recommendations and to the acceptance of the Employer.

H31.3109

Vapour Control Layer/ Air Barrier

- a) Prime substrates as necessary to achieve a full bond.
- b) Fix material to provide a fully sealed barrier free from tears, punctures and sagging.
- c) Joints in the vapour barrier shall be aligned to suit the configurations of the Works, insulation and backing.
- d) Sides and ends of sheets shall only be lapped where fully supported.
- e) Laps shall be formed and continuously sealed in accordance with the manufacturer's recommendations.
- f) Joints in a second layer, if required, shall be staggered by half a sheet.
- g) Penetrations by pipes, ducts, structural members and other components shall be completely sealed with adhesive tape in accordance with the manufacturer's recommendations.
- h) Immediately before covering over, check membranes for tears and perforations. Repair any damage found or replace the membrane in accordance with the manufacturer's recommendations and to the acceptance of the Employer.

H31.3110

Fire and Smoke Barriers

- a) Cut material to fit tightly, achieve correct compression and be securely fixed along edges.
- b) Joints shall be wired or stapled together to provide a complete barrier to smoke and flame.
- c) Installation of proprietary systems/ products shall be in accordance with the manufacturer's recommendations.

H31.3111

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

H31.3112

Accessories

Closure pieces, flashings, trims, gutters, fillers, spacers, tapes, sealants and fixings, where not specified, shall be types recommended by and installed in accordance with the manufacturer's recommendations to suit the service conditions.

H31.3113

Flashings/ Trims

- a) Joints in flashings/ trims shall be installed to fully accommodate thermal movement.
- b) Proprietary expansion joints shall be installed on flat sheets wherever practicable.
- c) Joints generally shall be in accordance with the system manufacturer's recommendations and/ or the recommendations contained within the latest edition of 'Profiled Sheet Metal Roofing and Cladding, A Guide to Good Practice' published by The National Federation of Roofing Contractors (NFRC) whichever the more onerous, or as otherwise stated.

H31.3114 Sealants

For general sealants refer to Section Z22 of the Architectural Specification.

H31.3115 Structural Movement Joints

- a) Back-to-back supported upstands shall be provided, fixed either side of gaps coinciding with structural movement joints. The gap width shall match the structural movement requirements and shall be protected by cover flashings fixed to one side only.
- b) Details shall be in accordance with the manufacturer's recommendations.

H31.3116 Skirtings/ Upstands

- a) Form upstands in accordance with the manufacturer's recommendations.
- b) Return insulation up upstands as required.
- c) Aluminium sheet shall be dressed up (and over) upstands to form continuous waterproofing as required.

H31.3117 Abutments

Weathertight junctions with interfacing elements shall be located and dressed down.

H31.3118 Verge Termination

- a) Refer to the Design Drawings.
- b) Interface with adjoining systems as required, as indicated on the Design Drawings, and provide a fully sealed interface.

H31.3119 Eaves Termination

- a) Refer to the Design Drawings.
- b) Interface with adjoining systems and eaves gutter, as indicated on the Design Drawings and provide a fully sealed interface.

H31.3120 Gutters

- a) Gutters shall be fully supported at each joint and at intermediate positions as required under all conditions.
- b) Spigot ends shall be fixed up the slope.
- c) Joints shall be fully watertight under all conditions.

H31.3200 TOLERANCES

H31.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.

- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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H51 NATURAL STONE SLAB CLADDING/ FEATURES

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

H51.1000 TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

H51.1100 ARCHITECTURAL SPECIFICATION AND SCOPE

H51.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

H51.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

H51.1201 General

- a) Design and execute the Works in accordance with the relevant parts of BS 8298 and the Centre for Window and Cladding Technology (CWCT) Standard for Systemised Building Envelopes and CWCT Technical Notes.
- b) The Works shall be covered by a single source warranty.
- c) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and to achieve the performance requirements.
- d) Components for lightning protection and earth bonding shall be concealed.
- e) Design and install the Works as complete integrated systems, including necessary support structure, bracketry, fixing rails and plates, angles, cleats, grouting, fixings and fastenings, rivets, clips, vapour control barriers, insulation, damp-proof membranes, breather and other membranes, intumescent fire stops and cavity barriers, acoustic breaks, pressed metal components, closures, seals and sealants, gaskets, fillers, tapes, spacers, packers, shims, isolators and other accessories and components necessary to complete the installation.

H51.1202 Services

- a) Accommodate services as indicated in the Services Engineer's documentation, in a concealed manner acceptable to the Employer.
- b) Agree locations/ positioning of services with the Employer where not indicated on the Design Drawings.
- c) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.

H51.1203 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Indicate the type, size and positioning of mechanical fixing devices on the Working Drawings.
- c) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

H51.1204 Fixing to Structure

- a) Provide necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) Include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
- c) Co-ordinate fixing with the superstructure design.
- d) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

H51.1205 Vapour Control

Where ventilation is not required, such as fully blanked-off zones, include suitable vapour control barrier(s) and associated protection to provide a continuous line of protection.

H51.1206 Pressed Metal Components/ Accessories

- a) Incorporate necessary pressed metal accessories including flashings, collars, copings, cappings, cills, reveals, returns and other formed accessories.
- b) Form components from fully welded and/ or sealed pressed metal sheets, which shall be sufficiently thick to provide a visually flat surface and to eliminate distortion and permanent deformation.
- c) Systems shall include special prefabricated corner pieces for changes in direction. There shall be no cut corners at changes in direction.
- d) Components shall be of finish, colour and texture confirmed by the Employer, where not specified.
- e) Provide concealed support as required.
- f) Provide insulation as required to achieve the performance requirements, including anti-drumming insulation to the underside.

Natural Stone Cladding

H51.1207 Type EWS-331 Natural Stone Cladding

Natural stone cladding system configured as indicated on the Design Drawings.

- a) Manufacturer: Eurocon Tiles Products Ltd.
- b) Natural stone: Makos Stone.
- c) Reference: Scarpa FlowStone.
- d) Finish: Bush hammered.
- e) Thickness: 20mm, as accepted by the Employer.
- f) Tile size: 400mm(L) x 200mm(H).
- g) Edges: Square edges to co-ordinate with the jointing requirements as indicated on the Design Drawings.
- h) Joints:
 - i) Joints shall be sealed with lime mortar to match natural stone.
 - ii) Joints shall be flush as indicated on the Design Drawings.
 - iii) Vertical joints shall be staggered/ offset against the vertical mortar joints behind.
- i) Sealant: Apply a suitable, thin uniform film of proprietary sealer recommended by the stone manufacturer and to the acceptance of the Employer.
- j) Fixing:
 - i) Adhesive fixed to blockwork wall substrate in accordance with the Structural Engineer's documentation.

- ii) Manufacturer: Sika.
- iii) Reference: SikaCeram-30.
- k) Special features/ details: Pre-formed 90 degree corner pieces comprising 400mm long and 200mm long in the two directions.

H51.1300

MATERIALS

Stone

H51.1301

Natural Stone

- a) Stone selection and testing to comply with CWCT 'Guide to the Selection and Testing of Stone Panels for External Use'.
- b) Provide proof of advance registration of materials.
- c) Stone slabs for external use fixed to walls or ceilings/ soffits by mechanical or mortar/ adhesive methods shall be in accordance with BS EN 1469.
- d) The stone types specified are based on the visual requirements of the Employer. Confirm the suitability of the stone types for purposes and applications based on performance requirements and testing. If the stone types are inappropriate for use, inform the Employer in writing, recommend suitable stone type(s) of similar appearance to those specified and submit samples for review and acceptance.
- e) Stone shall be CE marked in accordance with BS EN 1469, including any additional information as required to indicate compliance with the performance requirements. The following information shall be supplied either on the packaging or on the delivery note:
 - i) The petrographical name of the stone.
 - ii) The commercial name of the stone.
 - iii) The name and address of the manufacturer.
 - iv) The name and location of the quarry.
 - v) Reference in accordance with BS EN 1469.
 - vi) The declared value or marking designation classes.
 - vii) Other information, e.g. surface chemical treatments.
 - viii) Other information as required by Annex ZA of BS EN 1469 including:
 - Breaking strength.
 - Breaking strength after freeze/ thaw testing.
 - Abrasion.
- f) Arrangements shall be made for the Employer, and others as necessary, to inspect samples of stone in the respective quarries which represent the range of variations in appearance. The acceptance of the Employer shall be obtained before confirming orders with manufacturers or proceeding with production.
- g) The stone shall be thoroughly seasoned and free from cracks, vents, fissures or other defects that may adversely affect appearance, strength, weathering qualities or durability.
- h) Permissible variations in colour, texture and other natural material characteristics of the proposed stone shall be as accepted by the Employer through range sampling. This shall include any finishing processes as described and undertaken during fabrication, prior to commencing production.
- i) No deleterious constituents or minerals shall be permitted, outside the natural characteristics of the stone as accepted through sampling.

- j) Stone shall be non-susceptible to staining.
- k) No saw marks shall be visible on the finished surface.
- l) The total quantity required shall be obtainable within the sample variation parameters.

H51.1302 Stone Sealer

- a) Sealer shall be compatible with the stone type.
- b) The sealer shall maintain the visual requirements and performance of the stone.

Metalwork and Finishes

H51.1303 Metalwork

Refer to Section Z11.

H51.1304 Finishes

Refer to Section Z30 for general finishes to metalwork.

Fixings

H51.1305 General

- a) Refer to Section Z20.
- b) Fixing components shall comply with statutory requirements.
- c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Sealants

H51.1306 General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.

Membranes

H51.1307 Breather Membrane

- a) Membranes shall be water resistant, water vapour permeable and manufactured from non-woven, spunbonded high density polyethylene, or acceptable equivalent.
- b) Membranes shall be certified to an internationally recognised Agrément Certificate to the acceptance of the Employer.
- c) Vapour resistance of the breather membrane shall not be greater than that of the substrate it is protecting.

H51.1308 Vapour Control Layers/ Air Leakage Barrier

- a) High performance reinforced membranes of metal foil or plastics, protected both sides by rigid facings/ linings to achieve the performance criteria.
- b) Foil backed plasterboard shall not be accepted.
- c) Membranes shall be certified to an internationally recognised Agrément Certificate to the acceptance of the Employer.

H51.2000 SUBMITTALS AND TESTING

H51.2100 SUBMITTALS

Tender Submittals

H51.2101

Tender Response

- a) Provide tender submittals in accordance with the requirements of Section A of the Architectural Specification.
- b) Submit a design response with the tender proposal, to include profiles of typical conditions, with dimensions.
- c) The tender design response shall include:
 - i) Samples where specified.
 - ii) List of Tests included.
 - iii) Quality management programme.
 - iv) List of proposed Working Drawings.
 - v) Summary of deviations from the Design Drawings and the Architectural Specification.
 - vi) Outline technical specifications reflecting proposed materials/ systems.
 - vii) A list of proposed manufacturers and subcontractors to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

H51.2102

Pre-contract Samples

Not required.

H51.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) Samples of types of cladding materials, 600mm x 600mm cladding and special shapes, as agreed.
- b) Samples of visible accessories.
- c) Various samples of fastening devices and anchors.
- d) Various stone samples for testing of stone properties and performance. Refer to testing requirements specified.

H51.2104

Mock-up Requirements

Not required.

H51.2105

Prototype Requirements

Not required.

H51.2106

Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed structural bay of each type of system.

H51.2200

TESTING

H51.2201

General

- a) Off-Site testing:

- i) The Contractor may submit data from previous independently certified tests to demonstrate that the Contractor's proposed systems achieve the performance requirements of the Architectural Specification. The information shall be to the entire satisfaction of the Employer.
 - ii) If suitable data to demonstrate compliance with the performance requirements is not available, submit prototypes of each type and have them independently tested in accordance with the testing criteria indicated in the Architectural Specification.
 - iii) Independently certified test data, as applicable, shall include static and dynamic results, and Agrément certificates.
- b) On-Site testing: The Contractor shall include on-Site testing specified herein.
- c) The testing regime shall be agreed between the Employer and the Contractor, with regard to the specific service conditions. The regime shall be in accordance with BS EN 1469, with an independent body being appointed.

H51.2202 Appointment of Testing Laboratory

For the purpose of testing, a qualified geologist/ stone consultant, working for an independent Kenya Accreditation Service (KENAS) accredited testing laboratory shall be appointed for the whole cycle of testing required. The laboratory shall certify that the samples tested are from the same block(s) selected for the project and continuing custody of samples together with marking of blocks will be deemed essential. Deliver samples to the testing laboratory, including the completion of all customs formalities (if appropriate) and the payment of all levies or duties.

H51.2203 Selection

- a) Quarry assessment: Quarry evaluation, in situ material variability and characteristics, production facility inspection and quality system assessment shall be carried out by an independent qualified geologist/ stone consultant experienced in the use of natural stone for external façades.
- b) Representative approval testing blocks (3 No.) shall be selected by a qualified geologist/ stone consultant working for an independent Kenya Accreditation Service (KENAS) accredited testing laboratory. Testing shall be performed at an independent KENAS accredited testing laboratory. The material selected for testing shall match the agreed project reference control samples.
- c) The testing laboratory or manufacturer shall be engaged to select testing samples at the quarry.

H51.2204 Preliminary Testing

- a) Petrographic examination in accordance with BS EN 12407.
- b) Water absorption in accordance with BS EN 13755.
- c) Apparent density and real density in accordance with BS EN 1936.
- d) Open porosity and total porosity in accordance with BS EN 1936.
- e) Flexural strength under constant moment in accordance with BS EN 13161.
- f) Determination of breaking load at dowel hole in accordance with BS EN 13364.
- g) Determination of frost resistance in accordance with BS EN 12371.
- h) Resistance to salt crystallization in accordance with BS EN 12370.
- i) Test certificates and reports shall be presented in their entirety and are to include individual and mean values obtained.

H51.2205 Production Quality Management Testing

- a) General:
 - i) When production of stone for the project commences, the stone shall be tested at a KENAS accredited test laboratory acceptable to the Employer to demonstrate compliance with the Architectural Specification.

- ii) Unless otherwise agreed, test samples for the production testing shall be selected by an independent qualified geologist/ stone consultant.
- b) Visual inspection:
 - i) The rough edge of each block shall be sawn off exposing a fresh face. The face shall be visually inspected by an independent qualified geologist/ stone consultant for any visible defects, changes in structure or texture, and general conformance to the aesthetic criteria defined by the Employer and illustrated in agreed project reference samples.
 - ii) From the slab a test area shall be taken sufficient to prepare the proposed tests in the project bedding orientation.
- c) Type and frequency of testing shall be agreed in lieu of the preliminary testing results to maintain a true representation of the material reserved for the project.

H51.2206

Testing of Fixings

Assembly/ panel testing:

- a) The specific test methods and number of tests shall be appropriate to the scope design and complexity of the project.
- b) As a minimum each type of anchor or fixing shall have at least 15 No. tests carried out to destruction.
- c) Each panel shall be tested to ultimate failure.
- d) The actual number of tests to be performed and the test conditions (i.e. bedding/ rift orientation, dry, wet, cyclic loading, freeze-thaw cycles) shall be determined by a construction professional based on the approval test data and available technical performance data available for the particular fixing(s).
- e) The type of test (shear, pull-out) shall be dictated by the nature of the anchor/ fixing (i.e. support and/ or gravity). Where appropriate, for instance, tests shall be performed in different loading directions to simulate positive and negative wind loading with a gravity load applied.
- f) Test certificates and reports shall be presented in their entirety and are to include individual and mean values obtained.

H51.2207

Impact Testing

A soft body impact test shall be carried out in accordance with BS EN 12600, conforming to the category requirements specified.

H51.2208

Results of Tests

Results shall confirm the suitability of the selected stone and shall be submitted to the Employer for acceptance.

On-Site Testing

H51.2209

Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:

- i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
 - ii) Apply a proof load of 1.5 times the unfactored design load.
 - iii) Test 10% of the installed fixings as a minimum, or as indicated in the Structural Engineer's documentation, where the more onerous shall apply.
- g) Torque Site testing:
- i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
 - ii) Test 100% of the installed fixings.
 - iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.
 - iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
- i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum, or as indicated in the Structural Engineer's documentation, where the more onerous shall apply.

H51.3000

EXECUTION

H51.3100

WORKMANSHIP

Fabrication

H51.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.
- g) Each stone unit shall be clearly marked with its identification symbol relative to its position within the wall layout. Production and storage of units shall be configured so that delivery in accurate sequence for Site fixing is possible.

H51.3102

Metalwork

Refer to Section Z11.

H51.3103

Stone

- a) Stone shall be cut, dressed, worked and finished by skilled masons. Evidence of previous experience and details of work previously carried out shall be provided.

- b) Stone shall be cut, dressed, worked and finished before delivery to Site.
- c) Cutting, dressing, working and finishing of the stone shall not adversely affect performance and the results obtained through testing.
- d) Remedial work during fabrication, such as patching and filling, shall not be undertaken, without acceptance by the Employer.

H51.3104

Sizes Generally

- a) Panels shall be cut to size. They shall hold out square at the back, i.e. without corners broken away whereby the strength of the fixings system may be impaired.
- b) The thickness of each unit shall not vary from that specified/ indicated on the Design Drawings by more than +3mm or +10%, whichever is the more onerous. Thicknesses behind fixing mortice positions shall be consistent.
- c) Units/ panels shall be square at faces so that any deviations in length or height dimensions are uniform and shall achieve uniform joint widths. The edges shall also be square.

Workmanship

H51.3105

General

- a) Workmanship shall generally be in accordance with the relevant parts of BS 8298.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

H51.3106

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

H51.3107

Suitability of Base/ Backing

- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.
- d) Surfaces to be covered shall be firmly fixed, dry, smooth, without depressions, voids or protrusions, clean and free from frost, unacceptable curing compounds, release agents and other surface contaminants.
- e) Preliminary work shall be complete and satisfactory.

Installation

H51.3108

General

- a) Systems shall accommodate future moisture and temperature movement.

- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- d) Setting-out of cut materials/ components at the perimeter shall be of equal sizes, not smaller than one third of original size and to the acceptance of the Employer, unless otherwise indicated on the setting out drawings.
- e) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- f) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- g) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- h) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- i) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- j) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

H51.3109 Drainage Points

Drainage weepholes shall be provided at the base of the wall to conceal protruding pipework.

H51.3110 Support System/ Fixings

- a) Wherever anchor slots, inserts or pre-set fixings of any kind are placed in structural concrete, it is essential that these are accurately positioned. Where, for any reason, this does not occur, a suitable new fixing shall be provided, which is securely post-fixed to the structural concrete at no additional cost.
- b) Pre-cut mortices, sinkings and notches for cramps and dowels shall be formed to align adjacent stone.

H51.3111 Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

H51.3112 Damp-proof Membranes

- a) Substrates to receive membranes shall be free from dust and grease, free of cavities, ridges and sharp projections and shall be primed to receive adhesive as recommended by the membrane manufacturer. Surfaces that are not suitable to receive membrane shall be reported to the Employer.
- b) Membrane shall be lapped at least 100mm and bonded in accordance with the manufacturer's recommendations.

H51.3113 Breather Membrane

- a) Breather membranes shall be installed in accordance with the manufacturer's recommendations.
- b) Before fixing, the moisture content of substrate shall be checked and shall be below 20%.
- c) Fix material to create a fully sealed membrane free from tears, punctures and sagging to provide a complete barrier to water, snow and wind blown dust/ particles.
- d) The membrane shall be secured at reveals/ perimeters of openings.
- e) Joints and edges, including around pipes, window openings and ducts, shall be sealed and secured in accordance with the manufacturer's recommendations.
- f) Immediately before covering over, check membranes for tears and perforations. Repair any damage found or replace the membrane in accordance with the manufacturer's recommendations and to the acceptance of the Employer.

H51.3114 Vapour Control Layer/ Air Barrier

- a) Prime substrates as necessary to achieve a full bond.
- b) Fix material to provide a fully sealed barrier free from tears, punctures and sagging.
- c) Joints in the vapour barrier shall be aligned to suit the configurations of the Works, insulation and backing.
- d) Sides and ends of sheets shall only be lapped where fully supported.
- e) Laps shall be formed and continuously sealed in accordance with the manufacturer's recommendations.
- f) Joints in a second layer, if required, shall be staggered by half a sheet.
- g) Penetrations by pipes, ducts, structural members and other components shall be completely sealed with adhesive tape in accordance with the manufacturer's recommendations.
- h) Immediately before covering over, check membranes for tears and perforations. Repair any damage found or replace the membrane in accordance with the manufacturer's recommendations and to the acceptance of the Employer.

H51.3115 Fire and Smoke Barriers

- a) Cut material to fit tightly, achieve correct compression and be securely fixed along edges.
- b) Joints shall be wired or stapled together to provide a complete barrier to smoke and flame.
- c) Installation of proprietary systems/ products shall be in accordance with the manufacturer's recommendations.

H51.3116 Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.

- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

H51.3117 Flashings/ Trims

- a) Joints in flashings/ trims shall be installed to fully accommodate thermal movement.
- b) Proprietary expansion joints shall be installed on flat sheets wherever practicable.
- c) Joints generally shall be in accordance with the system manufacturer's recommendations and/ or the recommendations contained within the latest edition of 'Profiled Sheet Metal Roofing and Cladding, A Guide to Good Practice' published by the National Federation of Roofing Contractors (NFRC) whichever the more onerous, or as otherwise stated.

H51.3118 Sealants

For general sealants refer to Section Z22 of the Architectural Specification.

Protection and Completion

H51.3119 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

H51.3120 Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

H51.3121 Completion

- a) Installed work shall be left clean.
- b) Defects shall be repaired without delay, to minimise damage and nuisance.
- c) A representative of each system/ product manufacturer shall inspect the Works and notify the Contractor of any defects. Defects shall be corrected.
- d) Do not use the Works for any purpose, except testing, until Practical Completion.
- e) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components.

H51.3200 TOLERANCES

H51.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.

- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.
- p) Tolerances shall be in accordance with BS 5606, BS EN 1469, and as specified herein.

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K10 PLASTERBOARD DRY LININGS/ CEILINGS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

K10.1000 TYPE, SYSTEMS AND MATERIALS

K10.1100 ARCHITECTURAL SPECIFICATION TYPE

K10.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

K10.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

K10.1201 General

- a) System build-ups shall be as indicated on the Design Drawings. Indicated fixing zone dimensions do not include plaster skim or other applied finishes.
- b) Unless indicated otherwise wall lining systems shall form integrated systems spanning from the structural floor to the structural soffit, maintaining the overall system performance throughout.
- c) Studwork framing is specified based on the stud to be used. Head, base and abutment channels shall be the system manufacturer's standard type of the corresponding size unless indicated otherwise in the Architectural Specification.
- d) The position of facing boards described in the system descriptions indicate the outer board first, moving inwards towards the framing.
- e) Where the Works will be subject to wet conditions such as in bathrooms/ shower rooms/ kitchens, the outer facing plasterboard shall be replaced with moisture resistant type with equivalent fire/ acoustic performance to that indicated in the system description.
- f) Install damp-proof membranes at interfaces with substrates which have not fully cured and contain residual moisture. Such membranes shall maintain the performance of both the substrate and the proposed plasterboard system.
- g) Thicknesses shall be as indicated on the Design Drawings.

K10.1202 Framing and Supports

The Design Drawings do not identify all the framing and supporting accessories:

- a) Lining systems shall include channels, fixings, fixing straps, timber sections/ noggings, bearers, retaining clips, angles, trims, firestops, sealants, beads, edges, corner reinforcements, control joints, tapes, compounds and other accessories recommended/ supplied by the system manufacturer to suit the service conditions.
- b) Studs and dry lining channels shall be set out at maximum 600mm centres unless indicated otherwise on the Design Drawings or described in the Architectural Specification.
- c) Ceiling/ bulkhead systems shall include necessary secondary support, connecting clips, nuts and bolts, fixings, firestops, sealants, beads, edges, corner reinforcements, control joints, tapes, compounds and other accessories/ components recommended/ supplied by the system manufacturer to suit the service conditions.
- d) Openings for access panels and service penetrations shall receive additional support.

K10.1203 Ceiling Suspension Systems

- a) Unless otherwise specified, suspension systems shall comprise hot dip galvanised mild steel tee sections with associated fixings and accessories.
- b) The system shall be supported from the structural soffit by galvanised mild steel rigid adjustable hangers, secondary and main runners, with appropriate fixings to the substrate soffit in accordance with the manufacturer's recommendations.

K10.1204 Fixtures, Fittings and Services

- a) Systems shall include pattresses and fixing plates where required to support surface mounted fixtures and fittings. Pattresses/ fixing plates shall be of non-combustible materials in accordance with the fire performance requirements.
- b) Medium weight fixtures shall be supported with fixing plates as recommended by the system manufacturer.
- c) Linings with specific acoustic performance requirements shall incorporate proprietary acoustic service supports and backing plates as recommended by the system manufacturer to suit the service conditions.
- d) Systems shall include cut-outs for light fittings, switches, socket outlets and other services as indicated on the Design Drawings.
- e) Setting-out of ceiling supports/ hangers shall be co-ordinated with services within the ceiling voids.
- f) Socket outlet, switch and data outlet boxes:
 - i) Socket outlet, switch and data outlet boxes shall not be located back to back.
 - ii) Detailing of socket outlet, switch and data boxes shall be in accordance with the system manufacturer's recommendations.
 - iii) Where required to maintain fire and/ or acoustic performance, socket outlet, switch, and data outlet boxes shall be sealed with intumescent acoustic putty pads such as CP 617 manufactured by Hilti (GB) Ltd, or acceptable equivalent.

K10.1205 Finishing

- a) Unless specified, or indicated otherwise, outer lining plasterboard shall be square edged, scrim taped and finished with plaster skim suitable to receive applied finishes. Refer to Section M20 of the Architectural Specification.
- b) Generally, skim plaster shall not be applied to moisture resistant plasterboard in areas subject to high humidity.
- c) Where moisture resistant plasterboard has been used for temporary moisture resistance during construction, in a location that is not permanently subject to high humidity, a skim plaster with a suitable bonding agent pre-treatment shall be applied in accordance with the system manufacturer's recommendations.
- d) Flush jointing (tape and fill) shall only be used if samples of the joints have been accepted by the Employer.
- e) Where indicated and as configured on the Design Drawings, the system shall include an integrated skirting detail.

K10.1206 Technical Requirements

- a) Where the fire performance of a system is indicated, the value given is for integrity and insulation.
- b) Systems shall be sealed at the perimeter to maintain the fire and/ or acoustic performance in accordance with the manufacturer's recommendations.

Ceiling voids shall incorporate continuous vertical cavity barriers for fire/ smoke and sound, using proprietary encapsulated mesh-reinforced mineral fibre products in accordance with the system manufacturer's recommendations and configured as indicated on the Design Drawings or otherwise required.

Ceilings, Soffits and Bulkheads

- K10.1207 Type CLG-101 Plasterboard Ceiling
- Suspended plasterboard monolithic ceiling/ bulkhead.
- a) Manufacturer: Knauf Kenya Ltd.
 - b) Framing: Metal framing system.
 - c) Facings: 1 No. layer of 15mm WallBoard.
- K10.1208 Type CLG-102 Plasterboard Ceiling - Fire Rated
- Suspended plasterboard monolithic ceiling.
- a) Manufacturer: Knauf Kenya Ltd.
 - b) Fire performance: 60 minutes resistance.
 - c) Framing: Metal top hats fixed to underside of trusses.
 - d) Facings:
 - i) Inner facing: 1 No. 15mm layer cement particle board.
 - ii) Outer facing: 1 No. 15mm layer FireLine plasterboard.

Plasterboard Linings

- K10.1209 Type IWS-101 Plasterboard Dry Lining
- Internal lining to walls, configured as indicated on the Design Drawings.
- a) Manufacturer: Knauf Kenya Ltd.
 - b) Reference: Regular Gypsum Board.
 - c) Framing: Metal framing as agreed with the Employer.
 - d) Facings: 1 No. layer of 12.5mm plasterboard.

K10.1300 MATERIALS

Plasterboard

- K10.1301 General
- a) Plasterboard shall be in accordance with BS EN 520.
 - b) Where applicable, plasterboard shall include metallised polyester film backing. Metal foil adhered to the plasterboard shall not be accepted as vapour barrier.
 - c) Recycled content shall be in accordance with the quality management criteria.
- K10.1302 High Performance Building Boards
- a) Impact resistant gypsum plasterboard with higher density core with glassfibre reinforcement and other additives in the core in accordance with BS EN 520, Types D, F, I and R.
 - b) Specially formulated board suitable for high humidity areas to receive ceramic tiling or similar bonded surface finish. Minimum 1500kg/ m³ density.

Metalwork and Finishes

- K10.1303 Metalwork
- Refer to Section Z11.

K10.1304	Light Steel Frame Metal Stud/ Channels Light steel frame metal stud/ channels shall be in accordance with BS EN 14195.
K10.1305	Finishes Refer to Section Z30 for general finishes to metalwork. Fixings
K10.1306	General a) Refer to Section Z20. b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions. c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances. d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion. e) Visible fixings shall be a type agreed with the Employer prior to installation. Adhesives
K10.1307	General Refer to Section Z20. Sealants
K10.1308	General a) Refer to Section Z22. b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
K10.2000	SUBMITTALS AND TESTING
K10.2100	SUBMITTALS
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K10.2101	Tender Response Not required. Samples, Mock-ups, Prototypes and Quality Benchmarks
K10.2102	Pre-contract Samples Not required.
K10.2103	Post Contract Award Samples Not required.
K10.2104	Mock-up Requirements Not required.
K10.2105	Prototype Requirements

Not required.

K10.2106

Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed structural bay of each type of dry lining and ceiling system.

K10.2200

TESTING

K10.2201

General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

K10.3000

EXECUTION

K10.3100

WORKMANSHIP

Fabrication

K10.3101

General

Fabrication of components shall, as a minimum, be in accordance with current regulations and standards.

Workmanship

K10.3102

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system manufacturer.

Inspection/ Preparation

K10.3103

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

K10.3104

Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

K10.3105

Dampness

Where systems/ products are to be installed on new wet-laid backgrounds/ bases:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

K10.3106

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Visible joints at angles shall be mitred or to the acceptance of the Employer.
- h) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- i) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- j) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- k) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

K10.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.

- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.
- e) Only fix boards in areas that have been made weathertight.

K10.3108

Plasterboard

- a) Cutting of plasterboard shall be kept to a minimum.
- b) Plasterboard shall be cut without damage to core or tearing of paper facing.
- c) Plasterboard shall be taken from sheets of sufficient dimensions to reduce and avoid horizontal cuts within the finished surface.
- d) Cut edges shall be positioned at internal corners wherever possible, with masked bound edges of adjacent boards at external corners.
- e) Where plywood backing is indicated, plasterboard shall be fixed through the plywood into the stud framework.
- f) Boards shall be fixed securely and firmly to suitably prepared and levelled backgrounds, with heads of fastenings countersunk, without breaking the paper or the gypsum core. Finishes shall appear flush, smooth and flat with surfaces free from bowing and abrupt changes of level. Damaged boards shall not be used.
- g) Supports shall be fixed working from the centre of each board.

K10.3109

Metal Stud Linings

- a) Metal stud linings shall be fixed in accordance with BS 5234 or in accordance with the manufacturer's recommendations.
- b) Studs shall be positioned at equal centres, maintaining sequence across openings. Additional studs shall be provided as necessary to support the vertical edges of boards.
- c) Where more than one layer of plasterboard is applied, joints between layers shall be staggered.
- d) Boards shall be fixed to each stud and along edges with proprietary screws at appropriate centres, not less than 10mm from the edge of the board. Heads of screws shall be countersunk below the surface of boards without breaking the paper or the gypsum core, and filled to form a flush surface.
- e) Where indicated on the Design Drawings to provide support for handrails and/ or equipment, fixtures and fittings, additional support framing and fixings points within the lining shall be provided.

K10.3110

Plasterboard Ceilings

- a) Install ceilings in accordance with BS EN 13964.
- b) Boards shall be fixed, jointed and finished in accordance with the system manufacturer's recommendations.
- c) Boards shall be screwed without damaging surfaces. Any damaged board shall be removed and replaced.
- d) Boards shall be screwed securely and firmly to support members providing a flat surface free from bowing, lipping or any local distortion. Heads of screws shall be countersunk below the surface of boards without breaking the paper or the gypsum core, and filled to form a flush surface.
- e) Joints of boards applied in two or more layers shall be staggered so that edges and ends are fully supported and screwed to structure/ framing.

K10.3111

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.

- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.
- f) Eliminate ridges and high spots.

K10.3112

Joints in Plasterboard

- a) Joints between tapered edges of boards shall be lightly butted, leaving a 3mm gap where cut unbound edges occur.
- b) Horizontal joints shall not occur in surfaces exposed to view except where the height of the wall exceeds the maximum available length of the board. Joint positions not indicated on the Design Drawings shall be agreed with the Employer. Horizontal joints in two-layer boarding shall be offset by a minimum of 600mm and noggings shall be positioned to support the horizontal joints as recommended by the system manufacturer.

K10.3113

Finishing

- a) Cut edges of boards shall be lightly sanded to remove paper burrs with a PVAC sealer applied to exposed cut edges and any other plaster surface to which tape is applied.
- b) Joints and gaps shall be filled and covered with continuous lengths of tape, and fully bedded. Where joints are to be covered with finish they shall be feathered out to provide a smooth seamless surface.
- c) External angles shall be protected by the use of drywall angle beads with plasterboard edge beads at visible jointed abutments. Joint finish shall be applied to external angles. When jointing is complete and dry, apply drywall primer to the complete surface ready to receive decoration.
- d) Beads shall be flush with the board surface.
- e) Nail and screw depressions shall be filled with joint filler to provide a flush and smooth surface.
- f) Minor indentations shall be filled.
- g) On completion of joint, angle and spotting treatments a surface finish shall be applied to provide a continuous consistent finish to the surface of boards.

K10.3114

Sealants

Refer to Section Z22.

K10.3115

Fire and Smoke Barriers

- a) Cut material to fit tightly, achieve correct compression and be securely fixed along edges. Joints shall be wired or stapled together to provide a complete barrier to smoke and flame. Where proprietary systems/ products are installed they shall be in accordance with the manufacturer's recommendations.
- b) Form a complete barrier without gaps.
- c) Sealants shall not compromise the integrity of the Works.

K10.3116

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

Protection

K10.3117 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

K10.3118 Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

K10.3119 Completion

- a) Leave installed work clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components.

K10.3200

TOLERANCES

K10.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.

- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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K13 RIGID SHEET FINE LININGS/ PANELLING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

K13.1000 TYPE, SYSTEMS AND MATERIALS

K13.1100 ARCHITECTURAL SPECIFICATION TYPE

K13.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in strict compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

K13.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

K13.1201 General

- a) The Works shall be installed within the fixing zones indicated on the Design Drawings.
- b) Proprietary systems shall be manufactured and installed in accordance with the manufacturer's recommendations to suit the service conditions.
- c) Systems shall include fixings, framing, bracketry, support framing, grids, seals, insulation and other components/ accessories necessary to complete the Works as recommended by the manufacturer to suit the service conditions.

K13.1202 Services

- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- b) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.
- c) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.

K13.1203 Fixings

Fixings shall be concealed unless accepted otherwise by the Employer.

K13.1204 Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) Include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in, grouting-in and making good.
- c) Co-ordinate fixing with the superstructure design.
- d) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

K13.1205 Framing

- a) Framing profiles and other visible components shall be consistent and matching in appearance throughout the Works.

- b) Framing profiles shall be of the minimum cross sections necessary to achieve the performance requirements, while complying with the design intent indicated on the Design Drawings.
- c) Align joints/ framing with interfacing systems. Gaps within joints shall be uniform.

Hygienic Wall Linings

K13.1206 Type LIN-501 Hygienic Wall Lining

Proprietary hygienic wall lining configured as indicated on the Design Drawings.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Panel dimensions: As indicated on the Design Drawings.
- c) Colour: As indicated on the Design Drawings.
- d) Fixing: Adhesive fixed to substrate as recommended by the manufacturer to suit the service conditions.
- e) Joints and interfaces:
 - i) Horizontal joints: None permitted.
 - ii) Vertical joints: Welded.
 - iii) Skirting junction: Interface trim at junction with coved skirtings.
 - iv) Other junctions: Provide a flexible silicone sealant at ceiling junctions and at door/ window architraves and reveals.

K13.1300 MATERIALS

Metalwork and Finishes

K13.1301 Metalwork

Refer to Section Z11.

K13.1302 Finishes

Refer to Section Z30 for general finishes to metalwork.

Fixings

K13.1303 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

K13.1304 General

Refer to Section Z20.

Sealants

K13.1305

General

Refer to Section Z22.

Vapour Control Layers/ Air Leakage Barriers

K13.1306

General

- a) High performance reinforced membranes of metal foil or plastics, protected both sides by rigid facings/ linings to achieve the performance criteria.
- b) Foil backed plasterboard shall not be accepted.
- c) The product shall also perform as an air barrier.
- d) Membranes shall be certified to an internationally recognised Agrément Certificate to the acceptance of the Employer.
- e) Vapour resistance of the material shall be correct for the specific application.
- f) Include necessary tapes, seals and accessories to provide a fully vapour and air sealed system at joints, perimeter conditions and penetrations.

K13.2000

SUBMITTALS AND TESTING

K13.2100

SUBMITTALS

Tender Submittals

K13.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

K13.2102

Pre-contract Samples

Not required.

K13.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 300mm sample of accepted board/ panel material in specified colour including edging, edge detail and trims.
- b) Accepted visible fixings.

K13.2104

Mock-up Requirements

Not required.

K13.2105

Prototype Requirements

Not required.

K13.2106

Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed structural bay of each type of system.

K13.2200

TESTING

K13.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) On-Site testing shall be carried out by a Testing Body accredited by the Kenya Accreditation Service (KENAS) to demonstrate that the proposed systems achieve the requirements of the Architectural Specification.

K13.3000 EXECUTION

K13.3100 WORKMANSHIP

Fabrication

K13.3101 General

Fabrication of components shall, as a minimum, be in accordance with current regulations and standards.

Workmanship

K13.3102 General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system manufacturer.

Inspection/ Preparation

K13.3103 Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

K13.3104 Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

K13.3105 Dampness

Where systems/ products are to be installed on new wet-laid backgrounds/ bases:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

K13.3106

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- h) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- i) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- j) Colour/ textural variations:
 - i) Units shall be selected/ sorted on Site to achieve a consistent overall appearance of the completed work.
- k) Do not cut, drill or otherwise alter the work of others to accommodate the installation of the systems unless accepted by the Employer.
- l) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

K13.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

K13.3108

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects.
- d) Spread adhesive evenly, pressing down materials/ components firmly and rolling (if recommended by the manufacturer) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.
- f) Eliminate ridges and high spots.

K13.3109 Sealants

Refer to Section Z22.

K13.3110 Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

Protection

K13.3111 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

K13.3112 Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

K13.3113 Completion

- a) Leave installed work clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components.

K13.3200 TOLERANCES

K13.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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K32 FRAMED PANEL CUBICLE PARTITIONS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

K32.1000 TYPE, SYSTEMS AND MATERIALS

K32.1100 ARCHITECTURAL SPECIFICATION TYPE

K32.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

K32.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

K32.1201 General

- a) Noggings and bearers shall be installed to provide fixing points for linings, or to support fixtures, fittings and services.
- b) Fixings shall be concealed unless otherwise stated.
- c) Methods of fixing and fastenings shall be in accordance with the manufacturer's recommendations.
- d) Where required, cubicles shall be sized to achieve the requirements of Building Regulations Approved Document M.
- e) Cubicle systems shall include components recommended by the system manufacturer including doors, ironmongery, pilasters, pedestals and divider panels to complete the installation.

Duct Access Panelling

K32.1202 Type PAN-201 Duct Access Panel

Proprietary solid laminate access panel system configured as indicated on the Design Drawings.

- a) Manufacturer: Venesta.
- b) Reference: To be proposed by the Contractor to the acceptance of the Employer.
- c) Panels:
 - i) Colour: White or to match adjacent wall colour, as accepted by the Employer.
 - ii) Edge treatment: Selected from the standard product range to the acceptance of the Employer.
- d) Shadow/ flash gap panels formed from panels of a contrasting colour, selected from the standard product range.
- e) Skirting/ plinth panels formed from panels of a contrasting colour, selected from the standard product range, mounted on water resistant spacers to avoid contact with the floor.
- f) Concealed panel mounting system to permit removal of panels for access.

- g) Factory formed openings/ cut-outs to receive sanitary appliances and other components indicated on the Design Drawings and in accordance with Section N13.

Vanity Units

K32.1203

Type PAN-301 Vanity Unit

Proprietary through-coloured high pressure laminate faced moisture resistant chipboard core vanity system configured as indicated on the Design Drawings.

- a) Manufacturer: Venesta.
- b) Reference: To be proposed by the Contractor to the acceptance of the Employer.
- c) Fascia panels/ doors:
 - i) Colour: As indicated on the Design Drawings.
 - ii) Edge treatment: Selected from the standard product range to the acceptance of the Employer.
- d) Skirting/ plinth panels formed from panels of a contrasting colour, selected from the standard product range, mounted on water resistant spacers to avoid contact with the floor.
- e) Concealed panel mounting system to permit removal of panels for access.
- f) Countertop:
 - i) Solid grade laminate countertop with curved/ coved upstand to rear, and downstand front edge, configured as indicated on the Design Drawings.
 - ii) Colour: As indicated on the Design Drawings.
- g) Factory formed openings/ cut-outs to receive sanitary appliances and other accessories/ systems indicated on the Design Drawings and in accordance with Section N13.

K32.1300

MATERIALS

Metalwork and Finishes

K32.1301

Metalwork

Refer to Section Z11.

K32.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Timber

K32.1303

General

Refer to Section Z10.

Rigid Sheet/ Board

K32.1304

Plywood

Plywood used in the Works shall achieve the following minimum requirements:

- a) Service class 2 plywood, unless stated otherwise, in accordance with BS EN 636.
- b) Minimum class 2 bond quality in accordance with BS EN 314.

- c) Plywood durability shall be minimum Use Class 2 (UC 2) in accordance with BS EN 335 unless otherwise accepted by the Employer.
- d) Dimensional tolerances shall be in accordance with BS EN 315.

K32.1305 Chipboard

Wood based particleboard (chipboard) shall be in accordance with BS EN 312. The grade of particleboard shall satisfy moisture resistance, robustness and other service conditions.

K32.1306 Medium Density Fibreboard (MDF)

- a) MDF shall be in accordance with BS EN 622: Part 5 for dry process boards.
- b) Where MDF is to be used with the application of a face veneer or laminate facing, a suitable balancing veneer shall be applied.

Plastic Laminates

K32.1307 General

- a) High pressure laminates up to 2mm thickness and bonded to supporting substrates shall be in accordance with BS EN 438: Part 3.
- b) Compact grade high pressure laminate shall be in accordance with BS EN 438: Part 4.
- c) Compact grade laminate and composite high pressure laminate panels for internal wall finishes shall be in accordance with BS EN 438: Part 7.

Preservative/ Fire Retardant Treatments

K32.1308 General

- a) Refer to Section Z12.
- b) Comply with the recommendations of Timber Development UK (TDUK).
- c) Methods shall be suitable for the service conditions, carried out by a processor licensed by the treatment solution manufacturer for the specific treatment. For each batch of timber a certificate of compliance shall be issued.
- d) Where timber materials/ components are visible the preservative/ fire retardant treatment shall not alter the visual characteristics of the timber or finish.

Fixings

K32.1309 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Fixings shall be concealed unless accepted otherwise by the Employer.

Adhesives

K32.1310 General

Refer to Section Z20.

Sealants

K32.1311 General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's written recommendations, to suit the service conditions.

K32.2000 SUBMITTALS AND TESTING

K32.2100 SUBMITTALS

Tender Submittals

K32.2101 Tender Response
Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

K32.2102 Pre-contract Samples
Not required.

K32.2103 Post Contract Award Samples
In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm sample of each accepted panel in colour and material including edging and trims.
- b) One of each exposed ironmongery component in accepted finish.
- c) One of each exposed fixing in accepted finish.
- d) One of each exposed cubicle accessory including, but not limited to legs, hinges and brackets in accepted finish.

K32.2104 Mock-up Requirements
Not required.

K32.2105 Prototype Requirements
Not required.

K32.2106 Quality Benchmark Requirements
Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed type of each system.

K32.2200 TESTING

K32.2201 General
Refer to Section A clause series A.6000 for the general requirements for testing.

K32.3000 EXECUTION

K32.3100 WORKMANSHIP

Fabrication

K32.3101 General
a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.

- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects, to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.
- g) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

K32.3102 Metalwork

Refer to Section Z11.

K32.3103 Joinery and Carpentry

Refer to Section Z10.

K32.3104 Bonded Decorative Laminates

- a) Refer to Section Z10.
- b) Carry out the Works in accordance with BS 4965.
- c) Laminates shall be machine cut.
- d) The laminate finish of composite laminate boards/ panels shall be thoroughly bonded to the backing substrate in accordance with the recommendations of the British Laminate Fabricators Association.
- e) Edges of composite laminate boards/ panels shall be smooth cut, sealed as required and finished using methods specified or to the acceptance of the Employer.
- f) Edgings shall be applied in a manner that minimises visible cores.
- g) Fixing holes shall be oversized but sufficient to allow shrinkage.

Workmanship

K32.3105 General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

K32.3106 Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

K32.3107 Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation/ Application

K32.3108

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Setting-out of cut materials/ components at the perimeter shall be of equal sizes, not smaller than one third of original size and to the acceptance of the Employer, unless otherwise indicated on the setting out drawings.
- h) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- i) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- j) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- k) Colour/ textural variations:
 - i) Units shall be selected/ sorted on site to achieve a consistent overall appearance of the completed work.
 - ii) Colour and texture of applied finishes shall be consistent throughout the Works, with no banding, patchiness or other visual variations.

- l) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- m) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

K32.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

K32.3110

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.
- f) Eliminate ridges and high spots.

K32.3111

Sealants

Refer to Section Z22.

K32.3112

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant, areas required for drainage nor otherwise alter the performance requirements of the Works nor interfacing systems.

Protection

K32.3113

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

K32.3114

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Apply suitable number of coats of polish or treatment of a type recommended by the system/ product manufacturer.

- d) Do not use materials or methods that could alter the character of the exposed finishes.
- e) Protect adjacent surfaces from damage due to cleaning operations.

K32.3115

Completion

- a) Leave installed work clean.
- b) Replace defective components without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/components.

K32.3200

TOLERANCES

K32.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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K40 DEMOUNTABLE SUSPENDED CEILINGS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

K40.1000 TYPE, SYSTEMS AND MATERIALS

K40.1100 ARCHITECTURAL SPECIFICATION TYPE

K40.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

K40.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

K40.1201 General

- a) Install the Works within the fixing zones indicated on the Design Drawings.
- b) The Works shall include fixings, framing, bracketry, support framing, grids, seals, insulation and other components/ accessories necessary to complete the Works as supplied/ recommended by the manufacturer to suit the service conditions.

K40.1202 Cavity Barriers

Ceiling voids shall incorporate continuous vertical cavity barriers for fire/ smoke and sound, using proprietary encapsulated mesh-reinforced mineral fibre products, installed in accordance with the manufacturer's recommendations and configured as indicated on the Design Drawings or otherwise required.

K40.1203 Suspension Systems

- a) Unless otherwise specified, suspension systems shall be hot dip galvanised mild steel tee section grid system.
- b) The system shall be supported from the structural soffit by galvanised mild steel rigid adjustable hangers, secondary and main runners, with appropriate fixings to the substrate soffit in accordance with the manufacturer's written recommendations.

K40.1204 Services and Fittings

- a) Systems shall accommodate light fittings, grilles, smoke detectors, PA speakers, sprinkler heads or other service penetrations as indicated on the Design Drawings or required by the Services Engineer.
- b) Additional pattresses and supports as necessary to receive such fittings shall be provided.
- c) The setting-out of ceiling supports/ hangers shall be co-ordinated with any services within the ceiling voids.
- d) Metal ceiling panels shall incorporate factory formed penetrations with upturned edges to receive fittings.
- e) Access panels shall be provided where indicated on the Design Drawings.

Glass Wool Tile Ceilings

K40.1205

Type CLG-501 Glass Wool Tile Ceiling (Hygienic)

Proprietary suspended hygienic tile and exposed grid ceiling system, configured as indicated on the Design Drawings.

- a) Hygienic lay-in tiles formed from glass wool encapsulated in a smooth polymeric film.
 - i) Module size: 600mm x 600mm.
 - ii) Edge detail: Tegralar.
 - iii) Ceiling tile shall be moisture resistant to wet areas.
- b) Exposed 15mm wide metal grid and suspension system.
- c) Tiles fixed with retaining clips.
- d) Perimeter detail:
 - i) Perimeter detail shall be as indicated on the Design Drawings.
 - ii) Perimeter trim chosen from the manufacturer's standard range for the acceptance of the Employer.
- e) Powder coated finish, colour from the manufacturer's standard range, to exposed metalwork as agreed with the Employer.

K40.1206

Type CLG-502 Glass Wool Tile Ceiling

Proprietary suspended tile and exposed grid ceiling system configured as indicated on the Design Drawings.

- a) Lay-in tiles formed from glass wool encapsulated in a smooth polymeric film.
 - i) Module size: 600mm x 600mm.
 - ii) Edge profile: Tegralar.
 - iii) Ceiling tile shall be moisture resistant to wet areas.
- b) Exposed 15mm wide metal grid and suspension system.
- c) Tiles fixed with retaining clips.
- d) Perimeter detail:
 - i) Perimeter detail as indicated on the Design Drawings:
 - ii) Perimeter trim chosen from the manufacturer's standard range for the acceptance of the Employer.
- e) Powder coated finish, colour chosen from the manufacturer's standard range, to exposed metalwork and as agreed with the Employer.

K40.1300

MATERIALS/ COMPONENTS

Metalwork and Finishes

K40.1301

Metalwork

Refer to Section Z11.

K40.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Fixings

K40.1303

General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Fixings shall be concealed unless accepted otherwise by the Employer.

Adhesives

K40.1304

General

Refer to Section Z20.

Sealants

K40.1305

General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's written recommendations, to suit the service conditions.

K40.2000

SUBMITTALS AND TESTING

K40.2100

SUBMITTALS

Tender Submittals

K40.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

K40.2102

Pre-contract Samples

Not required.

K40.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm sample of each type of tile including one finished corner and two adjacent finished edges.
- b) Paint finishes as specified.
- c) Ceiling grid/ support system.
- d) Samples of panels, grilles and trims.
- e) Fixing types.
- f) Cavity barrier material.

K40.2104

Mock-up Requirements

Not required.

K40.2105 Prototype Requirements

Not required.

K40.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First full room of each system.

K40.2200 TESTING

K40.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

K40.3000 EXECUTION

K40.3100 WORKMANSHIP

Fabrication

K40.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication of materials/ components shall take place in equipped workshops with site work restricted to fixing.
- d) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- e) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

K40.3102 Metalwork

- a) Refer to Section Z11.
- b) Cutting and drilling of ceiling panels and associated members, including apertures for services, shall take place before the application of painted finishes. Site cutting or drilling shall not be permitted.

K40.3103 Joinery and Carpentry

Refer to Section Z10.

Workmanship

K40.3104 General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000 and BS EN 13964.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

K40.3105

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

K40.3106

Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

K40.3107

Dampness

Where systems/ products are to be installed adjacent to new wet-laid materials:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated probe.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

K40.3108

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Setting-out shall be centred between walls so that cut tiles/ planks at perimeter are of equal sizes and not smaller than one third of original size.
- h) Materials/ components to be installed in 'running lengths' shall be subject to the following:

- i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
- ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- i) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- j) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- k) Colour/ textural variations:
 - i) Units shall be selected/ sorted on site to achieve a consistent overall appearance of the completed work.
 - ii) Natural variations in colour and texture of materials shall be evenly distributed across the visible surfaces of the Works.
- l) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- m) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.
- n) Light fittings, grilles, fire and smoke barriers shall be in the correct positions relative to the ceiling grid, prior to commencing installation. Common setting out points shall be used. Provide additional support/ bracing as required.

K40.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing or stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals or between preservative treated timber and metal.
- e) Straighten hangers before use and install vertically without bends or kinks. Do not allow hangers to press against any fittings within the void.

K40.3110

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects. Joints shall be tightly butted or gaps/ joints left as required.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.

K40.3111

Movement Joints

Install movement joints in accordance with the manufacturer's written recommendations.

K40.3112

Sealants

Refer to Section Z22.

K40.3113 Fire and Smoke Barriers

- a) Cut material to fit tightly, achieve correct compression and be securely fixed along edges. Joints shall be wired or stapled together to provide a complete barrier to smoke and flame. Where proprietary systems/ products are installed, they shall be in accordance with the manufacturer's recommendations.
- b) Form a complete barrier without gaps.
- c) Sealants shall not compromise the integrity of the Works.

K40.3114 Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance requirements of the Works and interfacing systems shall be maintained.

Protection

K40.3115 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

K40.3116 Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

K40.3117 Completion

- a) Leave installed work clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components.

K40.3200 TOLERANCES

K40.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.

- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent tile/ panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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L10

WINDOWS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L10.1000

TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

L10.1100

ARCHITECTURAL SPECIFICATION TYPE

L10.1101

Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

L10.1200

SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

L10.1201

General

- a) Execute the Works in accordance with the following:
 - i) The Centre for Window and Cladding Technology (CWCT) Standard for Systemised Building Envelopes.
 - ii) BS 6375, Performance of windows and doors.
 - iii) BS 8213: Part 1, Windows, doors and rooflights. Design for safety in use and during cleaning of windows, including door-height windows and roof windows. Code of practice.
 - iv) BS 8213: Part 4, Windows and doors. Code of practice for the survey and installation of windows and external doorsets.
 - v) BS EN 14351: Part 1, Windows and doors. Product standard, performance characteristics. Windows and external pedestrian doorsets.
 - vi) BS EN 1279, Glass in building. Insulating glass units.
 - vii) BS 4873, Aluminium alloy windows and doorsets. Specification.
 - viii) Glass and Glazing Federation (GGF) Guide to Good Practice: Installation of Replacement Windows and Doors.
- b) The Works shall be covered by a single source warranty.
- c) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and to achieve the performance requirements.
- d) Components for lightning protection and earth bonding shall be concealed.
- e) The Detailed Design of the Works shall not be based on only a single line of defence. The cavities between the lines of defence shall be drained and ventilated to the exterior.
- f) The Works shall be designed and installed as complete integrated systems, including necessary support structure, bracketry, fixing rails and plates, angles, cleats, grouting, fixings and fastenings, rivets, clips, vapour control barriers, insulation, damp-proof membranes, breather and other membranes, firestops and cavity barriers, acoustic breaks, pressed metal components, closures, seals and sealants, gaskets, fillers, tapes, spacers, packers, shims, isolators, drainage channels, anti-rotation pins, glazing bridges and other components/ accessories necessary to complete the Works.

- L10.1202 Services
- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
 - b) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.
 - c) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.
- L10.1203 Fixings
- a) Fixings shall be concealed unless accepted otherwise by the Employer.
 - b) Indicate the type, size and positioning of mechanical fixing devices on the Working Drawings.
 - c) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.
- L10.1204 Fixing to Structure
- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
 - b) The Works shall include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
 - c) Co-ordinate fixing with the superstructure design.
 - d) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.
- L10.1205 Secondary Support
- a) Systems shall include structural steel support, as necessary.
 - b) Where the Contractor deems that visible secondary support is required in addition to that indicated in the Structural Engineer's documentation and on the Design Drawings, the Contractor shall inform the Employer at tender return.
 - c) Systems shall include necessary sub-constructions/ assemblies including, but not limited to, framing, brackets, cleats, angles and other components.
- L10.1206 Framing
- a) Framing profiles and other visible components shall be consistent and matching in appearance throughout the Works.
 - b) Framing profiles shall be of the minimum cross sections necessary to achieve the performance requirements, while complying with the design intent indicated on the Design Drawings.
 - c) Location and appearance of drainage slots shall be to the acceptance of the Employer.
 - d) Framing shall accommodate tolerances in the glass and shall not cause deflections that would cause stress outside acceptable limits or optical distortion.
- L10.1207 Joints
- a) Joints/ framing shall align with interfacing systems. Gaps within joints shall be uniform.
 - b) Movement joints shall accommodate movements while maintaining the overall system performance.
 - c) Movement joints shall appear as similar to the standard system joint as possible.
- L10.1208 Glazing/ Infill Panels
- a) Glazing/ infill panels shall be as indicated on the Design Drawings, using the Types indicated as described in Section L40.

- b) Glazing panels shall receive applied finish(es) to locations indicated on the Design Drawings, refer to Section L40 of the Architectural Specification.
- c) Refer to Sections L40 and Z25 for glazing which shall be accommodated by the framing of the systems.

L10.1209

Gaskets

- a) Gaskets shall be black.
- b) Visible glazing gaskets shall have factory-formed corners. Other gaskets shall have overlapping joints with appropriate sealant in between.
- c) The internal gasket/ sealant line of the entire envelope system shall provide a continuous vapour and air seal. This shall include interfacing connections.

L10.1210

Opening Elements

- a) Opening lights shall be in accordance with BS 6375: Part 2 and BS EN 14351: Part 1 and with the performance criteria herein.
- b) Opening elements shall be integrated into the systems in lieu of the fixed light glazing, to locations and with functionality as indicated on the Design Drawings.
- c) Opening elements shall not disengage from the fixed areas of the Works when open or closed under any of the specified loads.
- d) Opening frames shall be mitred at the corners.
- e) Where required, opening elements shall be fitted with electrically powered actuators geared to open and close them automatically and to retain them safely open.
- f) Panels shall include standby batteries for continuous operation of vents for a 3-hour period in the event of loss of mains power.
- g) When fastened in the closed position, the vents shall not be capable of movement or removal from the fixed areas of the Works except by actuation or deliberate action from the interior of the building.
- h) Operation shall be by one or more of the following, as described or indicated on the Design Drawings:
 - i) Manually operated with satin finished stainless steel ironmongery and hardware from the manufacturer's standard range. Manually operated elements shall as a minimum include friction stays and tracks, hinges, single opening handles incorporating a multi-point locking mechanism fully concealed within the sash.
 - ii) Manually operated via a remote mechanism such as Teleflex, or acceptable equivalent, located and finished as accepted by the Employer. Necessary satin finished stainless steel ironmongery and hardware from the manufacturer's range to achieve the required functionality, shall be included, as accepted by the Employer through sampling.
- i) Opening elements shall have restrictors with a maximum opening of 100mm as indicated on the Design Drawings.

L10.1211

Provision of Background Ventilation

Two stage opening lights with satin finished stainless steel lockable restrictor suitably accommodated by the framing components.

L10.1212

Vapour Control

Where ventilation is not required, such as fully blanked-off zones, include suitable vapour control barrier(s) and associated protection to provide a continuous line of protection.

L10.1213

Fixing Brackets for Blinds

- a) Fixing brackets shall be provided fixed to the framework, as indicated on the Design Drawings.
- b) Brackets shall be compatible with the blinds proposed for incorporation.

L10.1214 Pressed Metal Components/ Accessories

- a) Systems shall incorporate necessary pressed metal accessories including flashings, copings, cappings, cills, reveals and returns and other formed accessories.
- b) Components shall be formed from fully welded and/ or sealed pressed metal sheets, which shall be sufficiently thick to provide a visually flat surface and to eliminate excessive distortion and permanent deformation.
- c) Include special prefabricated corner pieces for changes in direction. There shall be no cut corners at changes in direction.
- d) Components shall be of finish, colour and texture confirmed by the Employer, where not specified.
- e) Provide concealed support as required.
- f) Insulation shall be included as required to achieve the performance requirements, including anti-drumming insulation to the underside.
- g) Joints:
 - i) Joints shall be of profiles accepted by the Employer and shall maintain the performance requirements of the Architectural Specification.
 - ii) Locations shall be as indicated on the Design Drawings, or to the acceptance of the Employer.
 - iii) Assemble joints centrally over support.
 - iv) Joints shall include concealed continuous sealed gaskets with recessed/ folded interconnecting joints to provide a neat flush external appearance.

L10.1215 Demountability

- a) Elements of the Works shall be individually and independently removable to provide access for maintenance and/ or replacement of glazing/ infill units and other components in the event of breakage/ damage.
- b) The Detailed Design shall provide systems that enable maintenance and cleaning of components, while minimising progressive dismantling and associated disruption.
- c) The removal of glazing/ infill units shall not affect the performance or safety of adjacent work or any other part of the Works. A method statement for removal and replacement of components shall be submitted for acceptance by the Employer.

L10.1216 Fire Preservative Treatment and Fire Retardant Materials

- a) Methods of preservative treatment shall be in accordance with the manufacturer's recommendations to achieve the requirements of the Architectural Specification.
- b) Where timber components are visible, the preservative/ fire retardant treatment shall not alter the visual characteristics of the timber or finish.

Aluminium Windows

L10.1217 Type EWS-152 Window - Aluminium

Aluminium window system set into structural openings of various sizes, configured as indicated on the Design Drawings.

- a) Extruded thermally broken and separated aluminium framing sections configured as indicated on the Design Drawings.
 - i) Framing shall be of profiles to match accepted samples and retain glazed-in units/ panels.
- b) Joints:

- i) Externally, framing members shall have anodised aluminium 'low profile' cover caps to sizes and profiles as indicated on the Design Drawings. Colour shall match the framing.
- ii) Methods of restraint shall be concealed.
- c) Opening elements with methods of operation as indicated on the Design Drawings.
- d) Integrated louvres as indicated on the Design Drawings:
 - i) Single bank ventilation louver.
 - ii) Concealed thermally broken and separated aluminium perimeter framing and mullions.
 - iii) Framing shall match the main framing.
 - iv) Horizontal aluminium louver blades, secured to mullions.
 - v) Blanking panels.
 - vi) Louvres shall include bird guard/ insect mesh.
- e) Finish shall be powder coated to a colour indicated on the Design Drawings.

L10.1300

MATERIALS

Metalwork

L10.1301

General

Refer to Section Z11.

L10.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Glass

L10.1303

General

Refer to Sections L40 and Z25.

Fixings

L10.1304

General

- a) Refer to Section Z20.
- b) Fixing components shall comply with statutory requirements.
- c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Adhesives

L10.1305

General

- a) Refer to Section Z20.
- b) Adhesives shall be compatible with the proposed finishes and any preservative/ fire retardant treatments.

Sealants and Gaskets

L10.1306

Sealants

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.

L10.1307

Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

Membranes

L10.1308

Damp-proof Membrane

- a) Membranes shall be inert, durable, impermeable, rot-proof, vermin-proof and not degradable by moisture and extreme temperatures and manufactured from ethylene propylene diene M-class rubber (EPDM) or acceptable equivalent.
- b) Membranes shall be certified to an internationally recognised Agrément Certificate to the acceptance of the Employer.

L10.1309

Breather Membrane

- a) Membranes shall be water resistant, water vapour permeable and manufactured from non-woven, spunbonded high density polyethylene, or acceptable equivalent.
- b) Membranes shall be certified to an internationally recognised Agrément Certificate to the acceptance of the Employer.
- c) Vapour resistance of the breather membrane shall not be greater than that of the substrate that it is protecting.

L10.1310

Vapour Control Layers/ Air Leakage Barrier

- a) High performance reinforced membranes of metal foil or plastics, protected both sides by rigid facings/ linings to achieve the performance criteria.
- b) Foil backed plasterboard shall not be accepted.
- c) Membranes shall be certified to an internationally recognised Agrément Certificate to the acceptance of the Employer.

Insulation

L10.1311

Requirements

- a) Insulation shall be in accordance with the appropriate British Standard and/ or be British Board of Agrément (BBA) certified or certified by an equivalent internationally recognised body acceptable to the Employer.
- b) Insulation shall be inert, durable, rot-proof and vermin-proof and not be degradable by moisture, extreme temperatures or water vapour, unless the Detailed Design of the system protects the insulation from the need for such requirements.
- c) Insulation materials generally shall be in accordance with the LPC Design Guide for the Fire Protection of Buildings.
- d) Insulation shall not bulge, sag, delaminate or detach during its installation or in its installed position during the life of the Works.
- e) Insulation shall have zero Ozone Depleting Potential (ODP), be CFC and HFC free and have a Global Warming Potential (GWP) of less than five. Refer also to Section A of the Architectural Specification.
- f) Insulation shall be selected in accordance with the Green Guide to Specification.

L10.2000

SUBMITTALS AND TESTING

L10.2100

SUBMITTALS

Tender Submittals

L10.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

L10.2102

Pre-contract Samples

Not required.

L10.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) Complete window unit, 600mm x 600mm, with accepted finishes and colours inclusive of fittings.
- b) Accepted gasket types, extrusions, caps, trims and flashings, including at least one joint and one corner joint and including accepted finishes and colours where applicable.
- c) Integrated blinds and mechanisms, where required.
- d) Visible fixings (where visible fixings form part of the design intent).
- e) Accepted 'trickle' ventilator.
- f) Accepted ironmongery and hardware.
- g) Samples of fastening devices and anchors.
- h) Operating mechanisms, switches and controls, including mounting.

L10.2104

Mock-up Requirements

Not required.

L10.2105

Prototype Requirements

Not required.

L10.2106

Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed installation of each type of system.

L10.2200

TESTING

L10.2201

General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Submit independently certified tests and Agrément certificates that demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification.
- c) Independently certified test data for off-Site testing shall include static and dynamic results, where applicable.
- d) Where data from previous independently certified tests and Agrément certificates demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification, off-Site independent testing need not be undertaken.

- e) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).
- f) The Works shall be tested in accordance with the requirements of the CWCT Standard Test Methods for Building Envelopes, which shall be amended as required, and where agreed with the Employer, to suit the service conditions.

Off-Site Testing

L10.2202 Fire Performance Testing

Materials shall be tested in accordance with BS EN ISO 1182 and BS EN ISO 1716.

L10.2203 Weatherproofing and Watertightness Tests

- a) Test in accordance with the requirements of BS EN 1027 up to a pressure of 600Pa to demonstrate compliance with the requirements of the Architectural Specification.
- b) Performance under testing:
 - i) There shall be no leakage into the internal face of the Works at any time during the test or within 15 minutes of completion of the test.
 - ii) At completion of the test, there shall be no standing water in locations to drain.

L10.2204 Wind Resistance Tests

- a) Test in accordance with the requirements of BS EN 12211 to demonstrate compliance with the requirements of the Architectural Specification.
- b) Samples tested shall be subjected to at least 5 cycles of positive pressure at maximum gust conditions and the performance. The procedure shall then be repeated with negative pressure.
- c) Performance under testing:
 - i) At both positive and negative applications of the peak test pressure, there shall be no permanent damage to framing members, glass or glazing panels or anchors. Framing members shall not buckle, panels shall remain securely held, glass and glazing shall not be damaged and gaskets shall not be displaced. The glass itself shall not deflect such that edge cover is insufficient to restrain the glass under peak test pressure or such that spacers become visible.
 - ii) After loading to the positive and negative peak test pressure, permanent deformation to framing members shall not exceed 1/ 500 of the span measured between points of attachment to the building one hour after the loading has been removed.
 - iii) The loads created by specified test conditions shall be accommodated safely, without detriment to the overall design, structural integrity and performance of the Works.
 - iv) The permanent fixings of any component shall be capable of resisting the combined dead load and maximum wind load with a factor of safety of at least 1.5.

L10.2205 Impact Testing

- a) Impact testing shall be carried out in accordance with CWCT Technical Note (TN) 76, to demonstrate conformance to the category requirements specified.
- b) A soft body impact test to glazed elements shall be carried out in accordance with BS EN 12600, conforming to the category requirement specified.
- c) A soft body impact test to non-glazed elements shall be carried out in accordance with BS EN 13049, conforming to the category requirements specified.
- d) A manual attack test shall be carried out in accordance with Loss Prevention Certification Board's (LPCB) LPS 1175, conforming to the category requirements specified.

- e) The extent of any damage determined through testing shall be recorded and quantified. Samples shall also be submitted to the Employer.

L10.2206 Acoustic Testing

The Works shall achieve the requirements when tested in accordance with BS EN ISO 10140.

L10.2207 Thermal Cycling

The prototypes shall be tested to determine the effects of thermal movements on the performance of the Works, in particular the joints.

On-Site Testing

L10.2208 Waterproofing and Weathertightness Testing

- a) Test the weathertightness of the Works using the site hose test carried out in accordance with the recommendations of the CWCT Standard for Systemised Building Envelopes.
- b) If a different method is proposed details of the testing system and a proposed method statement shall be submitted to the Employer for acceptance at least one month prior to the proposed testing on Site.
- c) Prior to testing, check that the Works have been completed to a stage where the integrity of the system can be tested, that obvious defects have been made good and that the Works have been cleared of materials, debris and dust.
- d) Testing shall be carried out when work is complete including that of associated trades and interfacing trades.
- e) Performance under testing:
 - i) There shall be no leakage through the Works at any time during the test.
 - ii) If any leaks/ defects occur, mark the location on the Works, water shall be drained completely. Prepare a report to be submitted to the Employer together with proposals for remedial measures. Replace or repair any part of the Works that is adversely affected, while maintaining the design intent.
 - iii) After making good any defects, retest locally to verify integrity of repair.
 - iv) At completion of the test, there shall be no standing water in locations to remain dry. Certify the waterproof integrity of the Works.
 - v) Invite the Employer to witness the tests.

L10.2209 Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:
 - i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
 - ii) Apply a proof load of 1.5 times the unfactored design load.
 - iii) Test 10% of the installed fixings as a minimum.

- g) Torque Site testing:
 - i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
 - ii) Test 100% of the installed fixings.
 - iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.
 - iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
 - i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum.

L10.3000

EXECUTION

L10.3100

WORKMANSHIP

Fabrication

L10.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly shall take place in equipped workshops with Site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

L10.3102

Joinery and Carpentry

Refer to Section Z10.

L10.3103

Metalwork

Refer to Section Z11.

L10.3104

Frames

- a) Framing profiles shall be assembled into unit frames by means of mitred or butted corners mechanically jointed with cleats and appropriate additional sealants. Cutting shall be sufficiently accurate to prevent the display of unfinished metal at mitre joints.
- b) Profiles shall be free of any rolling marks, imprints, scratches, distortions, flaws, steps, waves or other defects.

Workmanship

L10.3105

General

- a) Fabricate and install the Works in accordance with the relevant and applicable parts of BS 8000 and BS 8213: Part 4.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.
- d) The Works shall be true to detail with continuous profiles, free from marks, defects, flaws, steps, waves, or damage of any nature.
- e) The glazing work shall be set out such that framing members are installed in the correct position, within tolerance, and in the correct relationship to the building structure.
- f) Framing members shall be set out at evenly spaced centres, straight, parallel and truly aligned with other features where indicated on the Design Drawings.
- g) The finished work shall be square, regular, true to line, level and plane with a satisfactory fit at junctions.

Inspection/ Preparation

L10.3106

Inspection

- a) Before commencing installation, survey the structure.
- b) Check dimensions, line, level and fixing points.
- c) Report immediately to the Employer if the structure is unsuitable to receive the Works.
- d) If the structure/ substrate is unsuitable, propose remedial action to make it suitable.

L10.3107

Suitability of Base/ Backing

- a) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- b) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.
- c) Surfaces to be covered shall be firmly fixed, dry, smooth, without depressions, voids or protrusions, clean and free from frost, unacceptable curing compounds, release agents and other surface contaminants.

Installation

L10.3108

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- c) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred, or be to the acceptance of the Employer.

- d) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- e) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- f) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- g) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.

L10.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

L10.3110

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

L10.3111

Accessories

Closure pieces, flashings, trims, gutters, fillers, spacers, tapes, sealants and fixings where not specified, shall be types recommended by and installed in accordance with the manufacturer's recommendations to suit the service conditions.

L10.3112

Sealants

Refer to Section Z22 of the Architectural Specification.

Protection and Completion

L10.3113

Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors.

L10.3114

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

L10.3115

Completion

- a) Repair defects without delay to minimise damage and nuisance.

- b) Do not use the Works for any purpose, except testing, until Practical Completion.
- c) On Practical Completion, check the Works for damage and defects. Replace damaged or defective materials/ components.

Temporary Protection and Completion

L10.3116 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors.

L10.3117 Completion

- a) Leave installed work clean.
- b) Work necessary to provide a weathertight finish shall be satisfactorily completed.
- c) Repair defects without delay to minimise damage and nuisance.
- d) A representative of the system manufacturers shall inspect the Works and shall notify the Contractor of any defects. Defects shall be corrected.

L10.3200

TOLERANCES

L10.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.

- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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L12 INTERNAL GLAZING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L12.1000 TYPE, SYSTEMS AND MATERIALS

L12.1100 ARCHITECTURAL SPECIFICATION TYPE

L12.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

L12.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

L12.1201 General

- a) Proprietary systems shall be manufactured and installed in accordance with the manufacturer's recommendations to suit the service conditions.
- b) The Works shall be constructed as complete integrated systems, including necessary components and accessories.

L12.1202 Services

- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- b) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.
- c) Provide necessary seals, gaskets and support framing where services penetrate or interface with the Works.

L12.1203 Framing

- a) Framing and other visible components shall utilise profiles that are consistent and matching in appearance throughout the Works.
- b) Framing shall accommodate tolerances in the glass and shall not cause deflections that would cause stress outside acceptable limits or optical distortion.
- c) Align joints/ framing with interfacing systems. Gaps within joints shall be uniform.
- d) Movement joints shall appear as similar to the standard system joint as possible, to the acceptance of the Employer.

L12.1204 Glazing

- a) Glazing panels shall be, unless otherwise stated, clear, unwired, Kite marked safety glass in accordance with BS 6206 and BS EN 12600.
- b) Applied finishes:
 - i) Where indicated on the Design Drawings, glass panels shall receive applied finishes.

- ii) Glass panels shall have safety manifestation to comply with the requirements of the Architectural Specification. Methods, patterns and colours shall be to the acceptance of the Employer.

c) Gaskets:

- i) Gaskets shall be black.
- ii) Visible glazing gaskets shall have factory-formed corners or overlapping joints as agreed with the Employer.

L12.1205

Demountability

- a) Elements of the Works shall be individually and independently removable to provide access for maintenance and/ or replacement of glazing/ infill units and other components in the event of breakage/ damage.
- b) The removal of glazing/ infill units shall not affect the performance or safety of adjacent work or any other part of the Works. Submit a method statement for removal and replacement for acceptance.

Internal Glazing

L12.1206

Type IWS-501 Internal Glazed Screen

Glazed internal screen configured as indicated on the Design Drawings.

a) Framing:

- i) Hardwood timber framing to profiles indicated on the Design Drawings.
- ii) Species shall be agreed with the Employer.
- iii) Exposed surfaces of framing shall have a clear lacquered finish to a colour and appearance (matt/ satin/ gloss) agreed with the Employer.

b) Glazing:

- i) 8mm laminated with a 0.38 PVB: 4mm clear glass, 0.38 PVB and 4mm clear glass.
- ii) 8.38mm total thickness.
- iii) Manifestation: Applied film as agreed with the Employer.

L12.1300

MATERIALS

Metalwork

L12.1301

General

Refer to Section Z11.

L12.1302

Finishes

Refer to Section Z30 for general finishes to metalwork.

Glass

L12.1303

General

Refer to Section Z25.

Timber

L12.1304

General

Refer to Section Z10.

Preservative/ Fire Retardant Treatments

L12.1305

General

- a) Refer to Section Z12.
- b) Methods shall meet the service conditions, carried out by a processor licensed by the treatment solution manufacturer for the specific treatment. For each batch of timber a certificate of compliance shall be issued.
- c) Where timber components are visible, the preservative/ fire retardant treatment shall not alter the visual characteristics of the timber or finish.

Fixings

L12.1306

General

- a) Refer to Section Z20.
- b) Fixing components shall comply with statutory requirements.
- c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Adhesives

L12.1307

General

Refer to Section Z20.

Sealants and Gaskets

L12.1308

Sealants

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.

L12.1309

Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

L12.2000

SUBMITTALS AND TESTING

L12.2100

SUBMITTALS

Tender Submittals

L12.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

L12.2102

Pre-contract Samples

Not required.

L12.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm length sample of each frame type in accepted profile and finish. Sample shall include a corner profile and length of exposed gasket.
- b) 300mm x 200mm sample of glass type in accepted finish and, where applicable, a sample of accepted manifestation.

L12.2104 Mock-up Requirements

Not required.

L12.2105 Prototype Requirements

Not required.

L12.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed installation of each type of system.

L12.2200 TESTING

L12.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

L12.3000 EXECUTION

L12.3100 WORKMANSHIP

Fabrication

L12.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with site work restricted to fixing.
- d) Fabricate the Works using proven methods of construction, to comply with the design requirements.
- e) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects, to profiles indicated on the Design Drawings.
- f) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- g) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.
- h) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

L12.3102 Metalwork

Refer to Section Z11.

L12.3103 Joinery and Carpentry

Refer to Section Z10.

Workmanship

L12.3104 General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

L12.3105 Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

L12.3106 Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

L12.3107 Dampness

Where systems/ products are to be installed adjacent to new wet-laid materials:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

L12.3108 General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Finishes shall not be installed within 48 hours of any heating having been turned off. After completion of installation, slowly return the heating to its operative temperature not less than 48 hours after completing the installation.
- d) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.

- e) Systems shall accommodate future moisture and temperature movement.
- f) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- g) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- h) Setting-out shall be centred between walls so that cut tiles/ planks at perimeter are of equal sizes and not smaller than one third of original size.
- i) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred to the acceptance of the Employer.
- j) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- k) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- l) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- m) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.
- n) Cut edges of mineral and timber faced boards shall be lightly sanded and treated to match finished faces.

L12.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer, and where required by the Employer to be visible to the Employer's acceptance.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

L12.3110

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects. Tightly butt or leave gaps/ joints as required.
- d) Remove surplus adhesive from exposed faces of coverings as work proceeds.

L12.3111

Sealants

- a) Refer to Section Z22.
- b) Sealants shall not compromise the integrity of the Works.
- c) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- d) Apply as a continuous bead unless specified or recommended otherwise by the manufacturer.

L12.3112

Fire and Smoke Barriers

- a) Cut material to fit tightly, achieve correct compression and be securely fixed along edges. Joints shall be wired or stapled together to provide a complete barrier to smoke and flame. Where proprietary systems/ products are installed they shall be in accordance with the manufacturer's recommendations.
- b) A complete barrier shall be formed; there shall be no gaps.
- c) Sealants shall not compromise the integrity of the Works.

L12.3113

Packings

- a) Where required, provide suitable tight packings at fixing points to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant, areas required for drainage nor otherwise alter the performance requirements of the Works nor interfacing systems/ products.

L12.3200

TOLERANCES

L12.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) Vertical elements shall be within $\pm 3\text{mm}$ of their notional plan setting out position.
- b) Horizontal elements shall be within $\pm 3\text{mm}$ of any given vertical datum.
- c) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- d) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- e) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- f) The maximum deviation in squareness (diagonal measurement across the component) shall be the lesser of $\pm 3\text{mm}$ or $\pm 0.075\%$ of design dimension.
- g) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- h) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- i) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- j) The cross-section of any element shall not be twisted by more than 1° from the alignment.

- k) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- l) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- m) Tolerances shall not be cumulative. The most onerous tolerance shall apply.
- n) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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L13 LOUVRES/ SCREENS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L13.1000 TYPE, SYSTEMS AND MATERIALS

L13.1100 ARCHITECTURAL SPECIFICATION TYPE

L13.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

L13.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

L13.1201 General

- a) The Works shall be covered by a single source warranty.
- b) Movement joints shall appear as similar to the standard system joint as possible, to the acceptance of the Employer.
- c) Components for lightning protection and earth bonding shall be concealed.
- d) The Works shall include necessary components and accessories.

L13.1202 Services

- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- b) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.
- c) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.

L13.1203 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

L13.1204 Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) Mechanical fixing devices shall be austenitic stainless steel of a suitable grade.
- c) Include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
- d) Co-ordinate fixing with the superstructure design.
- e) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

L13.1205 Vapour Control

Where ventilation is not required, such as fully blanked-off zones, include suitable vapour control barrier(s) and associated protection to provide a continuous line of protection.

L13.1206 Pressed Metal Components/ Accessories

- a) Incorporate necessary pressed metal accessories including flashings, copings, cappings, cills, reveals and returns and other formed accessories.
- b) Components shall be formed from fully welded and/ or sealed pressed aluminium sheets, which shall be sufficiently thick to provide a visually flat surface and to eliminate distortion and permanent deformation.
- c) Include special prefabricated corner pieces for changes in direction. There shall be no cut corners at changes in direction.
- d) Components shall be of finish, colour and texture confirmed by the Employer, where not specified.
- e) Provide concealed support as required.
- f) Include anti-drumming insulation to the underside.
- g) Joints:
 - i) Joints shall be of profiles accepted by the Employer.
 - ii) Locations shall be as indicated on the Design Drawings, or to the acceptance of the Employer.
 - iii) Assemble joints centrally over support.
 - iv) Joints shall include concealed continuous sealed gaskets with recessed/ folded interconnecting joints to provide a neat flush external appearance.

L13.1207 Demountability

- a) Elements of the Works shall be individually and independently removable to provide access for maintenance.
- b) The Detailed Design shall provide systems that enable maintenance and cleaning of components, while minimising progressive dismantling and associated disruption.
- c) The removal of units shall not affect the performance or safety of any other part of the Works or adjacent work.

Louvres/ Screens

L13.1208 General

- a) Louvre blades mounted to the front of mullions shall have concealed fixings.
- b) Unless specified or indicated otherwise, metal components of the louvred systems shall be finished to match the interfacing framing.

L13.1209 Rain Defence

Water penetration classification shall be in accordance with BS EN 13030, as follows:

- a) Water penetration shall be Class B for single bank systems.

L13.1210 Rear Blanking Panels

- a) Where indicated on the Design Drawings, louvre systems shall include blanking panels.
- b) Panels shall be formed from aluminium sheet, with suitable insulation as required. Insulation shall be encapsulated and protected by the aluminium sheet.

- c) Where indicated in the Services Engineer's documentation and/ or on the Design Drawings, blanking panels shall be connected to ductwork. Methods of connection, where visible, shall be to the acceptance of the Employer.
- d) Apertures shall be cut to co-ordinate and align with services and ductwork requirements.

Louvres

L13.1211

Type EWS-701 Louvre

Single bank ventilation and rain defence louvre, configured as indicated on the Design Drawings.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Concealed thermally broken and separated aluminium perimeter framing and mullions.
- c) Horizontal aluminium louvre blades, secured to mullions.
- d) Blanking panels.
- e) Louvres shall include bird guard/ insect mesh.
- f) Powder coat finished to white colour as agreed with the Employer through sampling.

Louvred Doors

L13.1212

Type DRS-421 Metal Louvred Doorset

Single bank ventilation louvred doors, configured as indicated on the Design Drawings.

- a) Framing (main framing and door leaf framing) to minimal dimensions and profiles.
- b) Door leaf:
 - i) Door facings shall be mild steel.
 - ii) Reinforced and insulated core.
 - iii) Heavy duty hinges with dog-bolts.
- c) Single bank ventilation mild steel louvred infill panel(s) as indicated on the Door Schedule:
 - i) Mild steel perimeter framing and mullions.
 - ii) Framing shall match adjacent finish.
 - iii) Horizontal mild steel louvre blades, secured to mullions.
 - iv) Blanking panels.
 - v) Louvres shall include bird guard/ insect mesh.
- d) Door frame:
 - i) Mild steel profiled, insulated core door frame.
 - ii) Low profile cill.
 - iii) Perimeter seals to satisfy the stipulated performance criteria.
- e) Finish:
 - i) Mild steel shall be galvanised.
 - ii) Finish shall be polyester powder coated.

- iii) Colour shall be as indicated on the Door Schedule.

L13.1213

Type EWS-731 Metal Mesh Fence

Metal mesh fence with matching integrated gates, configured as indicated on the Design Drawings.

- a) Support posts:
 - i) Galvanised mild steel square hollow sections.
 - ii) Posts shall be mechanically fixed to blockwork substrate.
- b) Mesh screen:
 - i) Material shall be galvanised mild steel.
 - ii) Mesh opening size and thickness shall be as agreed with the Employer.
- c) Lockable, hinged integrated gates with mesh infill to match adjacent mesh screen finish and profile.
- d) Exposed metal shall have a powder coat finish, colour as agreed with the Employer.

L13.1300

MATERIALS

Metalwork

L13.1301

General

Refer to Section Z11.

L13.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Fixings

L13.1303

General

- a) Refer to Section Z20.
- b) Fixing components shall comply with statutory requirements.
- c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Adhesives

L13.1304

General

- a) Refer to Section Z20.
- b) Adhesives shall be compatible with the proposed finishes and any preservative/ fire retardant treatments.

Sealants and Gaskets

L13.1305

Sealants

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.

- L13.1306 Gaskets
- a) Refer to Section Z23.
 - b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

L13.2000 SUBMITTALS AND TESTING

L13.2100 SUBMITTALS

Tender Submittals

- L13.2101 Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

- L13.2102 Pre-contract Samples

Not required.

- L13.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm sample of door, including lipped edge detail, frame, louvre blades, blanking panels, seals/ gaskets, and other necessary components, forming the acceptable control samples for the project.
- b) Minimum 300mm length of door frame, including integrated seals.
- c) 1 No. of each exposed accepted fixing/ bracket in accepted finish.

- L13.2104 Mock-up Requirements

Not required.

- L13.2105 Prototype Requirements

Not required.

- L13.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed installation of each type of system.

L13.2200 TESTING

- L13.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).
- c) The Works shall be tested in accordance with the requirements of the CWCT Standard Test Methods for Building Envelopes.
- d) Ventilation systems shall be tested in accordance with the requirements of BS EN 13030 and Heating Ventilation and Air Conditioning (HEVAC) requirements.

On-Site Testing

L13.2202

Waterproofing and Weathertightness Testing

- a) Test the weathertightness of the Works using the site hose test carried out in accordance with the recommendations of the CWCT Standard for Systemised Building Envelopes.
- b) If a different method is proposed, details of the testing system and a proposed method statement shall be submitted to the Employer for acceptance at least one month prior to the proposed testing on Site.
- c) Prior to testing, check that the Works have been completed to a stage where the integrity of the system can be tested, that obvious defects have been made good and that the Works have been cleared of materials, debris and dust.
- d) Carry out testing when work is complete including that of associated trades and interfacing trades.
- e) The Works when tested shall be in accordance with the required weather resistance classification for the system.
- f) At completion of the test there shall be no standing water in locations to remain dry. Certify the waterproof integrity of the Works.
- g) Invite the Employer to witness the tests.

L13.2203

Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:
 - i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
 - ii) Apply a proof load of 1.5 times the unfactored design load.
 - iii) Test 10% of the installed fixings as a minimum.
- g) Torque Site testing:
 - i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
 - ii) Test 100% of the installed fixings.
 - iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.
 - iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
 - i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum.

L13.3000

EXECUTION

L13.3100

WORKMANSHIP

Fabrication

L13.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly shall take place in equipped workshops with site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

L13.3102

Metalwork

Refer to Section Z11.

Workmanship

L13.3103

General

- a) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- b) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.
- c) Where required, materials shall be bent to the required profile without causing grain separation or other defects. Corners shall be formed to the smallest radius possible and curved components to radius as required.
- d) The system shall interface with pipes, ducts, structural members and other components that pass through it by mechanical means including seals, collars, sleeves, clips, welds, counter flashings and other such methods to maintain the requirements of the Architectural Specification.
- e) Sharp metal edges shall be folded under or removed as work proceeds.

Inspection/ Preparation

L13.3104

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

L13.3105

Suitability of Base/ Backing

- a) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- b) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

- c) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.

Installation

L13.3106

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Cutting of materials/ components:
- i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- d) Materials/ components to be installed in 'running lengths' shall be subject to the following:
- i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or to the acceptance of the Employer.
- e) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- f) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- g) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- h) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- i) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

L13.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

L13.3108

Damp-proof Membranes

- a) Substrates to receive membranes shall be free from dust and grease, free of cavities, ridges and sharp projections and be primed to receive adhesive as recommended by the membrane manufacturer. Surfaces that are not suitable to receive membrane shall be reported to the Employer.

- b) Membrane shall be lapped at least 100mm and bonded in accordance with the manufacturer's recommendations.

L13.3109

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

L13.3110

Accessories

Closure pieces, flashings, trims, fillers, spacers, tapes, sealants and fixings where not specified, shall be types recommended by and installed in accordance with the manufacturer's recommendations to suit the service conditions.

L13.3111

Flashings/ Trims

- a) Install joints in flashings/ trims to fully accommodate thermal movement.
- b) Install proprietary expansion joints on flat sheets wherever practicable.
- c) Joints generally shall be in accordance with the system manufacturer's recommendations.

L13.3112

Sealants

For general sealants refer to Section Z22 of the Architectural Specification.

L13.3200

TOLERANCES

L13.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.

- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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L20.3201 General

8

L20 INTERNAL DOORS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L20.1000 TYPE, SYSTEMS AND MATERIALS

L20.1100 ARCHITECTURAL SPECIFICATION TYPE

L20.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

L20.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

L20.1201 General

- a) The Works shall be covered by a single source warranty.
- b) Where applicable, isolating tape, plastic washers or other suitable means shall be used to prevent bimetallic corrosion between dissimilar metals.
- c) Door systems shall include fixings, framing, bracketry, seals, ironmongery and other components/ accessories necessary to complete the Works. Where not specified, they shall be suitable for the service conditions and be to the acceptance of the Employer.

L20.1202 Services

- a) Refer to the Services Engineer's documentation and the Fire Strategy Report with regard to door operations, security and any additional devices.
- b) Systems shall accommodate services, sensing devices and final connections as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- c) The location/ positioning of services, and associated components, shall be agreed with the Employer where not indicated on the Design Drawings.
- d) Wiring:
 - i) Wireways shall be concealed.
 - ii) Wireways shall connect equipment with the building power supply.
 - iii) Wireways shall accommodate the Services Engineer's, manufacturer's and Statutory requirements.
 - iv) System shall arrive pre-wired unless otherwise accepted by the Employer.
 - v) Wireways shall maintain the performance requirements of the system or interfacing systems.
- e) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.

L20.1203 Visual Requirements

- a) Configurations and structural opening dimensions shall be as indicated on the Door Schedule and/ or the Design Drawings.
- b) Vision panels, louvres, door protection and other features/ accessories shall be as indicated on the Door Schedule and/ or the Design Drawings.
- c) Architraves:
 - i) Architraves shall be provided as part of the doorset.
 - ii) Architrave profiles shall be selected from the doorset manufacturer's standard range and to the acceptance of the Employer.
 - iii) Unless otherwise specified, architraves shall be finished to match door frames and leaves.
- d) Finishes shall be as indicated on Door Schedule and the individual System Types described in this Section.

L20.1204

Performance Requirements

- a) Performance shall be as indicated on the Door Schedule and/ or the Design Drawings.
- b) Industry recognised independent third party certification is required indicating compliance of individual doorsets with the performance.
- c) Doorsets shall be marked on the hinge edge with their door number and performance.
- d) The Works shall be securely fixed and sealed in accordance with the manufacturer's recommendations, such that the performance and certification of the doorsets are maintained.
- e) Fixing of signage, ironmongery and other fixtures shall maintain the performance and integrity of the doorsets.

L20.1205

Vision Panels

- a) Vision panels shall maintain the performance of the doorsets.
- b) Vision panels shall be, unless otherwise stated, clear, unwired, Kite marked safety glass in accordance with BS 6206 and BS EN 12600.
- c) Material shall be 10mm thick toughened glass.

L20.1206

Ironmongery

Ironmongery shall be in accordance with Section P21.

L20.1207

Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) The type, size and positioning of all mechanical fixing devices shall be as recommended by the system manufacturer to the acceptance of the Employer.
- c) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

L20.1208

Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) Include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in, grouting-in and making good.
- c) Co-ordinate fixing with the superstructure design.

L20.1209

Demountability

- a) Elements of the Works shall be individually and independently removable to provide access for maintenance and/ or replacement of units in the event of damage.

- b) The removal of units shall not affect the performance or safety of adjacent work or any other part of the Works. Submit a method statement for removal and replacement of components for acceptance by the Employer.

Timber Doors - Paint Finished

L20.1210

Type DRS-501 Paint Grade Timber Doorset

Factory paint finished timber doorset.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Door leaves:
- i) Solid laminated timber core and timber face.
 - ii) Vision panel bead: Hardwood in flush profile:
 - Beads shall include stainless steel trims, as indicated on the Design Drawings and/ or Door Schedule to the acceptance of the Employer, with stainless steel screw fixings.
 - Hardwood beads shall be screw fixed and pelleted.
 - iii) Lippings: Exposed hardwood.
- c) Door frames:
- i) Material: Hardwood.
 - ii) Profile: As indicated on the Design Drawings/ Door Schedule.
 - iii) Finish: As indicated on the Door Schedule.
- d) Factory applied pigmented polyurethane paint finish with colour matched PVC pellets to conceal fixings.

Timber Doors - Solid Wood

L20.1211

Type DRS-531 Solid Timber Doorset

Solid hardwood timber doorset.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Door leaves:
- i) Species: Mahogany.
 - ii) Solid timber core and timber face.
 - iii) Vision panel bead: Hardwood in flush profile:
 - Beads shall include stainless steel trims, as indicated on the Design Drawings and/ or Door Schedule to the acceptance of the Employer, with stainless steel screw fixings.
 - Hardwood beads shall be screw fixed and pelleted.
 - iv) Lippings: Exposed hardwood.
 - v) Finish: As indicated on the Door Schedule.
- c) Door frames:
- i) Species: Mahogany.

ii) Profile: As indicated on the Design Drawings/ Door Schedule.

iii) Finish: As indicated on the Door Schedule.

L20.1212

Type DRS-532 Solid Timber Doorset - Vent

Solid hardwood timber doorset.

a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.

b) Door leaves:

i) Species: Mahogany.

ii) Solid timber core and timber face.

iii) Vision panel bead: Hardwood in flush profile:

- Beads shall include stainless steel trims, as indicated on the Design Drawings and/ or Door Schedule to the acceptance of the Employer, with stainless steel screw fixings.
- Hardwood beads shall be screw fixed and pelleted.

iv) Lippings: Exposed hardwood.

v) Finish: As indicated on the Door Schedule.

c) Door frames:

i) Species: Mahogany.

ii) Profile: As indicated on the Design Drawings/ Door Schedule.

iii) Finish: As indicated on the Door Schedule.

d) Integrated vent:

i) Timber frame and grilles.

ii) Finish shall be as indicated on the Design Drawings.

L20.1300

MATERIALS

Metalwork and Finishes

L20.1301

Metalwork

Refer to Section Z11.

L20.1302

Finishes

a) Refer to Section Z30 for general finishes to metalwork.

b) Refer to Section Z31 for powder coatings.

Timber

L20.1303

General

Refer to Section Z10.

Preservative/ Fire Retardant Treatments

L20.1304

General

- a) Refer to Section Z12.
- b) Preservative/ fire retardant treatments shall be in accordance with Section A.7000.
- c) Where timber components are visible, the preservative/ fire retardant treatment shall maintain the visual characteristics of the timber or finish.

Glass

L20.1305 General

Refer to Section Z25.

Fixings

L20.1306 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

L20.1307 General

Refer to Section Z20.

Sealants

L20.1308 General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.

L20.2000 SUBMITTALS AND TESTING

L20.2100 SUBMITTALS

Tender Submittals

L20.2101 Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

L20.2102 Pre-contract Samples

Not required.

L20.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm sample of door, including lipped edge detail, forming the acceptable control samples for the project.

- b) Minimum 300mm of door frame, including integrated seals.
- c) Samples of glazing materials.
- d) Refer to Section P21 for sample requirements of ironmongery.

L20.2104 Mock-up Requirements

Not required.

L20.2105 Prototype Requirements

Not required.

L20.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed installation of each type of system.

L20.2200 TESTING

L20.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

L20.3000 EXECUTION

L20.3100 WORKMANSHIP

Fabrication

L20.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Manufacturing tolerances shall be in accordance with BS 5277, BS 5278, BS EN 951, BS EN 1529 and BS EN 1530.
- c) Timber doorsets shall be manufactured in accordance with BS 4787: Part 1.
- d) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.
- e) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with Site work restricted to fixing.
- f) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- g) Do not use materials/ components that are damaged or have any physical imperfections in the Works.
- h) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

L20.3102 Metalwork

Refer to Section Z11.

L20.3103 Joinery and Carpentry

Refer to Section Z10.

Workmanship

L20.3104

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

L20.3105

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

L20.3106

Suitability of Base/ Backing

- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation

L20.3107

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- d) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- e) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- f) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- g) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

- L20.3108 Ironmongery
- Ironmongery shall be assembled and fixed using fastenings with a matching finish supplied by the ironmongery manufacturer.
- L20.3109 Fixing Requirements
- a) Refer to Section Z20.
 - b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
 - c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
 - d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.
- L20.3110 Packings
- a) Provide suitable tight packings to take up tolerances and prevent distortion.
 - b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
 - c) Packings shall not intrude into zones that are to be filled with sealant. The performance of the Works and interfacing systems shall be maintained.
- L20.3111 Sealants
- For general sealants refer to Section Z22 of the Architectural Specification.
- Protection and Completion**
- L20.3112 Protection
- Finished areas shall be adequately protected from damage until Practical Completion.
- L20.3113 Cleaning
- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
 - b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
 - c) Do not use materials or methods that could alter the character of the exposed finishes.
 - d) Protect adjacent surfaces from damage due to cleaning operations.
- L20.3114 Completion
- a) Repair defects without delay to minimise damage and nuisance.
 - b) Do not use the Works for any purpose, except testing, until Practical Completion.
 - c) On Practical Completion, check the Works for damage and defects. Replace damaged or defective materials/ components.
- L20.3200 TOLERANCES**
- L20.3201 General
- Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Tolerances shall not be cumulative.
- n) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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L25.3201 General

10

L25 **EXTERNAL DOORS**

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L25.1000 **TYPE, SYSTEMS AND MATERIALS**

L25.1100 **ARCHITECTURAL SPECIFICATION TYPE**

L25.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation,

L25.1200 **SYSTEM DESCRIPTIONS**

Architectural and Functional Requirements

L25.1201 General

- a) The Works shall be covered by a single source warranty.
- b) Components for lightning protection and earth bonding shall be concealed.
- c) Where applicable, isolating tape, plastic washers or other suitable means shall be used to prevent bimetallic corrosion between dissimilar metals.
- d) Door systems shall include fixings, framing, bracketry, seals, ironmongery and other components/ accessories necessary to complete the Works. Where not specified, they shall be suitable for the service conditions and be to the acceptance of the Employer.

L25.1202 Services

- a) Refer to the Services Engineer's documentation and the Fire Strategy Report with regard to door operations, security and any additional devices.
- b) Systems shall accommodate services, sensing devices and final connections as indicated in the Services Engineer's documentation, in a concealed manner to the acceptance of the Employer.
- c) The location/ positioning of services, and associated components, shall be agreed with the Employer where not indicated on the Design Drawings.
- d) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.
- e) Wiring:
 - i) Wireways shall be concealed.
 - ii) Wireways shall connect equipment with the building power supply.
 - iii) Wireways shall accommodate the Services Engineer's, manufacturer's and Statutory requirements.
 - iv) System shall arrive pre-wired unless otherwise accepted by the Employer.
 - v) Wireways shall maintain the performance requirements of the system or interfacing systems.

L25.1203 Visual Requirements

- a) Configurations and structural opening dimensions shall be as indicated on the Door Schedule and/ or the Design Drawings.
- b) Vision panels, louvres, door protection and other features/ accessories shall be as indicated on the Design Drawings.
- c) Finishes shall be as indicated on the Door Schedule and/ or the individual System Types described in this Section.

L25.1204

Performance Requirements

- a) Performance shall be as indicated on the Door Schedule and/ or the Design Drawings.
- b) Industry recognised independent third party certification is required indicating compliance of individual doorsets with the performance.
- c) Duty categories as described shall be in accordance with BS 6375: Part 2.
- d) Doorsets shall be marked on the hinge edge with their door number and performance.
- e) The Works shall be securely fixed and sealed in accordance with the manufacturer's recommendations, such that the performance and certification of the doorsets are maintained.
- f) Fixing of signage, ironmongery and other fixtures shall maintain the performance and integrity of the doorsets.

L25.1205

Vision Panels

- a) Vision panels shall be configured as indicated on the Design Drawings and Door Schedule.
- b) Material shall be 10mm thick toughened glass.
- c) Vision panels shall maintain the performance of the doorsets.
- d) Vision panels shall be, unless otherwise stated, clear, unwired, Kite marked safety glass in accordance with BS 6206 and BS EN 12600.

L25.1206

Ironmongery

Ironmongery shall be in accordance with Section P21.

L25.1207

Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

L25.1208

Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) The Works shall include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in, grouting-in and making good.
- c) Co-ordinate fixing with the superstructure design.

L25.1209

Secondary Support

- a) Secondary support/ framing shall be configured as indicated in the Structural Engineer's documentation and the Design Drawings, suitably fixed back to the primary structure using methods acceptable to the Employer.
- b) Where the Contractor deems that visible secondary support is required in addition to that indicated in the Structural Engineer's documentation and on the Design Drawings, the Contractor shall inform the Employer at tender return.

L25.1210

Demountability

- a) Elements of the Works shall be individually and independently removable to provide access for maintenance and/ or replacement of units in the event of damage.
- b) The removal of units shall not affect the performance or safety of adjacent work or any other part of the Works. Submit a method statement for removal and replacement of components for acceptance by the Employer.

Glazed Framed Doors

L25.1211

Type DRS-211 Glazed Framed Door

Proprietary aluminium framed glazed hinged doorset, configured as indicated on the Design Drawings.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Framing:
 - i) Extruded aluminium thermally broken and separated sections forming the main framing.
 - ii) Polyester powder coated with maximum 20% gloss level, colour as indicated on the Design Drawings.
- c) Glazing:
 - i) Safety glass panels Type GLP-101 as described in Section L40.
 - ii) Glass panels shall include manifestation to the acceptance of the Employer.
- d) Sidelights: Where indicated on the Design Drawings and the Door Schedule, framing shall match the main framing.
- e) Performance requirements: Doorsets fixed into the structural openings such that the performance requirements are maintained.
- f) Thresholds: Thermally broken and drain water to the exterior of the building.
- g) Doors shall be fully weatherstripped, with easily exchangeable weather and draught seals.

L25.1212

Type DRS-212 Glazed Framed Door

Proprietary aluminium framed glazed hinged doorset, configured as indicated on the Design Drawings.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Door leaf:
 - i) Door facings shall be aluminium.
 - ii) Reinforced and insulated core.
- c) Glazing:
 - i) Safety glass panels Type GLP-101 as described in Section L40.
 - ii) Glass panels shall include manifestation to the acceptance of the Employer.
 - iii) Flush profiled powder coated beads with stainless steel trims as indicated on the Design Drawings and/ or Door Schedule.
- d) Door frame:
 - i) Profiled, insulated core aluminium door frame.
 - ii) Low profile cill.

- iii) Perimeter seals to satisfy the stipulated performance criteria.
- e) Integrated louvres as indicated on the Design Drawings:
 - i) Single bank ventilation louver.
 - ii) Concealed thermally broken and separated aluminium perimeter framing and mullions.
 - iii) Framing shall match the main framing.
 - iv) Horizontal aluminium louver blades, secured to mullions.
 - v) Blanking panels.
 - vi) Louvres shall include bird guard/ insect mesh.
- f) Finish: Polyester powder coated with maximum 20% gloss level, colour as indicated on the Design Drawings.

Metal Doors

L25.1213

Type DRS-401 Metal Doorset

Proprietary flush finished steel faced and framed doorset, configured as indicated on the Design Drawings.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Door leaf:
 - i) Door facings shall be zinc coated mild steel.
 - ii) Reinforced and insulated core.
 - iii) Anti-pick, high security cylinder lock, under the project Master Key plan.
 - iv) Heavy duty hinges with dog-bolts.
 - v) Vision panels:
 - Vision panels as indicated on the Design Drawings.
 - Profiled powder coated beads with stainless steel trims as indicated on the Design Drawings and/ or Door Schedule.
- c) Door frame:
 - i) Profiled, insulated core door frame.
 - ii) Low profile cill.
 - iii) Perimeter seals to satisfy the stipulated performance criteria.
- d) Integrated louvres as indicated on the Design Drawings:
 - i) Single bank ventilation.
 - ii) Concealed thermally broken and separated steel perimeter framing and mullions.
 - iii) Framing shall match the main framing.
 - iv) Horizontal steel louver blades, secured to mullions.
 - v) Blanking panels.

- vi) Louvres shall include bird guard/ insect mesh.
- e) Finish: Polyester powder coated with maximum 20% gloss level, colour as indicated on the Design Drawings.

L25.1300

MATERIALS

Metalwork and Finishes

L25.1301

Metalwork

Refer to Section Z11.

L25.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Glass

L25.1303

General

Refer to Section Z25.

Fixings

L25.1304

General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Fixing components shall comply with statutory requirements.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Sealants and Gaskets

L25.1305

Sealants

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.

L25.1306

Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

L25.2000

SUBMITTALS AND TESTING

L25.2100

SUBMITTALS

Tender Submittals

L25.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

L25.2102 Pre-contract Samples

Not required.

L25.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm sample of door, including lipped edge detail, forming the acceptable control samples for the project.
- b) Minimum 300mm length of door frame, including integrated seals.
- c) Samples of glazing materials.
- d) Refer to Section P21 for sample requirements of ironmongery.

L25.2104 Mock-up Requirements

Not required.

L25.2105 Prototype Requirements

Not required.

L25.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed installation of each type of system.

L25.2200 TESTING

L25.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

On-Site Testing

L25.2202 Waterproofing and Watertightness Testing

- a) Test the watertightness of the Works using the following simulated rain and hose test procedure, or as recommended by the system manufacturer to the acceptance of the Employer:
 - i) Subject the designated area of the Works to a 15 minute rain test using a spray rack containing sufficient hose nozzles to deliver the equivalent of 75mm of rain per hour. Check for leaks using endoscopy or other non-destructive methods, or by opening up the construction as directed. Perform repairs or replacements as necessary.
 - ii) Perform hose tests on 5% of sealed joints not subject to other testing regimes, in accordance with the procedures prescribed in the CWCT Standard for Systemised Building Envelopes. Check for any leaks and perform repairs, replacements and additional testing and inspections.
- b) Submit a method statement for carrying out the tests, for the acceptance of the Employer, at least one month prior to commencing testing on Site.
- c) Testing shall be carried out when work to the areas which are to be tested are complete, including that of associated and interfacing trades.
- d) Performance under testing:
 - i) There shall be no leakage through the Works at any time during the test.

- ii) Any part of the Works that is adversely affected shall be replaced or repaired; the design intent shall be maintained.
- e) After making good any defects, retest locally to verify integrity of repair.
- f) At the completion of each test, the results shall be recorded and issued to the Employer.

L25.2203

Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:
 - i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
 - ii) Apply a proof load of 1.5 times the unfactored design load.
 - iii) Test 10% of the installed fixings as a minimum.
- g) Torque Site testing:
 - i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
 - ii) Test 100% of the installed fixings.
 - iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.
 - iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
 - i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum.

L25.2204

Sealant Testing

- a) Staining: Test in accordance with BS 3712: Part 2. Perform test on each type of material in contact with sealant(s).
- b) Adhesion: Test elastomeric sealants for peel strength in accordance with BS 3712: Part 4.

L25.3000

EXECUTION

L25.3100

WORKMANSHIP

Fabrication

L25.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Manufacturing tolerances shall be in accordance with BS 5277, BS 5278, BS EN 951, BS EN 1529 and BS EN 1530.
- c) Steel door frames shall be manufactured in accordance with BS 1245.
- d) Fabrication shall be based on Site measurements to accommodate construction tolerances. Dimensions given on the Design Drawings shall be considered to be indicative only and should not be used for fabrication unless confirmed by the Employer as suitable.
- e) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with site work restricted to fixing as far as possible.
- f) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- g) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- h) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

L25.3102 Metalwork

Refer to Section Z11.

Workmanship

L25.3103 General

- a) Workmanship shall be generally in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

L25.3104 Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

L25.3105 Suitability of Base/ Backing

- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation

L25.3106 General

- a) Systems shall accommodate future moisture and temperature movement.

- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- d) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- e) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- f) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- g) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

L25.3107 Ironmongery

Ironmongery shall be assembled and fixed using fastenings with a matching finish supplied by the ironmongery manufacturer.

L25.3108 Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

L25.3109 Damp-proof Membranes

Substrates to receive membranes shall be free from dust and grease, free of cavities, ridges and sharp projections and be primed to receive adhesive as recommended by the membrane manufacturer. Surfaces that are not suitable to receive membrane shall be reported to the Employer.

L25.3110 Breather Membrane

- a) Before fixing, the moisture content of substrate shall be checked and shall be below 20%.
- b) Fix material to create a fully sealed membrane free from tears, punctures and sagging to provide a complete barrier to water, snow and wind blown dust/ particles.
- c) The membrane shall be secured at reveals/ perimeters of openings.
- d) Joints and edges, including around pipes, window openings and ducts, shall be sealed and secured as recommended by the membrane manufacturer.
- e) Immediately before covering over, check membranes for tears and perforations. Repair any damage found or replace the membrane in accordance with the manufacturer's recommendations and to the acceptance of the Employer.

- L25.3111 Vapour Control Layer/ Air Barrier
- a) Prime substrates as necessary to achieve a full bond.
 - b) Fix material to provide a fully sealed barrier free from tears, punctures and sagging.
 - c) Joints in the vapour barrier shall be aligned to suit the configurations of the Works, insulation and backing.
 - d) Sides and ends of sheets shall only be lapped where fully supported.
 - e) Laps shall be formed and continuously sealed in accordance with the manufacturer's recommendations.
 - f) Joints in a second layer, if required, shall be staggered by half a sheet.
 - g) Penetrations by pipes, ducts, structural members and other components shall be completely sealed with adhesive tape in accordance with the manufacturer's recommendations.
 - h) Immediately before covering over, check membranes for tears and perforations. Repair any damage found or replace the membrane in accordance with the manufacturer's recommendations and to the acceptance of the Employer.

- L25.3112 Packings
- a) Provide suitable tight packings to take up tolerances and prevent distortion.
 - b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
 - c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

- L25.3113 Flashings/ Trims
- a) Joints in flashings/ trims shall be installed to fully accommodate thermal movement.
 - b) Proprietary expansion joints shall be installed on flat sheets wherever practicable.
 - c) Joints generally shall be in accordance with the system manufacturer's recommendations and/ or the recommendations contained within the latest edition of 'Profiled Sheet Metal Roofing and Cladding, A Guide to Good Practice' published by the National Federation of Roofing Contractors (NFRC) whichever is the more onerous, or as otherwise stated.

- L25.3114 Sealants
- For general sealants refer to Section Z22 of the Architectural Specification.

L25.3200 TOLERANCES

- L25.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) At the time of handover the visual requirements of the Works shall be as follows:
 - i) The Works shall be straight and flat.
 - ii) Gaps to head and jambs of doors to frames shall be 3mm all round.
 - iii) The door shall provide a 3mm clearance above the internal floor finish level.

- iv) The maximum variation from plumb shall be $\pm 1.5\text{mm}$.
- c) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- d) Tolerances shall not be cumulative.
- e) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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L32 BALUSTRADES

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L32.1000 TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

L32.1100 ARCHITECTURAL SPECIFICATION TYPE

L32.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

L32.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

L32.1201 General

- a) Design and execute the Works in accordance with the relevant parts of BS 5395 and BS 6180.
- b) Temporary edge protection shall be in accordance with BS EN 13374.
- c) Permanent guardrails shall be in accordance with BS 13700 and BS EN ISO 14122.
- d) Systems shall include fixings, bracketry, support framing and accessories necessary to complete the Works.
- e) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and to achieve the performance requirements.

L32.1202 Handrails

- a) Handrails shall be continuous.
- b) End caps shall be provided to exposed stop ends of metal handrails.
- c) Handrails shall be attached to glass balustrades in such a manner that, should a glass pane fracture, the handrail will remain in position.

L32.1203 Services

Where specified, the Works shall be capable of containing, or inconspicuously supporting electrical supplies to serve electrical equipment indicated on the Design Drawings and in accordance with the Services Engineer's documentation.

L32.1204 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Indicate the type, size and positioning of mechanical fixing devices on the Working Drawings.
- c) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

L32.1205 Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.

- b) Include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
- c) Co-ordinate fixing with the superstructure design.
- d) Fixing devices shall be concealed, unless otherwise indicated on the Design Drawings or accepted by the Employer.

L32.1206 Secondary Support

- a) Systems shall include structural steel support, as necessary.
- b) Where the Contractor deems that visible secondary support is required in addition to that indicated in the Structural Engineer's documentation and on the Design Drawings, the Contractor shall inform the Employer at tender return.
- c) Systems shall include necessary sub-constructions/ assemblies including, but not limited to, framing, brackets, cleats, angles and other components.

L32.1207 Demountability

- a) Elements of the Works shall be individually and independently removable to allow access for maintenance and/ or replacement of system components in the event of breakage or damage.
- b) The Detailed Design shall provide systems that enable maintenance and cleaning of components, while minimising progressive dismantling and associated disruption.
- c) The removal of units shall not affect the performance or safety of adjacent work or any other part of the Works.

Metal Balustrades

L32.1208 Type BAL-301 Metal Balustrade

External balustrade system configured as indicated on the Design Drawings.

- a) Uprights:
 - i) Flat bar mild steel uprights to sizes and profiles indicated on the Design Drawings.
 - ii) Balusters shall be bolt and bracket fixed to substrates.
- b) Handrails:
 - i) Rectangular-flat mild steel handrail welded to baluster.
 - ii) Handrail corners shall be mitred and welded at changes in direction.
- c) Exposed metal surfaces shall be powder coated, to colour as agreed with the Employer.

L32.1300 MATERIALS

Metalwork and Finishes

L32.1301 General

Refer to Section Z11.

L32.1302 Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Fixings

L32.1303 General

- a) Refer to Section Z20.
- b) Fixing components shall comply with statutory requirements.
- c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

Adhesives

L32.1304 General

Refer to Section Z20.

Sealants and Gaskets

L32.1305 Sealants

- a) Refer to Section Z22.
- b) Sealant shall not leak or bleed causing any discolouration or staining.

L32.2000 SUBMITTALS AND TESTING

L32.2100 SUBMITTALS

Tender Submittals

L32.2101 Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

L32.2102 Pre-contract Samples

Not required.

L32.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm length of balustrade in accepted finish.
- b) One of each type of exposed fixing and bracketry in accepted finish.

L32.2104 Mock-up Requirements

Not required.

L32.2105 Prototype Requirements

Not required.

L32.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First completed system of each type.

L32.2200 TESTING

L32.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.

- b) Submit independently certified tests and Agrément certificates that demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification.
- c) Where data from previous independently certified tests and Agrément certificates demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification, off-Site independent testing need not be undertaken.
- d) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

On-Site Testing

L32.2202

Safety Tests for Fixings

- a) Engage an independent Construction Fixings Association (CFA) accredited testing specialist, acceptable to the Employer, to undertake safety tests for fixings.
- b) Locations of fixings determined by the Contractor for testing to be agreed with the Employer prior to the commencement of testing.
- c) Testing of fixings to be witnessed by the Employer as required.
- d) Testing of fixings to be completed prior to the tested fixings being covered/ obscured and becoming no longer visible.
- e) Submit to the Employer detailed records of fixings that have been tested.
- f) Site load testing:
 - i) Undertake testing of fixings on-Site to demonstrate that they achieve the loading requirements.
 - ii) Apply a proof load of 1.5 times the unfactored design load.
 - iii) Test 10% of the installed fixings as a minimum.
- g) Torque Site testing:
 - i) Undertake torque testing of fixing to demonstrate that torque requirements are achieved.
 - ii) Test 100% of the installed fixings.
 - iii) Clearly mark fixings to be concealed with red paint if satisfactorily tested.
 - iv) Marking of fixings shall not interfere or impact with existing markings and applied finishes.
- h) Pull-out testing:
 - i) Undertake pull-out tests in accordance with the CFA Guidance Note Procedure for Site Testing Construction Fixings.
 - ii) Apply a proof load of 1.5 times the unfactored design load during the pull-out tests.
 - iii) Test 10% of the installed fixings as a minimum.

L32.3000

EXECUTION

L32.3100

WORKMANSHIP

Fabrication

L32.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.

- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instructions from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with Site work restricted to fixing as far as possible.
- d) Fabricate the Works using proven methods of construction, to comply with design requirements.
- e) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects.
- f) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- g) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.
- h) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

L32.3102

Metalwork

Refer to Section Z11.

Workmanship

L32.3103

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

L32.3104

Inspection

- a) Before commencing installation, survey the substrate. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing substrate is unsuitable to receive the Works.
- b) If the substrate is unsuitable, propose remedial action to make it suitable.

L32.3105

Suitability of Structure

- a) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the structure or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- c) Tolerances of the substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation/ Application

L32.3106

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that shall prevail during building use.

- c) Agree arrangements for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works to prevent excessive thermal and moisture movement of the Works from taking place.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or as otherwise accepted by the Employer through sampling.
- h) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- i) Do not alter materials/ components with prefinished surfaces except where accepted by the Employer and except where cut finishes can be prepared and reinstated to their original finish quality.
- j) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

L32.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer, and where required by the Employer to be visible to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

L32.3108

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects. Tightly butt or leave gaps/ joints as required.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.
- f) Eliminate ridges and high spots.

- L32.3109 Sealants
- a) Refer to Section Z22.
 - b) Sealants shall not compromise the integrity of the Works.
 - c) Apply as a continuous bead unless specified or recommended otherwise by the manufacturer.

- L32.3110 Packings
- a) Provide suitable tight packings to take up tolerances and prevent distortion.
 - b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.

Protection

- L32.3111 Temporary Protection
- Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

- L32.3112 Cleaning
- a) At Practical Completion of the Works, or when otherwise accepted by the Employer, clean exposed areas/ surfaces using accepted cleaning materials and methods.
 - b) Materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
 - c) Apply suitable number of coats of polish or treatment of a type recommended by the system/ product manufacturer.
 - d) Do not use materials or methods that could alter the character of the exposed finishes.
 - e) Protect adjacent surfaces from damage due to cleaning operations.

- L32.3113 Completion
- a) Leave installed work clean.
 - b) Repair defects without delay to minimise damage and nuisance.
 - c) On Practical Completion, check the Works for damage and defects and replace damaged or defective materials/ components.

L32.3200 TOLERANCES

- L32.3201 General
- Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.
- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
 - b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
 - c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
 - d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
 - e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.

- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.

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L40

GLASS PANELS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L40.1000

TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

L40.1100

ARCHITECTURAL SPECIFICATION TYPE

L40.1101

Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation,

L40.1200

SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

L40.1201

General

- a) Insulating glass unit types shall be integral to the façade systems as described in other Sections and as indicated on the Design Drawings.
- b) Insulating glass units of each type may be required for vertical or inclined conditions, as indicated on the Design Drawings.
- c) Where required to suit the service conditions, safety glass shall be used. Refer to Section Z25.
- d) Where glass edges are visible they shall be suitable for open jointing or weathersealed jointing. Edges shall be to the acceptance of the Employer.
- e) Spacer bars to insulating glass units shall be black.
- f) Applied coatings (such as but not necessarily limited to low emissivity (low E), high performance, acoustic) shall maintain the appearance/ hue of the glass.
- g) The performance and visual requirements shall be maintained for all conditions.

L40.1202

Applied Finishes

- a) Where indicated on the Design Drawings, glass panels shall receive applied finishes.
- b) Glass panels shall have safety manifestation to comply with the requirements of the Architectural Specification. Methods, patterns and colours shall be to the acceptance of the Employer.
- c) Where applicable, systems shall include a solid black applied finish to the perimeter of the glazing to conceal the silicone bonding and frame behind.

Glass Panels

L40.1203

Type GLP-101 Insulating Glass Unit

Hermetically sealed, clear insulating laminated glass unit infill panels (safety glass where required) with low E coating.

- a) Build-up: 8mm laminated with a 0.38 PVB.
 - i) 4mm (reflective glass-external face) 0.38 PVB and 4mm clear glass.

- ii) 8.38mm total thickness.

L40.1300

MATERIALS

Glass and Coatings

L40.1301

General

Refer to Section Z25.

Sealants

L40.1302

General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.
- d) Structural silicone sealants:
 - i) Glazing requiring structural silicone bonding shall be glazed under controlled factory conditions without any need for Site applied structural bonding sealant, unless accepted otherwise by the Employer.
 - ii) Structural sealant glazing design shall limit the design tensile stress of sealants to 138kPa.

L40.1400

PERFORMANCE REQUIREMENTS

Refer to the performance requirements stated in the Section(s) that include the systems to which the glass panels shall be incorporated as an integral part.

Structural Performance

L40.1401

Thermal Movement

- a) The Works shall accommodate local thermal movements exerted due to climatic conditions.
- b) The Works shall accommodate effects due to the orientation of the building towards the sun and presence of any shading.
- c) Thermal movements shall not result in unacceptable levels of audible noise.

Environmental Performance

L40.1402

Light and Solar Radiant Heat Factors

- a) Data sheets for project specific glass build-ups in accordance with BS EN 410 (light transmittance, radiant transmittance of glazing) with tolerances of $\pm 3\%$ for flat glazing, shall be submitted in respect of solar and visible light performance confirming compliance with the Architectural Specification. Facilities shall be maintained to evaluate and report on expected solar performance under varying conditions of solar radiation and external/ internal air velocity.
- b) Optical and thermal performance values for glass infill panels shall be confirmed by the Contractor during the Detailed Design.
- c) Values shall be submitted for the following factors, to achieve the performance and visual requirements defined by the Architectural Specification, to the acceptance of the Employer:
 - i) Light factors:
 - Light transmission factor.

- External light reflectance.
 - Internal light reflectance.
 - UV radiation transmittance.
 - Colour rendering index.
- ii) Solar radiant heat factors:
- Solar radiant heat transmittance.
 - External solar radiant heat reflectance.
 - Solar radiant heat absorptance/ external.
 - Solar radiant heat absorptance/ internal.
 - Solar factor (G-value).
 - Shading coefficient.
- iii) The requirement for low E coatings.
- iv) The requirement for high performance coatings.
- d) Confirm the total solar transmission (G-value) for each glass type specified for review by the Employer. Glass manufacturers and types shall be acceptable to the Employer only if they achieve the performance and visual requirements defined by the Architectural Specification.
- e) Determine safety glass requirements to outer panes of the insulating glass units. Inner panes shall be safety glass in accordance with BS 6206 or BS EN 12600.

L40.2000

SUBMITTALS AND TESTING

L40.2100

SUBMITTALS

Tender Submittals

L40.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

L40.2102

Pre-contract Samples

Not required.

L40.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 1200mm x 1200mm samples of accepted glass types.
- b) Samples of accepted applied finishes on separate 1200mm x 1200mm glass panels.
- c) Accepted manifestation.

L40.2104

Mock-up Requirements

Not required.

L40.2105

Prototype Requirements

Not required.

L40.2106

Quality Benchmark Requirements

Refer to the requirements for quality benchmarks stated in the Section(s) that include the systems to which the glass panels shall be incorporated as an integral part.

L40.2200

TESTING

L40.2201

General

Refer to the requirements for testing stated in the Section(s) that include the systems to which the glass panels shall be incorporated as an integral part.

L40.3000

EXECUTION

L40.3100

WORKMANSHIP

L40.3101

Fabrication

- a) Refer to the requirements for fabrication stated in the Section(s) that include the systems to which the glass panels shall be incorporated as an integral part.
- b) Refer to Section Z25.

L40.3102

Workmanship

Refer to the requirements for workmanship stated in the Section(s) that include the systems to which the glass panels shall be incorporated as an integral part.

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L42.3102 Workmanship

3

L42 INFILL PANELS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

L42.1000 TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

L42.1100 ARCHITECTURAL SPECIFICATION TYPE

L42.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

L42.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

L42.1201 General

- a) Infill panels shall be integral to the external envelope systems as described in other Sections and as indicated on the Design Drawings.
- b) Mild steel sheet shall not be used in any panel within an aluminium frame.
- c) The final material thickness, type and make-up in the various locations shall be determined, paying full attention to the safety requirements. Final selection of material, together with type and location of interlayer and coatings shall remain the Contractor's responsibility.

Infill Panels

L42.1202 Type GLP-201 Aluminium Faced Infill Panel

Aluminium faced insulated composite infill panel.

- a) Aluminium sheet outer skin with powder coat finish to match framing.
- b) Aluminium inner sheet with white powder coat finish.
- c) Core insulation to suit composite panel construction, fully bonded to inner and outer sheets.

L42.1300 MATERIALS

Metalwork

L42.1301 General

Refer to Section Z11.

L42.1302 Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Sealants

- L42.1303 General
- a) Refer to Section Z22.
 - b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
 - c) Sealant shall not leak or bleed causing any discolouration or staining.
 - d) Structural silicone sealants:
 - i) Infill panels requiring structural silicone bonding shall be secured under controlled factory conditions without any need for Site applied structural bonding sealant, unless accepted otherwise by the Employer.
 - ii) Structural sealant design shall limit the design tensile stress of sealants to 138kPa.

Membranes

- L42.1304 Vapour Control Layers/ Air Leakage Barrier
- a) High performance reinforced membranes of metal foil or plastics, protected both sides by rigid facings/ linings to achieve the performance criteria.
 - b) Foil backed plasterboard shall not be accepted.
 - c) The product shall also perform as an air barrier.
 - d) Membranes shall be certified to an internationally recognised Agrément Certificate to the acceptance of the Employer.
 - e) Vapour resistance of the material shall be correct for the specific application.
 - f) Include necessary tapes, seals and accessories to provide a fully vapour and air sealed system at joints, perimeter conditions and penetrations.

Insulation

- L42.1305 Requirements
- a) Insulation shall be in accordance with the appropriate British Standard and/ or be British Board of Agrément (BBA) certified or certified by an equivalent internationally recognised body acceptable to the Employer.
 - b) Insulation shall be inert, durable, rot-proof and vermin-proof and not be degradable by moisture, extreme temperatures or water vapour, unless the Detailed Design of the system protects the insulation from the need for such requirements.
 - c) Insulation materials generally shall be in accordance with the LPC Design Guide for the Fire Protection of Buildings.
 - d) Insulation shall not bulge, sag, delaminate or detach during its installation or in its installed position during the life of the Works.
 - e) Insulation shall have zero Ozone Depleting Potential (ODP), be CFC and HFC free and have a Global Warming Potential (GWP) of less than five. Refer also to Section A of the Architectural Specification.
 - f) Insulation shall be selected in accordance with the Green Guide to Specification.

L42.2000 SUBMITTALS AND TESTING

L42.2100 SUBMITTALS

Tender Submittals

- L42.2101 Tender Response
- Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

L42.2102 Pre-contract Samples

Not required.

L42.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 1200mm x 1200mm framed samples of accepted opaque infill panels inclusive of finishes. If the module size is smaller, supply a full module.
- b) Sample indicating the accepted interface with the framing members.

L42.2104 Mock-up Requirements

Refer to the requirements for mock-ups stated in the Section(s) that include the systems to which the opaque infill panels shall be incorporated as an integral part.

L42.2105 Prototype Requirements

Refer to the requirements for prototypes stated in the Section(s) that include the systems to which the opaque infill panels shall be incorporated as an integral part.

L42.2106 Quality Benchmark Requirements

Refer to the requirements for quality benchmarks stated in the Section(s) that include the systems to which the opaque infill panels shall be incorporated as an integral part.

L42.2200 TESTING

L42.2201 General

Refer to the requirements for testing stated in the Section(s) that include the systems to which the opaque infill panels shall be incorporated as an integral part.

L42.3000 EXECUTION

L42.3100 WORKMANSHIP

L42.3101 Fabrication

- a) Refer to the requirements for fabrication stated in the Section(s) that include the systems to which the opaque infill panels shall be incorporated as an integral part.
- b) Refer to the applicable Z Sections.

L42.3102 Workmanship

Refer to the requirements for workmanship stated in the Section(s) that include the systems to which the opaque infill panels shall be incorporated as an integral part.

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M20 PLASTERED/ RENDERED COATINGS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

M20.1000 TYPE, SYSTEMS AND MATERIALS

M20.1100 ARCHITECTURAL SPECIFICATION TYPE

M20.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in accordance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

M20.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

M20.1201 General

- a) Coatings shall be of a thickness to suit profile depth indicated on the Design Drawings, and to maintain performance requirements.
- b) Unless otherwise specified, substrates shall be as indicated on the Design Drawings.
- c) Application shall be in accordance with the manufacturer's recommendations.
- d) Include movement joints within the Works as required, which shall be installed in accordance with the manufacturer's recommendations. Exposed elements shall be to the acceptance of the Employer.
- e) Include necessary primers, bonding compounds, sealants, beads, stops and other accessories recommended by the manufacturer.

M20.1202 Beads/ Stops

- a) Systems shall include stop beads at plasterboard edges, corners and shadow gaps.
- b) Edge beads/ corner beads/ stop beads/ angle beads to external render shall be stainless steel.
- c) Beads to internal plaster shall be galvanised mild steel.

M20.1203 Movement Joints

- a) External render shall incorporate flexible external joints with sealant and compressible joint filler and bond breaker.
- b) Stainless steel render beads shall be provided to both sides of movement joints.

M20.1204 Expanded Metal Lathing for External Render

- a) Stainless steel rib-lath shall be fixed to the entire face of the wall/ soffit.
- b) Stainless steel hammerscrews shall be as recommended by the lathing manufacturer, sized to suit mesh.

External Sand/ Cement Render

M20.1205 Type EWS-601 Sand/ Cement Render

Sand/ cement render applied to surfaces of masonry walls.

- a) Preparation in accordance with BS EN 13914: Part 1.
- b) Substrate: Where indicated on the Design Drawings, substrate shall be blockwork or cement particle board.
- c) Render coat(s):
 - i) Masonry cement or, subject to acceptance, Portland cement in accordance with BS EN 197: Part 1 plus an air-entraining admixture in accordance with BS EN 934: Part 3.
 - ii) Sand in accordance with BS EN 13139.
 - iii) The mix proportions of cement to sand shall be 1 to 3½-4½ for dense, strong and smooth or moderately strong and porous backgrounds; or 1 to 4½ for backgrounds that are moderately weak and porous.
- d) Thickness: 30mm in two coats, excluding dubbing out.
- e) Finish: Wood float finish to match accepted sample and to suit Site applied paint finish.

Board Finish Plaster

M20.1206 Type PLS-101 Board Finish Plaster

Single finish skim coat of Gypsum plaster to plasterboard substrates.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Thickness: 3mm applied in one coat.
- c) Finish: Smooth.

Hardwall Plaster

M20.1207 Type PLS-111 Hardwall Plaster

Two coat, high impact resistant, lightweight Gypsum plaster system, to surfaces of concrete and masonry walls.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) High impact resistant plaster undercoat.
 - i) Admixtures: Water retaining and in accordance with the manufacturer's recommendations.
 - ii) Thickness: 28mm, excluding dubbing out.
- c) Gypsum finish plaster.
 - i) Thickness: 2mm.
 - ii) Finish: Smooth.

M20.1300 MATERIALS

Metalwork

M20.1301 General

Refer to Section Z11.

M20.1302 Metal Lath/ Beads

Metal lath and beads shall be in accordance with BS EN 13658: Parts 1 and 2.

M20.1303 Finishes

Refer to Section Z30 for general finishes to metalwork.

Bonding Agents/ Sealers

M20.1304 Bonding Agent

Polyvinyl acetate emulsion shall be in accordance with BS 5270 and shall only be used in dry conditions, as recommended by the emulsion manufacturer.

M20.1305 Substrate Sealer

Sealer of polyvinyl acetate emulsion shall be in accordance with BS 5270 and shall be as recommended by the emulsion manufacturer.

Cement

M20.1306 General

Ordinary Portland cement or Portland blastfurnace cement in accordance with BS EN 197: Part 1.

Aggregate

M20.1307 General

- a) Fine (sand) in accordance with BS EN 13139 and PD 6682: Part 3, grading limit in accordance with BS 8204: Part 1.
- b) Fine aggregate in accordance with BS EN 12620 grading limit M with not more than 10% passing sieve size 150 microns.
- c) Coarse aggregate in accordance with BS EN 12620, 10mm.

Admixtures

M20.1308 General

Admixtures shall be in accordance with BS EN 934: Part 3.

Gypsum

M20.1309 General

Gypsum binders and gypsum plasters shall be in accordance with BS EN 13279: Part 1.

M20.2000 SUBMITTALS AND TESTING

M20.2100 SUBMITTALS

Tender Submittals

M20.2101 Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

M20.2102 Pre-contract Samples

Not required.

M20.2103	Post Contract Award Samples
	In accordance with Section A.4000, submit post contract award samples of the following:
	a) 300mm x 200mm sample of each plastered finish.
	b) 300mm x 200mm sample of rendered finish.
	c) 300mm of each exposed trim in accepted finish.
M20.2104	Mock-up Requirements
	Not required.
M20.2105	Prototype Requirements
	Not required.
M20.2106	Quality Benchmark Requirements
	Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:
	a) First 10m ² or whole wall of room, of each type of coating.
M20.2200	TESTING
M20.2201	General
	Submit the manufacturer's existing test data.
M20.3000	EXECUTION
M20.3100	WORKMANSHIP
	Fabrication
M20.3101	General
	Fabrication of components shall, as a minimum, be in accordance with current regulations and standards.
	Workmanship
M20.3102	General
	Workmanship shall generally be carried out in accordance with the relevant and applicable parts of BS EN 13914 and BS 8481.
	Inspection/ Preparation
M20.3103	Inspection
	a) Before commencing installation, survey the substrate. Check line, level and fixing points. Report immediately to the Employer if the existing substrate is unsuitable to receive the Works.
	b) If the substrate is unsuitable, propose remedial action.
M20.3104	Suitability of Substrate
	a) The suitability of the existing substrate shall be confirmed to the Employer before the installation of the Works.
	b) The substrate shall be allowed to dry out thoroughly so that drying shrinkage is substantially complete before applying the render/ plaster finish.

- c) Substrates shall be sound, with no loose areas or significant cracks or gaps.
- d) Cutting, chasing, plugging, making good, and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- e) Tolerances of the structure/ substrate shall be suitable to permit the specified flatness/ regularity of the finished coatings.
- f) Substrates shall be clean, free from dirt, dust, efflorescence, mould or any other contaminants that are incompatible with coatings.

M20.3105

Mixing of Materials

- a) Materials shall be mixed thoroughly to a uniform consistency in a suitable forced action mechanical mixer.
- b) Materials shall be used while sufficiently plastic to achieve full compaction.
- c) Once samples of coatings have been accepted, do not change the type or proportion of constituent materials.
- d) Supplies of materials shall be sufficient to give consistent and uniform colour and texture.

Application

M20.3106

General

- a) Proprietary systems shall be installed in accordance with manufacturer's recommendations.
- b) Each coat shall be applied firmly to achieve good adhesion in one continuous operation between angles and joints.
- c) Coats shall not be less than the thickness specified, in accordance with the Codes of Practice, shall be firmly bonded, of even and consistent appearance and be free from rippling, hollows and ridges.
- d) Surfaces shall be finished to a true plane and to the correct line and level, with angles and corners to a right angle, unless specified otherwise. Walls and reveals shall be plumb and square.

M20.3107

Adverse Weather

- a) Do not use frozen materials or apply to frozen surfaces.
- b) The Works shall not be applied when the air temperature is at or below 5°C and when the air humidity is above 90%.
- c) Temperature of the Works shall be maintained above freezing until render has fully hardened.
- d) Works damaged by frost shall be removed and replaced. When instructed by the Employer, damaged work shall be rebuilt.
- e) The Works shall not be applied when a frost is expected within 24 hours of application.

M20.3108

Combing

Combing, where specified, shall be carried out as the coating stiffens using a suitable comb to produce evenly spaced, wavy horizontal lines, approximately 20mm apart and 5mm deep, to provide a key for the following coat, with no penetration through the coat.

M20.3109

Dissimilar Backgrounds

Where jointing details are not specified, the Contractor shall submit, for review by the Employer, details for jointing of render/ plaster systems at the junction of dissimilar backgrounds.

M20.3110

Drying Out

- a) Each undercoat and final coat shall be kept damp for the initial period by covering with polythene sheet and/ or spraying with water. Drying out too rapidly shall be prevented and no forced heat drying or dehumidification shall be allowed. Work shall be carried out in the shade whenever possible. Each coat shall be allowed to dry out thoroughly so that drying shrinkage is substantially complete before applying the next coat.
- b) Base and intermediate coats of proprietary systems shall be permitted to dry out in accordance with the system manufacturer's recommendations prior to the application of other intermediate or finishing coats.

M20.3111 Trowel/ Float Application

Trowel/ float application shall be in accordance with the system manufacturer's recommendations, and shall leave an even overall texture to match accepted samples.

M20.3112 Machine Application

Render coats may be spray applied in accordance with the manufacturer's recommendations. Water content of mixtures shall be adjusted as required to suit machine/ pump equipment. Alteration of mixtures shall maintain performance and visual requirements.

Finishing

M20.3113 General

- a) Finishes to proprietary systems shall be in accordance with the manufacturer's recommendations to match accepted samples.
- b) Non-proprietary systems shall be finished with a trowel or float to produce finishes to match accepted samples.
- c) Finishes shall have no hollows, abrupt changes of level, trowel marks or any other defections or imperfections. Water brushing shall not be used and excessive trowelling shall be avoided.

M20.3114 Wood Float Finish

Finish with a dry wood float as soon as wet sheen has disappeared from the surface, to give an even overall texture with no hollows, abrupt changes of level or float marks.

M20.3200 TOLERANCES

M20.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- d) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- e) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- f) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- g) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.

- h) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- i) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- j) Tolerances shall not be cumulative.
- k) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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M40 CERAMIC TILING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

M40.1000 TYPE, SYSTEMS AND MATERIALS

M40.1100 ARCHITECTURAL SPECIFICATION TYPE

M40.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation for the complete system or installation.

M40.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

M40.1201 General

- a) Tiling shall be in accordance with BS 5385.
- b) Floor tiles shall be set to finished floor levels indicated on the Design Drawings.
- c) Configuration of tiles shall be as indicated on the Design Drawings.
- d) Where not specified, tiled finishes shall be supplied and installed as complete integrated systems, including fixings, sealants, adhesives, jointing/ transition strips, trims and other accessories/ components recommended/ supplied by the tile manufacturer to suit service conditions and as accepted by the Employer.

M40.1202 Joints/ Edgings

Exposed elements shall be as accepted by the Employer.

Porcelain Floor Tiling

M40.1203 Type FLH-101 Porcelain Floor Tiling

Slip-resistant porcelain floor tiling.

- a) Tile:
 - i) Manufacturer: Tile and Carpet Centre Ltd.
 - ii) Reference: Argile Opal.
 - iii) Finish: Matt.
 - iv) Colour: Grey.
 - v) Size: As indicated on the Design Drawings.
- b) Grout in accordance with manufacturer's recommendations, to the acceptance of the Employer.
 - i) Colour: As indicated on the Design Drawings.
 - ii) Joint width: To the acceptance of the Employer.

- c) Uncoupling membrane as required: In accordance with the manufacturer's recommendations.
- d) Accessories, where indicated on the Design Drawings:
 - i) Brushed satin finished stainless steel transition strip.
 - ii) Stair nosing insert.
- e) Slip resistance:
 - i) When tested using the TRL Pendulum Tester, flooring, inclusive of surface treatment, shall achieve the following pendulum test value (PTV):
 - Dry: Not less than 36 PTV.
 - Wet: Not less than 36 PTV.
 - Inclined slopes: In accordance with the requirements of the UK Health and Safety Executive, an increase of 1.76 PTV for each degree of incline is required.

M40.1204

Type TRM-101 Porcelain Skirting

Porcelain skirting.

- a) Tiles:
 - i) Manufacturer: Tile and Carpet Centre Ltd.
 - ii) Reference: Argile Silver.
 - iii) Finish: Matt.
 - iv) Colour: Silver.
 - v) Size: 600mm x 600mm.
 - vi) Accessories: Skirting shall include internal and external corner pieces.
- b) Grout in accordance with manufacturer's recommendations, to the acceptance of the Employer.
 - i) Colour: As indicated on the Design Drawings.
 - ii) Joint width: To the acceptance of the Architect

Porcelain and Ceramic Wall Tiling

M40.1205

Type LIN-101 Ceramic Wall Tiling

Glazed ceramic wall tiling.

- a) Tiles:
 - i) Manufacturer: Tile and Carpet Centre Ltd.
 - ii) Colour: As indicated on the Design Drawings.
 - iii) Size: As indicated on the Design Drawings.
- b) Grout in accordance with manufacturer's recommendations, to the acceptance of the Employer.
 - i) Colour: As indicated on the Design Drawings.
 - ii) Joint width: To the acceptance of the Employer.

- c) Adhesive: In accordance with manufacturer's recommendations, to the acceptance of the Employer.
- d) Accessories: Colour matched external corner/ edge trim to the acceptance of the Employer.

M40.1300

MATERIALS

Mortar Bedding

M40.1301

General

Type of mortar bedding system shall be in accordance with BS 5385.

Adhesives

M40.1302

General

- a) Refer to Section Z20.
- b) Adhesives shall be in accordance with BS EN 12004: Part 1.
- c) Adhesives shall be compatible with backgrounds/ bases, finished surfaces, preservative/ fire retardant treatments and shall maintain the performance requirements of the elements to be bonded.

Movement Joints

M40.1303

General

Movement joints/ metal edgings shall be in accordance with BS 5385.

Sealants

M40.1304

General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's written recommendations to suit the service conditions.

Grouting

M40.1305

General

Grout shall be in accordance with BS EN 13888.

M40.2000

SUBMITTALS AND TESTING

M40.2100

SUBMITTALS

Tender Submittals

M40.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

M40.2102

Pre-contract Samples

Not required.

M40.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) Manufacturer's literature confirming the adhesive type/ class, in accordance with BS EN 12004: Part 1, of each proposed adhesive type for each installation condition.
- b) Manufacturer's literature confirming the grout class, in accordance with BS EN 13888, of each proposed grout type for each installation condition.
- c) Typical module or minimum 300mm x 200mm size of each range type.
- d) Grout sample presented between two tiles to show the accepted colour, width and profile.
- e) 300mm sample of each proprietary profiled or sealant movement joint in accepted finish and profile and presented between two tiles.
- f) 300mm, or one sample of skirting in accepted finish, profile and size.
- g) 300mm sample of each beading/ edging/ trim in accepted finish and profile.

M40.2104 Mock-up Requirements

Not required.

M40.2105 Prototype Requirements

Not required.

M40.2106 Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First full room of each tile type including one of each exposed component of the Works.

M40.2200 TESTING

M40.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

M40.2202 Sealant Testing

Refer to Section Z22.

M40.2203 Grout Staining

Evaluate the risk of staining, as recommended by the manufacturer. Seek advice of specialist/ manufacturer if discolouration occurs on trial areas.

M40.2204 Slip Resistance Testing

- a) Testing for slip resistance shall be in accordance with the following documents:
 - i) 'Assessing the slip resistance of flooring' by the Health and Safety Executive (latest published version).
 - ii) 'The assessment of floor slip resistance, the UK Slip Resistance Group guidelines' by the UK Slip Resistance Group (latest published version).
- b) Testing shall be performed at an independent KENAS accredited laboratory accredited to perform the specified test methods.
- c) Pendulum test: Evaluate flooring in both dry and wet conditions using the TRL Pendulum Tester in accordance with BS EN 16165 and the recommendations of the UK Slip Resistance Group to obtain the pendulum test value (PTV) low slip potential.

- d) Roughness test: Evaluate flooring using a surface roughness meter, in accordance with the recommendations of the UK Slip Resistance Group, to obtain the surface roughness (Rz) value confirmed by the manufacturer's product literature.
- e) Flooring materials provided with manufacturer's data referring to slipperiness (R) values in accordance with DIN 51130 will not be acceptable unless PTV and Rz values are also provided.
- f) Test samples at the following stages of the project:
 - i) Submission to the Employer for acceptance.
 - ii) Production.
 - iii) Post-installation (in situ).
- g) Post installation (in situ) test locations shall be agreed with the Employer.
- h) Submit test results to the Employer for acceptance.
- i) Test samples shall include any surface sealer or treatment that is to be applied to the finished internal flooring.

M40.3000

EXECUTION

M40.3100

WORKMANSHIP

Fabrication

M40.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Fabricate the Works using proven methods of construction, to comply with the design requirements.
- d) Sections shall be formed true to shape, accurate in size, square, free from distortions, irregularities and defects, to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.

Workmanship

M40.3102

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000 and BS 5385.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained in the installation of the Works and, where applicable, be recommended by the system manufacturer.

Inspection/ Preparation

M40.3103

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line and level. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

M40.3104

Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to adjacent work, that can not/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems.

M40.3105

Dampness

Where tiles are to be installed on new wet-laid backgrounds/ bases:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.
- d) Tiles shall not be laid until readings show suitable humidity in accordance with tile and adhesive manufacturers' recommendations.

Installation/ Application

M40.3106

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise and within stated tolerances and in the correct relationship with the building structure.
- f) Before adhesive/ bedding material sets, adjustments shall be made to give true, regular appearance to tiles and joints when viewed under final lighting conditions. Sudden irregularities shall not occur.
- g) Setting-out shall be centred between walls so that cut tiles at perimeter are of equal sizes and not smaller than one third of original tile size.
- h) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- i) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.

- ii) Joints at angles shall be mitred to the acceptance of the Employer.
- j) Inspect each component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- k) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- l) Colour/ textural variations:
 - i) Units shall be selected/ sorted on site to achieve a consistent overall appearance of the completed work.
 - ii) Colour and texture of applied finishes shall be consistent throughout the Works, with no banding, patchiness or other visual variations.
- m) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- n) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

M40.3107

Adhesive

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond tiles securely to substrates to give true surfaces free from undulations, scratches, adhesive marks, stains and other visual defects.
- d) Spread the adhesive evenly, pressing down tiles firmly for full contact over the entire area of the tile.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.
- f) There shall be no ridges or high spots.

M40.3108

Checking Tile Adhesion

In the presence of the Employer, it shall be verified that there is adhesion over the whole tile area.

M40.3109

Mortar

Apply mortar bedding in accordance with the manufacturer's recommendations.

M40.3110

Joint Widths

- a) Joints shall be true to line, continuous and without steps.
- b) Tile to tile grout joint widths between tiles shall be controlled by using spacer pegs.

M40.3111

Grouting

- a) Grout shall not be applied until the bedding/ adhesive has hardened sufficiently.
- b) The joints shall be free from dust and debris.
- c) Joints shall be filled to the full depth of the tile.
- d) Joints shall be tooled to the accepted profile and wiped down to leave free from blemishes.

Protection

M40.3112

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

M40.3113

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be recommended/ accepted by the tile manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

M40.3114

Completion

- a) Installed work shall be left clean.
- b) Repair defects without delay, to minimise damage and nuisance.
- c) On Practical Completion, check the Works for damage and defects. Replace damaged or defective components/ accessories.

M40.3200

TOLERANCES

M40.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) Tolerances for tiling shall be in accordance with BS 5385: Part 1.
- b) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- c) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- d) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- e) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- f) The permissible deviation from vertical datum of a floor finish level shall be $\pm 3\text{mm}$, but shall be flush with any adjacent floor finish.
- g) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- h) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- i) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- j) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- k) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- l) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- m) Tolerances shall not be cumulative.
- n) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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M50 VINYL/ CARPET SHEETING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

M50.1000 TYPE, SYSTEMS AND MATERIALS

M50.1100 ARCHITECTURAL SPECIFICATION TYPE

M50.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

M50.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

M50.1201 General

- a) Underlays shall suit the service conditions and finished floor levels, and be in accordance with the manufacturer's recommendations.
- b) Vinyl flooring systems shall include matching integral coved skirting details as indicated on the Design Drawings.
- c) Provide a levelling compound where necessary and as recommended for purpose by the system manufacturer.
- d) Where not specified, linings and floor coverings shall be supplied and installed as complete integrated systems, including fixings, sealants, adhesives, jointing/ transition strips, trims and other accessories/ components recommended/ supplied by the flooring/ lining manufacturer to suit the service conditions to the acceptance of the Employer.

M50.1202 Joints

- a) Exposed elements shall be as accepted by the Employer.
- b) Seams to linings and flooring coverings shall be jointed in accordance with the manufacturer's recommendations, and to match the Employer's design intent.
- c) Joints to be sealed shall be seam welded with matching colour rods as recommended by the system manufacturer.

M50.1203 Slip Resistance

- a) When tested using the TRL Pendulum Tester, flooring, inclusive of surface treatment, shall achieve the following pendulum test value (PTV):
 - i) Dry: Not less than 36 PTV.
 - ii) Wet: Not less than 36 PTV.
 - iii) Inclined slopes: In accordance with the requirements of the UK Health and Safety Executive, an increase of 1.76 PTV for each degree of incline is required.
- b) When tested using the surface roughness meter, flooring shall achieve the following surface roughness (Rz) value:
 - i) Not less than 20 µm Rz.

Vinyl Sheet Flooring

M50.1204

Type FLS-111 Hygienic Vinyl Sheet Flooring - Anti-Slip

Hygienic anti-slip vinyl sheet flooring with welded joints.

- a) Sheet:
 - i) Manufacturer: Forbo.
 - ii) Reference: Surestep Laguna.
 - iii) Colour: 181662 reef green.
- b) Skirtings: Vinyl coved integral skirting bonded to substrate.
- c) Adhesive: In accordance with the manufacturer's recommendations, to the acceptance of the Employer.
- d) Edgings/ cover strips: In accordance with the manufacturer's recommendations.

Barrier Matting

M50.1205

Type FLS-601 Barrier Matting

Proprietary barrier matting with perimeter frame.

- a) Manufacturer: Forbo.
- b) Reference: Nuway Tuftiguard.
- c) Mat:
 - i) Construction: Closed.
 - ii) Thickness: 12mm.
 - iii) Colour: Classic buffed grey.
 - iv) Scrapers: Mill finished aluminium of profile recommended by the matting manufacturer to suit the mat thickness.
 - v) Wipers: Single/ double wipers with grey finish, as agreed with the Employer.
- d) Perimeter frame: Recessed aluminium matwell frame, mechanically fixed in accordance with the manufacturer's recommendations.
- e) Screed: Where required or as indicated on the Design Drawings, include a thin bed screed to finish flush with the lower flange of the perimeter frame.

M50.1300

MATERIALS/ COMPONENTS

Metalwork and Finishes

M50.1301

Metalwork

Refer to Section Z11.

M50.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Adhesives

M50.1303

General

Refer to Section Z20.

M50.2000 SUBMITTALS AND TESTING

M50.2100 SUBMITTALS

Tender Submittals

M50.2101 Tender Response
Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

M50.2102 Pre-contract Samples
Not required.

M50.2103 Post Contract Award Samples
In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm of each floor covering system.
- b) Accepted visible fixings (where visible fixings form part of the Design).
- c) Accepted movement joints minimum 300mm length.
- d) Accepted edge trims and covers minimum 300mm length.
- e) 1 No. of each accepted accessory.

M50.2104 Mock-up Requirements
Not required.

M50.2105 Prototype Requirements
Not required.

M50.2106 Quality Benchmark Requirements
Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First full room of each floor covering type, which shall include one of each exposed component of the Works.

M50.2200 TESTING

M50.2201 General

- a) Refer to Section A clause series A.6000 for the general requirements for testing and the approach to off-Site and on-Site testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

M50.2202 Slip Resistance Testing

- a) Testing for slip resistance shall be in accordance with the following documents:
 - i) 'Assessing the slip resistance of flooring' by the Health and Safety Executive (latest published version).
 - ii) 'The assessment of floor slip resistance, the UK Slip Resistance Group guidelines' by the UK Slip Resistance Group (latest published version).

- b) Testing shall be performed at an independent KENAS accredited laboratory accredited to perform the specified test methods.
- c) Pendulum test: Evaluate flooring in both dry and wet conditions using the TRL Pendulum Tester in accordance with BS EN 16165 and the recommendations of the UK Slip Resistance Group to obtain the pendulum test value (PTV) low slip potential.
- d) Roughness test: Evaluate flooring using a surface roughness meter, in accordance with the recommendations of the UK Slip Resistance Group, to obtain the surface roughness (Rz) value confirmed by the manufacturer's product literature.
- e) Flooring materials provided with manufacturer's data referring to slipperiness (R) values in accordance with DIN 51130 will not be acceptable unless PTV and Rz values are also provided.
- f) Samples shall be tested at the following stages of the project:
 - i) Submission to the Employer for acceptance.
 - ii) Production.
 - iii) Post-installation (in situ).
- g) Post installation (in situ) test locations shall be agreed with the Employer.
- h) Submit test results to the Employer for acceptance.
- i) Test samples shall include any surface sealer or treatment to be applied to the finished flooring.

M50.3000

EXECUTION

M50.3100

WORKMANSHIP

Fabrication

M50.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Install resilient floor coverings in accordance with BS 8203: Code of practice for the installation of resilient floor coverings.
- c) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- d) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- e) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

M50.3102

Metalwork

Refer to Section Z11.

Workmanship

M50.3103

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained in the installation of the Works and, where applicable, be recommended by the system manufacturer.

Inspection/ Preparation

M50.3104

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line and level. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

M50.3105

Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from grease, dirt and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose areas or significant cracks or gaps.
- c) Concrete substrates shall be free of mould oil, surface retarders and other materials incompatible with the bedding/ adhesive.
- d) Cutting, chasing, plugging and other necessary procedures required to the substrate or adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- e) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

M50.3106

Dampness

Where systems/ products are to be installed on new wet-laid backgrounds/ bases:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe in accordance with BS 8203 or other standard as agreed with the Employer.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation/ Application

M50.3107

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.

- g) Setting-out of cut materials/ components at the perimeter shall be of equal sizes, not smaller than one third of original size and to the acceptance of the Employer, unless otherwise indicated on the setting out drawings.
- h) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or as otherwise accepted by the Employer.
- i) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- j) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- k) Colour/ textural variations:
 - i) Units shall be selected/ sorted on Site to achieve a consistent overall appearance of the completed work.
 - ii) Colour and texture of applied finishes shall be consistent throughout the Works, with no banding, patchiness or other visual variations.
- l) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- m) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

M50.3108

Fixing Requirements

- a) Refer to Section Z20.
- b) Install fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

M50.3109

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.
- f) Eliminate ridges and high spots.

M50.3110

Sealants

Refer to Section Z22.

M50.3111

Seams in Resilient Flooring

- a) Patterns shall be matched at seams.

- b) Cut seams to provide a tight joint, without gaps, and bond in accordance with the manufacturer's recommendations.
- c) Adhesive shall be completely set before commencing welding of seams, in accordance with the manufacturer's recommendations.
- d) A neat, smooth, strongly bonded seam joint shall be formed flush with finished surface.

Protection

M50.3112 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

M50.3113 Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Suitable number(s) of coats of polish or treatment(s) shall be applied in accordance with the manufacturer's recommendations.
- d) Do not use materials or methods that could alter the character of the exposed finishes.
- e) Protect adjacent surfaces from damage due to cleaning operations.

M50.3114 Completion

- a) Installed work shall be left clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects, and replace damaged or defective materials/ components.

M50.3200 TOLERANCES

M50.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The permissible deviation from vertical datum of a floor finish level shall be $\pm 3\text{mm}$, but shall be flush with any adjacent floor finish.
- g) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.

- h) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- i) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- j) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- k) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- l) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- m) Tolerances shall not be cumulative.
- n) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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M60 PAINTING/ CLEAR FINISHING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

M60.1000 TYPE, SYSTEMS AND MATERIALS

M60.1100 ARCHITECTURAL SPECIFICATION TYPE

M60.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

M60.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

M60.1201 General

- a) Surfaces to receive finishes shall be indicated on the Design Drawings/ Finishes Schedule.
- b) Surfaces shall be prepared in accordance with the manufacturer's recommendations.
- c) Where not specified, preparatory materials, primers, base coats and undercoats shall be in accordance with the manufacturer's recommendations to suit the application and service conditions.
- d) Application shall generally be in accordance with the manufacturer's recommendations.
- e) Colours shall be as indicated on the Design Drawings/ Finishes Schedule.
- f) Where the Works will be subject to wet conditions such as in bathrooms/ shower rooms/ kitchens, the paint system shall be replaced with a moisture resistant type with equivalent performance.

Emulsion Paint

M60.1202 Type PTS-101 Emulsion Paint

Water based emulsion paint.

- a) Manufacturer: Crown Paints Kenya PLC.
- b) Reference: Vinyl Matt Emulsion Luxury.
- c) Colour: Manufacturer's standard colour range, to the acceptance of the Employer.
- d) Application: By brush/ roller.
- e) Apply 1 No. initial coat of emulsion paint, thinned in accordance with the manufacturer's recommendations.
- f) Apply 2 No. full finishing coats of emulsion paint in accordance with the manufacturer's recommendations.

Exterior Paint

M60.1203 Type PTS-171 Exterior Paint

Exterior paint with textured finish.

- a) Manufacturer: Crown Paints Kenya PLC.
- b) Reference: Crown Ruff N Tuff Texture Normal.
- c) Colour: To match existing buildings, to the acceptance of the Employer.
- d) Application: Stainless steel trowel. Finishing shall be in accordance with the manufacturer's recommendations.
- e) Initial coat: 1 No. coat of Ruff N Tuff white base coat in accordance with the manufacturer's recommendations.
- f) Finishing coat: 2 No. full coats of Crown Exterior quality paint such as Permacote or Permaplast, in accordance with the manufacturer's recommendations.

Concrete Sealer

M60.1204

Type PTS-231 Concrete Sealer

Sealer to masonry/ concrete substrates.

- a) Manufacturer: Crown Paints Kenya PLC.
- b) Reference: Crown Transeal Acrylic Clear Finish.
- c) Colour: Clear.
- d) Application: By brush/ roller.
- e) Initial coat: Diluted in accordance with the manufacturer's recommendations and sealed with a stabilising primer.
- f) Finishing coat: 1 No. full coats in accordance with manufacturer's recommendations.

M60.1300

MATERIALS

M60.1301

Source of Materials

- a) Coating materials shall be obtained from one source and the Employer shall be notified of the selected manufacturer before work commences.
- b) Materials used shall be as recommended for the application, and a warranty shall be provided from the manufacturer for the particular surface and the conditions of exposure.

M60.2000

SUBMITTALS AND TESTING

M60.2100

SUBMITTALS

Tender Submittals

M60.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

M60.2102

Pre-contract Samples

Not required.

M60.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 300mm sample of each accepted coating to the specified substrate.

- M60.2104 Mock-up Requirements
- Not required.
- M60.2105 Prototype Requirements
- Not required.
- M60.2106 Quality Benchmark Requirements
- Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:
- a) First completed structural bay/ 5lin.m of each type of coating system.

M60.2200 TESTING

- M60.2201 General
- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).

On-Site Testing/ Inspections

- M60.2202 Inspection
- a) A technical representative of the coating manufacturer shall inspect the work in progress and quality management records, take dry film thicknesses and other measurements. Samples shall be taken of products as necessary.
- b) The coating manufacturer shall forward a copy of the inspection report direct to the Employer without delay.
- c) Technical support from the coating manufacturer shall not relieve the Contractor of their contractual responsibility to apply coatings in accordance with the Architectural Specification.
- d) Where the coating manufacturer does not have an inspection/ quality management support system, employ an independent testing body to verify compliance of the coating systems with the Architectural Specification.
- M60.2203 Coatings Thickness Testing
- Perform the following tests and inspections using qualified personnel and equipment unless directed otherwise:
- a) Wet film thickness measurements shall be taken as necessary during application, using a wet comb or similar, to achieve the required thickness of the various coatings.
- b) Dry film thickness (DFT) measurement shall be taken as required in accordance with the methods described in BS EN ISO 2808, to check that work has achieved the required thickness.

M60.3000 EXECUTION

M60.3100 WORKMANSHIP

- M60.3101 General
- a) Workmanship shall generally be in accordance with BS 6150, BS 8000: Part 0 and BS 8000: Part 12.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the application of the Works and, where applicable, be recommended by the system manufacturer.

Inspection/ Preparation

- M60.3102 Inspection
- a) Before commencing application, survey the structure/ substrate. Report immediately to the Employer if the structure/ substrate is unsuitable to receive the Works.
 - b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.
- M60.3103 Suitability of Base/ Backing
- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
 - b) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the application of the Works, shall be completed.
 - c) Surfaces to be covered shall be firmly fixed, dry, smooth, without depressions, voids or protrusions, clean and free from frost, unacceptable curing compounds, release agents and other surface contaminants.
- M60.3104 Interfacing Components
- Fixtures and fittings that are not to be coated shall be removed, protected, safely set aside and later replaced on completion of the coating application.
- M60.3105 Preparation of New Surfaces
- a) Preparation methods used shall not unduly damage the substrate or adjacent surfaces, nor adversely affect subsequent coatings.
 - b) Materials and processes used in preparation shall be of the types recommended by their manufacturers and by the coating manufacturer to suit the service conditions.
 - c) Where stopping/ filling is required, products and methods shall be compatible with the substrate(s) and coatings, and be as recommended by the coating manufacturer.

Application

- M60.3106 General
- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
 - b) Before, during and after application, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
 - c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
 - d) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
 - e) Coatings shall be applied to clean, dust free, suitably dry surfaces in dry atmospheric conditions and after any previous coats have cured adequately.
 - f) Coatings shall be applied evenly to give a smooth finish of uniform thickness and with full depth of colour, free from brush marks, nibs, sags, runs and other defects.
 - g) Where required, additional stripe coats shall be applied to the edges, welds, corners of flanges, bolt heads, nuts and any areas difficult to coat.
 - h) Surfaces shall be kept clean and free from dust during coating and drying.
 - i) There shall be an interval of at least the period recommended by the manufacturer between successive coats of paint.
- M60.3107 Initial Coats

The preparatory coatings used shall be of the types recommended by the coating manufacturer for the situation and surfaces being prepared to receive new finishes.

- M60.3108 Final Finish
- a) Once applied the finish shall not slump, flow, crack, flake, split, sag, pit, bubble, blister, float, effloresce, craze, shrink, break, wrinkle, crinkle, yellow, chalk, fade, discolour, powder, stain, bleed or lose its finish or gloss.
 - b) There shall be no variation of final surface finish after application.
- M60.3109 Film Thickness
- a) The thickness of each coat shall be checked during application using a wet film thickness wheel or comb gauge in accordance with BS EN ISO 2808.
 - b) After each coat has dried, the total accumulated dry film thickness shall be measured in accordance with BS EN ISO 2808, the number and position of measurements shall be as directed by the Employer.
- M60.3110 Making Good
- a) Splashes resulting from work carried out on Site shall be cleared from surfaces.
 - b) Any factory/ pre-painted area of metalwork damaged in transit or at Site shall be hand or power tool cleaned to St2 standard (BS EN ISO 8501: Part 1) and re-coated to achieve the original requirements of the factory coating prior to application of site coatings.
 - c) Any remedial work shall be in accordance with the manufacturer's recommendations, matching the original finish in every respect. Samples of remedial work shall be submitted to the Employer for review prior to commencement of work.
 - d) Damage to coatings shall be made good. Strip back coatings to original surface, prepare surfaces and reapply the coating system to leave a neat, continuous and flat finish. The extent of recoating shall be agreed with the Employer. Application of new coatings over damaged coatings shall only be to areas agreed with the Employer and where a neat, continuous and flat finish can be achieved.
- M60.3111 Sealants
- Refer to Section Z22.
- Protection**
- M60.3112 Temporary Protection
- Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.
- M60.3113 Cleaning
- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
 - b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
 - c) Do not use materials or methods that could alter the character of the exposed finishes.
 - d) Protect adjacent surfaces from damage due to cleaning operations.
- M60.3114 Completion
- a) Installed work shall be left clean.
 - b) Repair defects without delay to minimise damage and nuisance.
 - c) On Practical Completion, check the Works for damage and defects.

Adverse Conditions

M60.3115 Working in Adverse Conditions

- a) If unavoidable wetting of the Works occurs, prompt action shall be taken to minimise and make good any damage.
- b) Temporary covers shall be provided as required to keep unfinished areas dry.
- c) In severe or continuously wet weather, work shall be suspended unless an effective temporary enclosure is provided over the working areas.

M60.3200 TOLERANCES

M60.3201 General

Tolerances shall be within the limits recommended by the respective manufacturer to suit the service conditions.

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N10 GENERAL FIXTURES/ FURNISHINGS/ EQUIPMENT

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

N10.1000 TYPE, SYSTEMS AND MATERIALS

N10.1100 ARCHITECTURAL SPECIFICATION TYPE

N10.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, as necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

N10.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

N10.1201 General

- a) System build-ups shall be as indicated on the Design Drawings.
- b) Fixtures/ furnishings and equipment systems shall include fixings, framing, bracketry, support framing, seals and other components/ accessories necessary to complete the Works as supplied/ recommended by the manufacturer to suit the service conditions.

N10.1202 Framing and Supports

Systems shall include channels, fixings, fixing straps, timber sections/ noggings, bearers, retaining clips, angles, trims, firestops, sealants, beads, edges, corner reinforcements, control joints, tapes, compounds and other accessories recommended/ supplied by the system manufacturer to suit the service conditions.

N10.1203 Services

- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- b) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.
- c) Systems shall include necessary seals, gaskets and support framing where services penetrate or interface with the Works.

N10.1204 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

N10.1205 Fixing to Structure

- a) Systems shall include necessary mechanical fixing devices including, but not limited to, anchor bolts, fixings, sockets and other components.
- b) The Works shall include necessary preparation such as drilling, plugging, screwing, bolting, cutting, casting-in/ grouting-in and making good.
- c) Co-ordinate fixing with the superstructure design.

Blinds

N10.1206 Type FFE-101 Roller Blind

Manually operated anti-glare roller blind.

- a) Manufacturer: Hunter Douglas.
- b) Reference: RB Basics Manual Roller Shades.
- c) Finish/ colour: As accepted by the Employer through sampling.

Mirrors

N10.1207 General Requirements

- a) Mirrors generally shall be float glass with smoothed edges, silvered to give maximum reflection; free from tarnishing, discolouration, scratches and other defects visible in the designed viewing conditions.
- b) Mirrors shall not crack or deform as a result of fixing methods or incompatibility with background materials and construction.
- c) Position with sides vertical and fix securely, adjusting as necessary to achieve a true undistorted reflection.

N10.1208 Type FFE-401 Mirror

Proprietary mirror configured as indicated on the Design Drawings.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Framing: 15mm x 15mm stainless steel angle with satin finish.
- c) 9mm thick plywood panel, with rebated rear face to take angle leg, screw fixed to partition.
- d) Mirror bonded to plywood backing.
- e) Mirror:
 - i) Toughened safety glass with silvered back face.
 - ii) Thickness as required.

N10.1300 MATERIALS

Metalwork and Finishes

N10.1301 Metalwork

Refer to Section Z11.

N10.1302 Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Fixings

N10.1303 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.

- c) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- d) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

N10.1304

General

Refer to Section Z20.

Sealants and Gaskets

N10.1305

Sealants

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Sealant shall not leak or bleed causing any discolouration or staining.

N10.1306

Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

N10.2000

SUBMITTALS AND TESTING

N10.2100

SUBMITTALS

Tender Submittals

N10.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

N10.2102

Pre-contract Samples

Not required.

N10.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm sample of accepted blind.

N10.2104

Mock-up Requirements

Not required.

N10.2105

Prototype Requirements

Not required.

N10.2106

Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First of each type installed.

N10.2200

TESTING

N10.2201 General

Refer to Section A clause series A.6000 for the general requirements for testing.

N10.3000 EXECUTION

N10.3100 WORKMANSHIP

Fabrication

N10.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with Site work restricted to fixing.
- d) Fabricate the Works using proven methods of construction, to comply with the design requirements.
- e) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects.
- f) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- g) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.
- h) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

N10.3102 Metalwork

Refer to Section Z11.

Workmanship

N10.3103 General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

N10.3104 Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

N10.3105 Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.

- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

N10.3106

Dampness

Where systems/ products are to be installed adjacent to new wet-laid materials:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe in accordance with BS 8203 or other standard as appropriate and agreed with the Employer.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

N10.3107

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or as otherwise accepted by the Employer.
- h) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- i) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- j) Materials/ components from the same production batch in the same area to prevent banding, patchiness or other visual variations.

- k) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- l) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

N10.3108

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing or stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals or between preservative treated timber and metal.

N10.3109

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects. Joints shall be tightly butted or gaps/ joints left as required.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.

N10.3110

Movement Joints

Install movement joints in accordance with the manufacturer's written recommendations.

N10.3111

Sealants

Refer to Section Z22.

N10.3112

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance requirements of the Works and interfacing systems shall be maintained.

Protection and Completion

N10.3113

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

N10.3114

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.

- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

N10.3115

Completion

- a) Installed work shall be left clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/components.

N10.3200

TOLERANCES

N10.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The permissible deviation of a floor finish level shall be $\pm 3\text{mm}$, but shall be flush with any adjacent floor finish.
- g) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- h) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- i) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- j) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- k) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- l) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- m) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- n) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- o) Tolerances shall not be cumulative.
- p) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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N11 DOMESTIC KITCHEN FITTINGS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

N11.1000 TYPE, SYSTEMS AND MATERIALS

N11.1100 ARCHITECTURAL SPECIFICATION TYPE

N11.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

N11.1200 SYSTEM DESCRIPTIONS

N11.1201 General

Fitted kitchen systems shall include fixings, framing, bracketry, support framing, seals, sealants and other components/ accessories necessary to complete the Works as supplied/ recommended by the manufacturer to suit the service conditions.

N11.1202 Services and Fittings

- a) Systems shall accommodate services as indicated in the Services Engineer's documentation in a concealed manner acceptable to the Employer.
- b) Systems shall include cut-outs, appliances and services outlets as indicated on the Design Drawings and the Services Engineer's documentation.
- c) Systems shall include additional pattresses and supports as necessary to receive fittings.
- d) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.
- e) The Works shall include the 'boxing out' of services after final on-Site co-ordination, to the acceptance of the Employer.
- f) Systems shall include seals, gaskets and support framing, as required, where services penetrate or interface with the Works.

N11.1203 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Visible fixings, where permitted, shall have an appearance and finish acceptable to the Employer.
- c) Indicate the type, size and positioning of mechanical fixing devices on the Working Drawings.

Domestic Kitchens

N11.1204 Type FFE-601 Teapoint

Fitted teapoint, configured as indicated on the Design Drawings.

- a) Kitchen cabinetry:
 - i) Internal linings/ carcassing and finishes:

- Suitable core material, minimum 18mm thick.
 - Melamine finish. The colour shall be white to the acceptance of the Employer.
- ii) Door/ drawer fronts, integrated appliance decor panels, front fillers shall be high pressure laminate faced moisture-resistant chipboard core, colour as agreed with the Employer.
 - iii) Handles shall be as agreed with the Employer.
 - iv) Soft close hinges such as Blumotion manufactured by Blum or acceptable equivalent.
 - v) Drawers shall incorporate inconspicuous soft close runners.
 - vi) Plinth panels shall match door/ drawer fronts.
 - vii) Shelving shall be adjustable.
- b) Solid surface worktops:
- i) 20mm thickness with cut apertures to accommodate appliances, fixtures and fittings.
 - ii) Square edged profile with 2mm bevelled edge.
 - iii) Routed draining grooves.
- c) Splashback: Ceramic tiling, Type LIN-101 as described in Section M40.
- d) Stainless steel undermounted sink.
- e) Stainless steel single mixer tap.
- f) Appliances:
- i) Integrated microwave.
 - ii) Integrated fridge freezer.
 - iii) Integrated dishwasher.
- g) Final installation of appliances, including mechanical and electrical installation shall be in accordance with the Services Engineer's documentation.
- h) Low profile, warm colour temperature spotlights (2700K).
- i) The system shall include fixings, bracketry, support framing and other components/ accessories necessary to complete the Works to suit the service conditions.

N11.1300

MATERIALS

Metalwork and Finishes

N11.1301

Metalwork

Refer to Section Z11.

N11.1302

Finishes

Refer to Section Z30 for general finishes to metalwork.

Timber

N11.1303

General

Refer to Section Z10.

Rigid Sheet/ Board

N11.1304

Plywood

Plywood used in the Works shall achieve the following minimum requirements:

- a) Service class 2 plywood, unless stated otherwise, in accordance with BS EN 636.
- b) Minimum class 2 bond quality in accordance with BS EN 314.
- c) Plywood durability shall be minimum Use Class 2 (UC 2) in accordance with BS EN 335 unless otherwise accepted by the Employer.
- d) Dimensional tolerances shall be in accordance with BS EN 315.

N11.1305

Medium Density Fibreboard (MDF)

- a) MDF shall be in accordance with BS EN 622: Part 5 for dry process boards.
- b) MDF boards when faced with veneers or laminates shall be suitably balanced.
- c) MDF durability shall be Use Class 2 (UC 2) in accordance with BS EN 335.

N11.1306

Chipboard

- a) Wood based particleboard (chipboard) shall be in accordance with BS EN 312.
- b) High density in accordance with BS EN 323.

Plastic Laminates

N11.1307

General

- a) High pressure laminates up to 2mm thickness and bonded to supporting substrates shall be in accordance with BS EN 438: Part 3.
- b) Compact grade high pressure laminate greater than 2mm thickness and used internally shall be in accordance with BS EN 438: Part 4.

Fixings/ Adhesives

N11.1308

General

Refer to Section Z20.

Sealants and Gaskets

N11.1309

Sealants

- a) Refer to Section Z22.
- b) Sealant shall not leak or bleed causing any discolouration or staining.

N11.1310

Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

N11.2000

SUBMITTALS AND TESTING

N11.2100

SUBMITTALS

Tender Submittals

N11.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

N11.2102 Pre-contract Samples

Not required.

N11.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 200mm of each finish and 1 No. of each product, in correct colours and finishes. Include edge detail where applicable.

N11.2104 Mock-up Requirements

Not required.

N11.2105 Prototype Requirements

Not required.

N11.2106 Quality Benchmark Requirements

Submit quality benchmarks of the following, in locations to be agreed with the Employer, in accordance with Section A.4000:

- a) The first completed and installed unit of each type.

N11.2200 TESTING

N11.2201 General

Refer to Section A clause series A.6000 for the general requirements for testing.

N11.3000 EXECUTION

N11.3100 WORKMANSHIP

Fabrication

N11.3101 General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with Site work restricted to fixing.
- d) Sections shall be formed true to shape, accurate in size, square, free from distortions, irregularities and defects, to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.

N11.3102 Joinery and Carpentry

Refer to Section Z10.

N11.3103 Metalwork

Refer to Section Z11.

N11.3104 Bonded Decorative Laminates

Refer to Section Z10.

N11.3105 Stone

- a) Stone shall be cut, dressed, worked and finished by skilled masons, in accordance with the Working Drawings before delivery to Site. Evidence of previous experience and details of work previously carried out shall be provided.
- b) Cutting, dressing, working and finishing of the stone shall not adversely affect performance and the results obtained through testing.
- c) Permissible variations for the finishing of the stone shall be as accepted by the Employer through range sampling, prior to commencing production.
- d) Remedial work such as patching and filling during fabrication shall not be undertaken, without acceptance by the Employer as part of the sampling process.
- e) No saw marks shall be visible on the finished surface of the stone units, unless accepted otherwise by the Employer.

Workmanship

N11.3106 General

- a) Carry out the Works in accordance with the manufacturer's recommendations.
- b) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Preparation

N11.3107 Suitability of Structure/ Substrate

- a) Before commencing installation, survey the structure/ substrate. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure/ substrate is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure/ substrate suitable.
- c) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- d) Cutting, chasing, plugging, making good and other necessary procedures required to the structure/ substrate, or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- e) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation/ Application

N11.3108 General

- a) Work shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel, unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.

- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Visible joints at angles shall be mitred or as otherwise accepted by the Employer through sampling.
- h) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- i) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- j) Colour/ textural variations:
 - i) Units shall be selected/ sorted on Site to achieve a consistent overall appearance of the completed work.
 - ii) Colour and texture of applied finishes shall be consistent throughout the Works, with no banding, patchiness or other visual variations.
- k) Obtain acceptance from the Employer before drilling or cutting parts of the structure, other than where indicated on the Design Drawings.
- l) Do not cut, drill or otherwise alter work of others to accommodate the installation of the systems unless accepted by the Employer.
- m) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

N11.3109

Domestic Kitchens

- a) Adjust hinges so that doors hang and close automatically when left open.
- b) Doors and drawers shall be aligned and not binding. Adjust as necessary.
- c) Ironmongery shall be checked, adjusted and lubricated as necessary.
- d) Taps shall be fixed securely, making a watertight seal with the appliance.
- e) Waste/ overflows shall be bedded in waterproof jointing compound and fixed with a resilient washer between appliance and backnut.
- f) Joints, corners and mitres shall be fitted. Fastenings shall be concealed. Threaded connections shall be made up tightly so that threads are entirely concealed.
- g) Install with lines, angles and surfaces in true alignment, plumb, level and in proper plane.
- h) Exposed work shall be matched to produce continuity of line and design. Joints in exposed metalwork shall be fitted and rigidly secured with hairline contacts. Exposed joints in flat surfaces shall be flush, unless otherwise indicated. End joints shall have sleeves of the same outline as the exposed shapes.
- i) Do not install units that have members that are warped, bowed, deformed or otherwise damaged or defaced. Remove and replace such members as directed.
- j) Provide hairline joints between contact surfaces of non-welded joints, unless indicated otherwise.

- k) Align components and rigidly secure non-moving joints by welding or fixing with machine screws or bolts. No areas of unfinished material shall be visible in the finished work. Drive in all exposed fasteners level and flush with the adjacent surfaces.

N11.3110

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

N11.3111

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.
- f) Eliminate ridges and high spots.

N11.3112

Sealants

Refer to Section Z22.

N11.3113

Packings

- a) Provide suitable tight packings at fixing points to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

Protection

N11.3114

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

N11.3115

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

N11.3116

Completion

- a) Installed work shall be left clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components.

N11.3200

TOLERANCES

N11.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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N13 SANITARY APPLIANCES/ FITTINGS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

N13.1000 TYPE, SYSTEMS AND MATERIALS

N13.1100 ARCHITECTURAL SPECIFICATION TYPE

N13.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation for the complete system or installation.

N13.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

N13.1201 General

- a) Sanitary items shall be configured and to locations as indicated on the Design Drawings.
- b) Exposed finishes shall be confirmed by the Employer where not indicated on the Sanitaryware Schedule.
- c) Concealed components shall be finished to achieve the corrosion protection requirements of the Architectural Specification.
- d) Non-ferrous or stainless steel fastenings shall be used unless otherwise specified.
- e) Sealant pointing (at joints between appliance/ fitting/ substrate and adjacent finishes) shall be silicone based sealant with fungicide. Colour shall be white or to complement the adjacent appliance/ fitting, as agreed with the Employer.
- f) Sanitary appliances shall be supplied and installed as complete integrated systems complete with fixings, clips, bracketry, seals, sealants, connecting pipework and other components/ accessories recommended/ supplied by the manufacturer.
- g) Refer to the Sanitaryware Schedule for product references.

N13.1300 MATERIALS/ COMPONENTS

N13.1301 General

- a) Ceramic fixtures shall be fired vitreous ceramic ware of the best quality, non-absorbent and burned so that the whole mass is thoroughly fused and vitrified, producing a material, consistent in colour, which when fractured shall show a homogeneous mass, close grained and free from pores.
- b) The glazing of vitreous ceramic fixtures shall be thoroughly fused to the body, without discolouration, chips or flaws, and shall be free from craze. Warped or otherwise imperfect fixtures shall not be accepted.

Metalwork and Finishes

N13.1302 Metalwork

Refer to Section Z11.

N13.1303 Finishes

Refer to Section Z30 for general finishes to metalwork.

Fixings

N13.1304

General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Sealants and Gaskets

N13.1305

Sealants

Refer to Section Z22.

N13.1306

Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

N13.2000

SUBMITTALS AND TESTING

N13.2100

SUBMITTALS

Tender Submittals

N13.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

N13.2102

Pre-contract Samples

Not required.

N13.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) Accepted visible fixings (where visible fixings form part of the Design).
- b) Accepted edge trims and covers minimum 300mm.
- c) 1 No. of each accepted accessory.

N13.2104

Mock-up Requirements

Not required.

N13.2105

Prototype Requirements

Not required.

N13.2106

Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First installed appliances of each type of system.

N13.2200

TESTING

N13.2201

General

Refer to Section A clause series A.6000 for the general requirements for testing.

N13.3000

EXECUTION

N13.3100

WORKMANSHIP

Fabrication

N13.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.

Workmanship

N13.3102

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

N13.3103

Inspection

- a) Before commencing installation, survey the structure/ substrate. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure/ substrate is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure/ substrate suitable.

N13.3104

Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation/ Application

N13.3105

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Systems shall accommodate future moisture and temperature movement.
- c) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- d) Support framing members shall be installed in the correct position, within tolerance, and in the correct relationship to the building structure.
- e) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- f) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- g) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- h) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- i) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.
- j) Noggings and bearers required to support sanitary appliances and fittings shall be positioned, securely fixed and concealed from view.
- k) Jointing and bedding compounds shall be used in accordance with the recommendations of the manufacturers of the appliances, accessories and pipes being jointed or bedded.

N13.3106

Appliances

- a) WC seats and lids shall be stable when raised and capable of remaining in a vertical position.
- b) Cisterns:
 - i) Cistern operating components shall be as recommended by the cistern manufacturer. The ball valve shall match pressure of water supply.
 - ii) A cistern shall be fixed at the height recommended by the manufacturer unless otherwise specified or indicated on the Design Drawings.
 - iii) The overflow pipe shall be fixed to falls and located to give visible warning of discharge. Agree the position with the Employer where not indicated on the Design Drawings.
- c) Taps shall be fixed securely, making a watertight seal with the appliance.
- d) Wastes/ overflows shall be bedded in waterproof jointing compound and fixed with a resilient washer between appliance and backnut.
- e) Appliances shall not be used for any purpose until Practical Completion.

N13.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals.

- e) Appliances and accessories shall be so assembled and fixed that surfaces designed to falls drain.

N13.3108

Sealants

Refer to Section Z22.

N13.3109

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be non-compressible, rot-proof and non-corrosive materials that maintain the performance of the systems with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant, areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

Protection

N13.3110

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

N13.3111

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

N13.3112

Completion

- a) Installed work shall be left clean.
- b) Defective components shall be replaced without delay, to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable components for satisfactory operation and replace damaged or defective materials/ components.

N13.3200

TOLERANCES

N13.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.

- e) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- f) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- g) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- h) Tolerances shall not be cumulative.
- i) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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N15 SIGNAGE

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

N15.1000 TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

N15.1100 ARCHITECTURAL SPECIFICATION TYPE

N15.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

N15.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

N15.1201 General

- a) Design and execute the Works in accordance with the following standards:
 - i) Signage generally shall be in accordance with BS 559.
 - ii) Graphical symbols and signs shall be in accordance with BS 5499.
 - iii) Safety signs and safety way guiding systems shall be in accordance with BS ISO 16069.
 - iv) Safety signs and the exit signs throughout the escape routes shall be illuminated to the latest format in accordance with the European Sign Directive Format (BS 5266: Part 1, BS EN 1838, BS EN 50172 and HSE Safety Signs and Signals Regulations, as applicable) and with any additional local authority requirements.
- b) System build-ups indicated on the Design Drawings and described in the Architectural Specification are only indicative of the design intent.
- c) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and to achieve the performance requirements.
- d) Determine the required system build-ups and necessary components to suit the service conditions.
- e) Signage systems shall include fixings, framing, bracketry, supports and other components/ accessories necessary to complete the Works as supplied/ recommended by the manufacturer to suit the service conditions.

Statutory Signage

N15.1202 Type SGN-101 Illuminated Statutory Sign

Illuminated statutory signage type, materials, finishes and colours shall be agreed with the Employer.

N15.1203 Type SGN-151 Non-illuminated Statutory Sign

Non-illuminated statutory signage type, materials, finishes and colours shall be agreed with the Employer.

Directional/ Wayfinding Signage

N15.1204 Type SGN-251 Non-illuminated Directional/ Wayfinding Sign - Internal

Non-illuminated, internal directional/ wayfinding signage type, materials, finishes and colours shall be agreed with the Employer.

N15.1205 Type SGN-252 Non-illuminated Directional/ Wayfinding Sign - External

Non-illuminated, external directional/ wayfinding configured as indicated on the Design Drawings.

- a) Polycarbonate lettering, colour as agreed with the Employer through sampling.
- b) Lettering shall include spacers to sit off the external wall substrate.
- c) Signage shall be mechanically fixed to blockwork substrate.

N15.1300 MATERIALS

Metalwork and Finishes

N15.1301 Metalwork

Refer to Section Z11.

N15.1302 Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Timber

N15.1303 General

Refer to Section Z10.

Glass

N15.1304 General

Refer to Section Z25.

Fixings

N15.1305 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

N15.1306 General

Refer to Section Z20.

Sealants

- N15.1307 General
- a) Refer to Section Z22.
 - b) Use sealant products in accordance with the system manufacturer's written recommendations, to suit the service conditions.

N15.2000 SUBMITTALS AND TESTING

N15.2100 SUBMITTALS

Tender Submittals

- N15.2101 Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

- N15.2102 Pre-contract Samples

Not required.

- N15.2103 Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 300mm x 300mm sign finish of each type in specified colour.
- b) Font and lettering/ numbering sample.
- c) Lighting type sample, where applicable.
- d) Fixing and seals.

- N15.2104 Mock-up Requirements

Not required.

- N15.2105 Prototype Requirements

Not required.

- N15.2106 Quality Benchmark Requirements

Submit the following quality benchmarks, in locations to be agreed with the Employer, in accordance with Section A.4000:

- a) The first sign of each type installed.

N15.2200 TESTING

- N15.2201 General

- a) Undertake testing by an independent accredited testing specialist or submit independently certified test data to demonstrate compliance with the Architectural Specification.
- b) Comply with the Fire Strategy Report and the Services Engineer's documentation.

N15.3000 EXECUTION

N15.3100 WORKMANSHIP

Fabrication

- N15.3101 General
- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
 - b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
 - c) Where applicable and practical, fabrication of materials/ components shall take place in equipped workshops with Site work restricted to fixing.
 - d) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
 - e) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.
- N15.3102 Metalwork
- Refer to Section Z11.
- N15.3103 Joinery and Carpentry
- Refer to Section Z10.
- Workmanship**
- N15.3104 General
- a) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
 - b) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.
- Inspection/ Preparation**
- N15.3105 Inspection
- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
 - b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.
- N15.3106 Suitability of Structure/ Substrate
- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
 - b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
 - c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
 - d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.
- N15.3107 Dampness
- Where systems/ products are to be installed adjacent to new wet-laid materials:
- a) Drying aids shall have been turned off for not less than four days.
 - b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe.

- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

N15.3108

General

- a) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- b) Before, during and after installation, temperature and humidity shall be maintained at levels approximating to those that will prevail during building use.
- c) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- d) Systems shall accommodate future moisture and temperature movement.
- e) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- f) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- g) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or as otherwise accepted by the Employer.
- h) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- i) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- j) Colour/ textural variations:
 - i) Units shall be selected/ sorted on Site to achieve a consistent overall appearance of the completed work.
- k) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- l) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

N15.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing or stiffening as required.

- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals or between preservative treated timber and metal.

N15.3110

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects. Joints shall be tightly butted or gaps/ joints left as required.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.

N15.3111

Sealants

- a) Refer to Section Z22.
- b) Acoustic sealant: To be applied at junctions as necessary to maintain acoustic performance requirements.
- c) Air pressure sealant: To be applied at junctions as necessary to maintain air pressure performance requirements.

N15.3112

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance requirements of the Works and interfacing systems shall be maintained.

Protection

N15.3113

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

N15.3114

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

N15.3115

Completion

- a) Installed work shall be left clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components replaced.

N15.3200

TOLERANCES

N15.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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N20 PURPOSE MADE FIXTURES/ FURNISHINGS/ EQUIPMENT

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

N20.1000 TYPE, SYSTEMS AND MATERIALS

N20.1100 ARCHITECTURAL SPECIFICATION TYPE

N20.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

N20.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

N20.1201 General

- a) Work shall be installed to locations and configurations indicated on the Design Drawings.
- b) Fixings shall be of types and strength suitable for the substrates as recommended by the Works manufacturer. Exposed fixings shall be of finish and profile accepted by the Employer.
- c) Where not specified, finishes shall be confirmed by the Employer.
- d) Substrates/ bases which are to receive the Works shall be as indicated on the Design Drawings.

Fixed Furniture

N20.1202 Type FFE-611 Reception Desk

Purpose-made reception desk, configured as indicated on the Design Drawings.

- a) Framing: Concealed timber support framing.
- b) Panelling and worktops:
 - i) High pressure laminate faced moisture resistant chipboard core panels.
 - ii) Colour as indicated on the Design Drawings.
 - iii) Sizes and profiles as indicated on the Design Drawings.
- c) Storage: As indicated on the Design Drawings.
- d) Plinth and skirting panels: To match panelling.
- e) Services: Reception desk shall include concealed integration of services, refer to the Design Drawings and Services Engineer's documentation.

N20.1300 MATERIALS

Metalwork and Finishes

N20.1301 Metalwork

Refer to Section Z11.

N20.1302

Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Timber

N20.1303

General

Refer to Section Z10.

Rigid Sheet/ Board

N20.1304

Plywood

Plywood used in the Works shall achieve the following minimum requirements:

- a) Service class 2 plywood, unless stated otherwise, in accordance with BS EN 636.
- b) Minimum class 2 bond quality in accordance with BS EN 314.
- c) Plywood durability shall be minimum Use Class 2 (UC 2) in accordance with BS EN 335 unless otherwise accepted by the Employer.
- d) Dimensional tolerances shall be in accordance with BS EN 315.

N20.1305

Medium Density Fibreboard (MDF)

- a) MDF shall be in accordance with BS EN 622: Part 5 for dry process boards.
- b) MDF boards when faced with veneers or laminates shall be suitably balanced.
- c) MDF durability shall be Use Class 2 (UC 2) in accordance with BS EN 335.

N20.1306

Chipboard

- a) Wood based particleboard (chipboard) shall be in accordance with BS EN 312.
- b) High density chipboard shall be in accordance with BS EN 323.

Plastic Laminates

N20.1307

General

- a) High pressure laminates up to 2mm thickness and bonded to supporting substrates shall be in accordance with BS EN 438: Part 3.
- b) Compact grade high pressure laminate greater than 2mm thickness and used internally shall be in accordance with BS EN 438: Part 4.

Fixings

N20.1308

General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

N20.1309

General

Refer to Section Z20.

Sealants

N20.1310

General

a) Refer to Section Z22.

b) Use sealant products in accordance with the system manufacturer's written recommendations, to suit the service conditions.

N20.2000

SUBMITTALS AND TESTING

N20.2100

SUBMITTALS

Tender Submittals

N20.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

N20.2102

Pre-contract Samples

Not required.

N20.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

a) 300mm x 200mm of each facing material in accepted finish.

N20.2104

Mock-up Requirements

Not required.

N20.2105

Prototype Requirements

Not required.

N20.2106

Quality Benchmark Requirements

Submit quality benchmarks of the following, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

a) The first completed component/ assembly of reception desk.

N20.2200

TESTING

N20.2201

General

Refer to Section A clause series A.6000 for the general requirements for testing.

N20.2202

Testing of Fixings

Allow for structural fixings to be proof load tested as required and witnessed by the Employer.

N20.3000

EXECUTION

N20.3100

WORKMANSHIP

Fabrication

N20.3101

General

- a) Fabrication of components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly shall take place in equipped workshops with Site work restricted to fixing.
- d) Fabricate the Works using proven methods of construction, to comply with the design requirements.
- e) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects, to profiles indicated on the Design Drawings.
- f) Do not use components that are damaged or have any other physical imperfections in the Works.
- g) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid components free from distortion.
- h) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

N20.3102

Metalwork

Refer to Section Z11.

N20.3103

Joinery and Carpentry

Refer to Section Z10.

Workmanship

N20.3104

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

N20.3105

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure/ substrate is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure/ substrate suitable.

N20.3106

Suitability of Base/ Backing

- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.

- b) Cutting, chasing, plugging, making good and other necessary procedures required to the structure/ substrate, or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

N20.3107

Dampness

Where systems/ products are to be installed on new wet-laid backgrounds/ bases:

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

N20.3108

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Visible joints at angles shall be mitred or to the acceptance of the Employer.
- d) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- e) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- f) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- g) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

N20.3109

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

N20.3110

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.

- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

N20.3111

Sealants

For general sealants refer to Section Z22 of the Architectural Specification.

Protection and Completion

N20.3112

Protection

Finished areas shall be adequately protected from damage until Practical Completion.

N20.3113

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

N20.3114

Completion

- a) Repair defects without delay to minimise damage and nuisance.
- b) Do not use the Works for any purpose, except testing, until Practical Completion.
- c) On Practical Completion, check the Works for damage and defects. Replace damaged or defective materials/ components.

N20.3200

TOLERANCES

N20.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of an expressed joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.

- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

END OF SECTION

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P12 FIRE/ SMOKE STOPPING

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

P12.1000 TYPE, SYSTEMS, MATERIALS AND PERFORMANCE

P12.1100 ARCHITECTURAL SPECIFICATION TYPE

P12.1101 Descriptive Work

- a) For general design and performance requirements, refer to Section A of the Architectural Specification. Specific design and performance requirements are provided in this Section.
- b) Undertake the Detailed Design, supply, install and warrant the Works complying with the visual intent indicated on the Design Drawings and criteria stated in the Architectural Specification.
- c) Where no material, product or manufacturer is indicated in the Architectural Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the Works.
- d) Where a material, product or manufacturer is indicated in the Architectural Specification, such material, product or manufacturer shall be deemed indicative representing the Employer's design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Employer in writing, but shall remain fully responsible for the Detailed Design and performance of the Works.
- e) Interfaces:
 - i) Co-ordinate with the work of others including interfacing as required.
 - ii) Maintain performance at interface conditions.
 - iii) Undertake the Detailed Design of interfaces with adjoining trades prior to commencement of the Works.

P12.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

P12.1201 General

- a) Design and execute the Works in accordance with:
 - i) The recommendations of the Association for Specialist Fire Protection (ASFP).
 - ii) The ASFP Red Book 'Fire Stopping: Linear joint seals, penetration seals & small cavity barriers'.
 - iii) The recommendations of other relevant members of the Passive Fire Protection Forum (PFPF).
- b) Systems that include proprietary products shall be designed and installed in accordance with the manufacturer's recommendations to suit the service conditions.
- c) The Contractor shall determine the type of fire protection to suit the service conditions.
- d) The Contractor shall determine the appropriate build-up of systems to suit the service conditions.
- e) The Works shall be covered by a single source warranty.
- f) Systems shall be provided with a permanently fixed label/ tag that identifies:
 - i) The material manufacturer.

- ii) The date of installation.
- iii) The Contractor's details.
- g) Fire/ smoke stopping systems shall include other components/ accessories necessary to complete the Works as supplied/ recommended by the manufacturer to suit the service conditions.

Fire/ Smoke Stopping

P12.1202

General Fire/ Smoke Stopping

General fire/ smoke stopping, as required to suit the service conditions.

- a) Provision of fire/ smoke stopping systems and products to interfaces, services and other penetrations to maintain fire compartmentation as indicated in the Fire Strategy Report.
- b) Fire/ smoke stopping, where not included within other systems, shall be as required to maintain the fire performance of the building as indicated on the Design Drawings.
- c) System types:
 - i) Fire stop sealant.
 - ii) Fire stop pipe sleeves/ penetrations as appropriate to suit the service conditions and to achieve the requirements of the Fire Strategy Report.
 - iii) Fire stopping to floors of service risers as appropriate to suit the service conditions.
 - iv) Cavity barriers.
 - v) Intumescent seals.
 - vi) Proprietary fire barriers/ stops.
 - vii) Intumescent mouldable firestop putty pads to rear of electrical back boxes cut into partitions.
 - viii) Reinforced mineral wool quilt.
 - ix) Fire resistant plasterboard in accordance with BS EN 520, classification Type F.
 - x) Proprietary trowel applied compounds.
 - xi) Proprietary trays.
 - xii) Proprietary preformed compressible fillers.
 - xiii) Fire stopping to cable trays containing data/ similar power completed using removable fire stop cushions/ bricks to allow future cable installations to be completed.
 - xiv) Others as required to suit the service conditions.

P12.1300

MATERIALS

P12.1301

General

- a) Comply with the requirements of the Architectural Specification.
- b) Materials/ products shall have been tested to demonstrate their fire properties and mechanical strength performance.

Insulation

P12.1302

Requirements

- a) Insulation shall be in accordance with the appropriate British Standard and/ or be British Board of Agrément (BBA) certified or certified by an equivalent internationally recognised body acceptable to the Employer.
- b) Insulation shall be inert, durable, rot-proof and vermin-proof and not be degradable by moisture, extreme temperatures or water vapour, unless the Detailed Design of the system protects the insulation from the need for such requirements.
- c) Insulation materials generally shall be in accordance with the LPC Design Guide for the Fire Protection of Buildings.
- d) Insulation shall not bulge, sag, delaminate or detach during its installation or in its installed position during the life of the Works.
- e) Insulation shall have zero Ozone Depleting Potential (ODP), be CFC and HFC free and have a Global Warming Potential (GWP) of less than five. Refer also to Section A of the Architectural Specification.
- f) Insulation shall be selected in accordance with the Green Guide to Specification.

P12.1400 PERFORMANCE REQUIREMENTS

P12.1401 General

Comply with the general performance requirements of Section A of the Architectural Specification and the following specific performance requirements.

Structural Performance

P12.1402 General

- a) Refer to the Structural Engineer's documentation.
- b) Unless stated otherwise, systems shall be designed in accordance with the current relevant and applicable British Standards and/ or Eurocodes.
- c) The Works shall accommodate the most onerous combination of loads, movements and deflections while maintaining the overall performance and without sustaining any permanent deformation.
- d) The Works shall accommodate loads, movements and environmental effects without levels of noise likely to be intrusive in and around the completed building.

P12.1403 Dead Loads

The Works shall be capable of accommodating the following dead loads:

- a) Self-weight gravity loads of the systems including any framing and supports.
- b) Loads imposed by elements that bear onto, are suspended from or are fixed to the systems, as indicated on the Design Drawings.

P12.1404 Imposed Loads

The Works shall be capable of accommodating the following imposed loads:

- a) Loads arising from moving elements of the Works, such as opening panels, doors and vents.
- b) Loads resulting from movements of the building structure and cladding support structure.
- c) Loads acting on the surface of the Works arising from maintenance and cleaning operations:
 - i) The Works shall sustain safely, without reduction in performance and without permanent deformation to any component.
 - ii) Loads imposed during replacement of system components and components of interfacing systems.

- iii) Loads associated with normal maintenance and access.
- d) Accidental loads imposed by persons falling against or onto the elements.
- e) Horizontal line loads applied to the Works due to the occupants/ users of the building, in accordance with BS 6180 and BS EN 1991: Part 1-1.
- f) Loads imposed by interfacing elements/ work.
- g) Known impact loads, or transferred impact loads.

P12.1405 Air Pressure Loads

- a) Refer to the requirements under Section A.5000.
- b) Calculated pressure loads shall include the effect of differential air pressures within the building.

P12.1406 Movement

The Works shall accommodate the following movements:

- a) Due to air pressure loads.
- b) Due to the movement of joints, whether designed to permit movement or not.
- c) Due to deflection under design loads.
- d) Due to changes in dimension and shape of components arising from building movements, including settlement, creep, twisting and racking.
- e) Thermal movement:
 - i) The Works shall accommodate local thermal movements exerted due to climatic conditions.
 - ii) The Works shall accommodate effects due to the orientation of the building towards the sun and presence of any shading.
 - iii) Thermal movements shall not result in unacceptable levels of audible noise.
- f) Moisture movement due to:
 - i) Shrinkage or expansion caused by variations in atmospheric moisture content.
 - ii) Drying shrinkage of building components.

P12.1407 Deflections

- a) The Works shall not deflect under loading in any way that is detrimental to any element of the Works or adjacent structural or building elements.
- b) Components, supports and fixings shall be capable of accommodating the above deflection without permanent distortion, deformation or failure.
- c) The Works shall accommodate differential structural movements in backing structures as relevant. Refer to the Structural Engineer's documentation.
- d) The magnitude of the allowable deflections shall be reduced if they are detrimental to any part of the Works, their support structure or internal finishes.
- e) Refer to the Structural Engineer's documentation for the anticipated movement of the building structure and relevant elements. Ascertain the precise characteristics of the adjacent structure and any provision for structural support in the Works.

Acoustic

P12.1408 General

- a) Where acoustic values are stated, these shall be deemed to be based on laboratory derived results, in accordance with BS EN ISO 10140.

- b) The specified acoustic performance shall be achieved on Site, inclusive of services penetrations and interfaces with other elements.
- c) The Weighted Sound Reduction Index (R_w) and the Weighted Apparent Sound Reduction Index (R'_{w}) shall be defined in accordance with BS EN ISO 717.

Fire and Smoke

P12.1409

Generally

- a) The Works shall as a minimum achieve the requirements of the Building Regulations.
- b) Comply with the performance requirements indicated in the Fire Strategy Report.
- c) Unless otherwise stated in the Fire Strategy Report, compliance with the Building Regulations shall be achieved by the application of the principles laid out in Approved Document B of the Building Regulations, BS 9997, BS 7974 and BS 9999.
- d) The Works shall be in accordance with any recommendations or conditions from Statutory Authorities, Fire Services and the Building Insurers.
- e) Submit test certificates, calculations and reports to demonstrate that materials/ systems achieve the fire performance requirements.

Durability

P12.1410

General

- a) Systems, components and materials shall be sufficiently durable to achieve the requirements of the Architectural Specification for the service life of the Works, provided that appropriate maintenance has been carried out.
- b) The Works shall perform throughout the service life without failure resulting from defects in design, materials or workmanship. Failure shall be defined as breakage, disengagement of components, deflection beyond stated values, reduction in performance or unacceptable change in appearance.

P12.2000

SUBMITTALS AND TESTING

P12.2100

SUBMITTALS

Tender Submittals

P12.2101

Tender Response

- a) Provide tender submittals in accordance with the requirements of Section A.4000 of the Architectural Specification.
- b) A design response shall be submitted with the tender proposal, to include profiles of typical conditions, with dimensions.
- c) The tender design response shall include:
 - i) Samples where specified.
 - ii) List of Tests included.
 - iii) Quality management programme.
 - iv) List of proposed Working Drawings.
 - v) Summary of deviations from the Design Drawings and the Architectural Specification.
 - vi) Outline technical specifications reflecting proposed materials/ systems.
 - vii) A list of proposed manufacturers and subcontractors to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

- P12.2102 Pre-contract Samples
- Not required.
- P12.2103 Post Contract Award Samples
- In accordance with Section A.4000, submit post contract award samples of the following:
- a) Fire/ smoke stopping materials/ products of each type 300mm x 200mm minimum size.
 - b) Various fixings and fastenings.
- P12.2104 Mock-up Requirements
- Not required.
- P12.2105 Prototype Requirements
- Not required.
- P12.2106 Quality Benchmark Requirements
- Submit the following quality benchmarks in accordance with Section A of the Architectural Specification:
- a) First of each type installed in location to be agreed with the Employer.
- P12.2200 TESTING**
- P12.2201 General
- a) Refer to Section A clause series A.6000 for the general requirements for testing.
 - b) Submit independently certified test data and Agrément certificates that demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification.
 - c) Where data from previous independently certified tests and Agrément certificates demonstrate that the proposed systems achieve the performance requirements of the Architectural Specification, off-Site independent testing need not be undertaken.
 - d) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).
- P12.2202 Fire/ Smoke Testing
- a) The Works shall be tested in accordance with BS EN 1363: Part 1, BS EN 1364: Part 1, BS EN 1364: Part 2, BS EN 1364: Part 3, BS 476: Part 6, BS 476: Part 7, BS 476: Part 20 and BS 476: Part 22, as appropriate.
 - b) Tests shall confirm that the required fire resistance integrity can be achieved for the stated duration in minutes.
 - c) Submit evidence of suitable mean temperature testing, approximately 200°C, for smoke leakage testing. Include actual smoke leakage results from the test for acceptance by the Employer.
- P12.2203 Inspection/ Testing Fire Sealing
- a) Install each cavity barrier, firestop and seal in accordance with the manufacturer's recommendations, standard details and test data.
 - b) Examine seals/ stopping for proper installation, adhesion and curing, as appropriate for the respective materials.
 - c) Each cavity barrier, firestop and seal, especially non-standard installations, shall be documented and certified by a member of the Nationwide Association of Passive Fire Installers and Specifiers (NAPFIS) or other testing/ certification bodies acceptable to the Employer.

- d) Measure the installed thickness of the fire stop material.
- e) Re-examine the penetration seals immediately prior to concealment by other construction, to check that no damage has occurred since the initial inspection.

P12.3000

EXECUTION

P12.3100

WORKMANSHIP

Fabrication

P12.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with Site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- f) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.

Workmanship

P12.3102

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system manufacturer.

Inspection/ Preparation

P12.3103

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

P12.3104

Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

P12.3105 Dampness

Where systems/ products are to be installed on/ adjacent to new wet-laid backgrounds/ bases, the backgrounds/ bases shall be sufficiently dried.

- a) Drying aids shall have been turned off for not less than four days.
- b) Tests for moisture content shall be taken, using a calibrated hygrometer or probe.
- c) Readings shall be taken in corners, along edges and at various points over the area being tested.

Installation

P12.3106 General

- a) The Works shall be installed and certified by members of the Nationwide Association of Passive Fire Installers & Specifiers (NAPFIS).
- b) The Works shall not commence before the building is weathertight, preceding wet trades have been completed and the building is dried out.
- c) Before, during and after installation, temperature and humidity shall be maintained at levels approximating those that will prevail during building use.
- d) Arrangements shall be made for operating the heating/ ventilation/ air conditioning installation up to the date of Practical Completion of the Works.
- e) Systems shall accommodate future moisture and temperature movement.
- f) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- g) Cutting of materials/ components:
 - i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
 - ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
 - iii) Keep cut edges to a minimum.
- h) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or as otherwise accepted by the Employer.
- i) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- j) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- k) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- l) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

P12.3107 Fixing Requirements

- a) Refer to Section Z20.

- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

P12.3108 Sealants

Refer to Section Z22.

P12.3109 Insulation

- a) Lay/ fix insulation evenly, with no gaps or lipping at joints.
- b) Fit insulation tightly with closely butted joints fittings and abutments. Leave no gaps.
- c) Keep insulation dry and secure as work proceeds.

P12.3110 Fire and Smoke Barriers

- a) Cut material to fit tightly, achieve correct compression and be securely fixed along edges. Joints shall be wired or stapled together to provide a complete barrier to smoke and flame.
- b) Form a complete barrier without gaps.

P12.3111 Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant.

Protection

P12.3112 Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

P12.3113 Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

P12.3114 Completion

- a) Installed work shall be left clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.
- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components.

P12.3200

TOLERANCES

P12.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- g) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- h) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- i) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- j) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- k) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- l) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- m) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- n) Tolerances shall not be cumulative.
- o) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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P21 IRONMONGERY

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

P21.1000 TYPE, SYSTEMS AND MATERIALS

P21.1100 ARCHITECTURAL SPECIFICATION TYPE

P21.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

P21.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

P21.1201 General

- a) The Works generally shall be in accordance with recommendations of the Guild of Architectural Ironmongers.
- b) Unless otherwise indicated, products shall be from Union.
- c) Refer to the Door Schedule/ Design Drawings and the Sections of the Architectural Specification detailing the doors/ frames to which ironmongery is fitted for specific component requirements.
- d) The ironmongery manufacturer shall be a registered full member of the Guild of Architectural Ironmongers, or approved international registered equivalent, and shall have in employment, on a permanent basis, a diploma holder of the Guild of Architectural Ironmongers (Dip GAI) who shall be available as a consultant for the duration of the Works and to work specifically with the Employer as required.
- e) Ironmongery systems shall include fixings, framing, bracketry, support framing, and other components/ accessories necessary to complete the Works as supplied/ recommended by the manufacturer to suit the service conditions.
- f) Wiring:
 - i) Wireways shall be concealed.
 - ii) Wireways shall connect equipment with the building power supply.
 - iii) Wireways shall accommodate the Services Engineer's, manufacturer's and Statutory requirements.
 - iv) System shall arrive pre-wired unless otherwise accepted by the Employer.
 - v) Wireways shall maintain the performance requirements of the system or interfacing systems.
 - vi) Locations/ positioning of services shall be agreed with the Employer where not indicated on the Design Drawings.

P21.1202 Product Conformity Marking

- a) Where applicable, items of ironmongery shall be CE marked in accordance with Annex ZA of the relevant BS EN.

- b) Product conformity marking shall be on an area of the item that will not be visible when installed.
- c) Comply with The Construction Products (Amendment etc.) (EU Exit) Regulations.

P21.1203 Suiteing of Locks

- a) Unless otherwise stated, cylinders and lever mechanism locks shall be under a master key suited plan.
- b) Master key and suiteing proposals shall be agreed in writing with the Employer and manufacturer prior to order placement.

P21.1204 Finishes

- a) Unless otherwise stated, ironmongery shall be satin polished stainless steel.
- b) Back of house hinges generally shall have satin chrome plated steel finish.
- c) Ironmongery shall be consistent in colour and texture, both individually and collectively.

P21.1205 Fixings

- a) Refer also to Section Z20.
- b) Ironmongery shall be supplied complete with stainless steel screws to the type and length recommended by the manufacturer and suitable for fixing to wood or metal as appropriate to suit the doors/ frames to which they are fitted. Visible fixings shall have countersunk heads.
- c) Ironmongery components shall be provided with clear fixing instructions and morticed items and door closing devices shall be supplied with fixing templates.

Ironmongery

P21.1206 General

Refer to the Ironmongery Schedule.

P21.1300 MATERIALS/ COMPONENTS

Metalwork and Finishes

P21.1301 Metalwork

Refer to Section Z11.

P21.1302 Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.
- c) Refer to Section Z33 for anodising.

Fixings

P21.1303 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.

- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

P21.1304

General

Refer to Section Z20.

Sealants

P21.1305

General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.

P21.2000

SUBMITTALS AND TESTING

P21.2100

SUBMITTALS

Tender Submittals

P21.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

P21.2102

Pre-contract Samples

Not required.

P21.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) 1 No. sample of ironmongery of each type in specified finish.
- b) A complete sample board of accepted standard items. The exact extent shall be agreed with the Employer.

P21.2104

Mock-up Requirements

Not required.

P21.2105

Prototype Requirements

Not required.

P21.2106

Quality Benchmark Requirements

Refer to the requirements for quality benchmarks stated in the Section(s) that include the systems to which the ironmongery shall be incorporated as an integral part.

P21.2200

TESTING

P21.2201

Test Requirements

- a) Submit necessary test data to demonstrate that the ironmongery supplied is in accordance with the following standards/ requirements:
- i) Hinges: BS EN 1935.
- ii) Door closing/ holding devices:

- Manually operated: BS EN 1154.
- Electrically powered: BS EN 1155.
- iii) Overhead door closing devices: BS EN 1154.
- iv) Floor spring closing devices: BS EN 1154.
- v) Door selectors: BS EN 1158.
- vi) Locks, cylinders and keys: BS EN 12209.
- vii) Lever handles: BS EN 1906.
- viii) Pull handles: BS 8424.
- ix) Ironmongery/ hardware for sliding doors and folding doors: BS EN 1527.
- x) Bolts: BS EN 12051.
- xi) Emergency and panic exit devices:
 - Manually operated: In accordance with BS EN 179 and BS EN 1125.
 - Electrically powered: In accordance with BS EN 13637.
- xii) Ironmongery/ hardware for windows: In accordance with BS EN 13126.
- xiii) Other testing requirements of the Sections covering those systems with which the ironmongery interfaces.
- b) The provision of test data does not relieve the Contractor of their responsibilities with respect to guarantees provided for the ironmongery.

P21.3000

EXECUTION

P21.3100

WORKMANSHIP

Fabrication

P21.3101

General

Fabrication of components shall, as a minimum, be in accordance with current regulations and standards.

Workmanship

P21.3102

Installation

- a) Workmanship shall generally be in accordance with the recommendations of the Guild of Architectural Ironmongers and the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

P21.3103

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.

- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing or stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals or between preservative treated timber and metal.

P21.3104

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.
- c) Bond materials/ components securely to substrates to give true surfaces free from undulations, air bubbles, scratches, adhesive marks, stains and other visual defects. Joints shall be tightly butted or gaps/ joints left as required.
- d) Spread the adhesive evenly, pressing down materials/ components firmly and rolling (if recommended) for full contact and a good bond overall.
- e) Remove surplus adhesive from exposed faces of coverings as work proceeds.

P21.3105

Sealants

- a) Refer to Section Z22.
- b) Acoustic sealant: To be applied at junctions as necessary to maintain acoustic performance requirements.
- c) Air pressure sealant: To be applied at junctions as necessary to maintain air pressure performance requirements.

P21.3106

Packings

- a) Provide suitable tight packings to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.
- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance requirements of the Works and interfacing systems shall be maintained.

Protection

P21.3107

Temporary Protection

Finished areas shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion.

P21.3108

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

P21.3109

Completion

- a) Installed work shall be left clean.
- b) Repair defects without delay to minimise damage and nuisance.
- c) Do not use the Works for any purpose, except testing, until Practical Completion.

- d) On Practical Completion, check the Works for damage and defects. Test operable systems for satisfactory operation and replace damaged or defective materials/ components.

P21.3110

Key Handover

- a) On completion, account for and adequately label keys.
- b) Keys shall be handed over directly to the Employer, in sealed containers with an itemised schedule on completion. Retain a duplicate schedule as a receipt.

P21.3200

TOLERANCES

P21.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) Elements shall be set out to their correct position as indicated on the Design Drawings, within $\pm 2\text{mm}$.
- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- e) Tolerances shall not be cumulative.
- f) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

END OF SECTION

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Q50 SITE/ STREET FURNITURE/ EQUIPMENT

To be read in conjunction with Section A, other related sections of the Architectural Specification and the Design Drawings.

Q50.1000 TYPE, SYSTEMS AND MATERIALS

Q50.1100 ARCHITECTURAL SPECIFICATION TYPE

Q50.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

Q50.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

Q50.1201 General

System build-ups shall be as indicated on the Design Drawings.

Q50.1202 Fixings

- a) Fixings shall be concealed unless accepted otherwise by the Employer.
- b) Visible fixings shall be satin finished stainless steel round headed bolts/ Allen bolts, unless otherwise indicated or required by the Employer.
- c) The type, size and positioning of mechanical fixing devices shall be as recommended by the system manufacturer for proprietary systems or as proposed by the Contractor for acceptance by the Employer.
- d) Where necessary, fixing devices shall be capable of three-dimensional adjustment to accommodate building structure and fabrication/ installation tolerances.

Q50.1203 Secondary Support

- a) Systems shall include a structural support system, as necessary.
- b) Where the Contractor deems that visible secondary support is required in addition to that indicated in the Structural Engineer's documentation and on the Design Drawings, the Contractor shall inform the Employer at tender return.
- c) Systems shall include necessary sub-constructions/ assemblies including, but not limited to, framing, brackets, cleats, angles and other components.

Canopies

Q50.1204 Type EXT-471 Canopy Roofing

Purpose-made canopy roof, configured as indicated on the Design Drawings.

- a) Primary and secondary framing: In accordance with the Structural Engineer's documentation.
- b) Canopy:
 - i) Manufacturer: MRM.

- ii) Material: Pre-manufactured zinc coated mild steel sheets.
- iii) Sheet profile: As agreed with the Employer.
- iv) External finish: Ceramic-coated stone chip surface finish.
- v) Colour: Forest Green, as accepted by the Employer through sampling.
- vi) Joints: As recommended by the manufacturer.
- vii) Fixing: Panels shall be mechanically fixed to posts in accordance with the Structural Engineer's documentation.

Q50.1205 Type EXT-475 Car Parking Shade

Cantilevered, proprietary car shade, configured as indicated on the Design Drawings.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Dimensions: As indicated on the Design Drawings.
- c) Number of spaces: 3 No. car spaces.
- d) Metalwork finish: Powder coated to colour chosen from manufacturer's standard range to the acceptance of the Employer.
- e) Canopy material:
 - i) Waterproof/ heatproof material.
 - ii) Colour to match building roof, Type RFS-251 as described in Section H31.
- f) Fixing: Canopy shall be root fixed into concrete foundations, in accordance with the Structural Engineer's documentation and manufacturer's recommendations.

Q50.1300 MATERIALS

Metalwork and Finishes

Q50.1301 Metalwork

Refer to Section Z11.

Q50.1302 Finishes

Refer to Section Z30 for general finishes to metalwork.

Fixings

Q50.1303 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

Q50.1304 General

Refer to Section Z20.

Sealants

Q50.1305

General

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.

Concrete

Q50.1306

Foundation Concrete for Posts

- a) Concrete shall be in accordance with BS 8500: Parts 1 and 2 and BS EN 206.
- b) Designated mix shall be not less than GEN 4 or Standard mix not less than ST5.
- c) Admixtures shall not be used.

Q50.2000

SUBMITTALS AND TESTING

Q50.2100

SUBMITTALS

Tender Submittals

Q50.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

Q50.2102

Pre-contract Samples

Not required.

Q50.2103

Post Contract Award Samples

Not required.

Q50.2104

Mock-up Requirements

Not required.

Q50.2105

Prototype Requirements

Not required.

Q50.2106

Quality Benchmark Requirements

Submit the following quality benchmarks in accordance with Section A.4000:

- a) An area determined by the Employer of each element of the Works fully installed, completed and accepted by the Employer.

Q50.2200

TESTING

Q50.2201

Test Requirements

Submit the manufacturer's testing data to demonstrate compliance with the Architectural Specification.

Q50.3000

EXECUTION

Q50.3100

WORKMANSHIP

Fabrication

Q50.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with site work restricted to fixing.
- d) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects, to profiles indicated on the Design Drawings.
- e) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.

Workmanship

Q50.3102

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

Q50.3103

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

Q50.3104

Suitability of Base/ Backing

- a) Bases/ backgrounds shall be rigid, dry, sound, smooth, clean, free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works, shall be completed.
- c) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation

Q50.3105

General

- a) Systems shall accommodate future moisture and temperature movement.
- b) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- c) Cutting of materials/ components:

- i) Where required, cut materials/ components in accordance with the manufacturer's recommendations.
- ii) There shall be no damage to the finished face of the materials/ components or any damage that would adversely affect the performance.
- iii) Keep cut edges to a minimum.
- d) Materials/ components to be installed in 'running lengths' shall be subject to the following:
 - i) Straight runs between angles or ends of runs shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.
 - ii) Joints at angles shall be mitred or as otherwise accepted by the Employer.
- e) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- f) Do not alter materials/ components with prefinished surfaces unless accepted by the Employer.
- g) Materials/ components from the same production batch shall be used in the same area to prevent banding, patchiness or other visual variations.
- h) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- i) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.

Q50.3106

Setting Posts in Concrete

- a) Holes shall be excavated with vertical sides.
- b) Posts/ struts shall be positioned centrally in the holes.
- c) The holes shall be filled with concrete to not less than the specified depth, well rammed as filling proceeds, and consolidated.
- d) Where necessary to suit the service conditions, the specified depth shall be exceeded to provide adequate support.
- e) Where holes are indicated on the Design Drawings as not completely filled with concrete, the upper part of the hole shall be backfilled with well rammed and consolidated excavated material.

Q50.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer. Where visible, positions shall be to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

Q50.3108

Packings

- a) Provide suitable tight packings at fixing points to take up tolerances and prevent distortion.
- b) Packings shall be of non-compressible, rot-proof and non-corrosive materials/ components that maintain the performance of the systems/ products with which they interface.

- c) Packings shall not intrude into zones that are to be filled with sealant or areas required for drainage. The performance of the Works and interfacing systems shall be maintained.

Protection and Completion

Q50.3109

Protection

Finished areas shall be adequately protected from damage until Practical Completion.

Q50.3110

Cleaning

- a) At Practical Completion of the Works, or when otherwise agreed with the Employer, clean exposed areas/ surfaces of the Works.
- b) Cleaning materials and methods shall be as recommended/ accepted by the system/ product manufacturer, where applicable.
- c) Do not use materials or methods that could alter the character of the exposed finishes.
- d) Protect adjacent surfaces from damage due to cleaning operations.

Q50.3111

Completion

- a) Repair defects without delay to minimise damage and nuisance.
- b) Do not use the Works for any purpose, except testing, until Practical Completion.
- c) On Practical Completion, check the Works for damage and defects. Replace damaged or defective materials/ components.

Adverse Conditions

Q50.3112

Working in Adverse Conditions

- a) If unavoidable wetting of the Works occurs, prompt action shall be taken to minimise and make good any damage.
- b) In severe or continuously wet weather, work shall be suspended unless an effective temporary enclosure is provided over the working areas.
- c) Concrete foundations:
- i) Do not cast foundations, or erect fencing/ gates if the temperature is below 3°C on a falling thermometer or 1°C on a rising thermometer
- ii) Foundations shall be adequately protected against frost and rapid drying by sun and wind.

Q50.3200

TOLERANCES

Q50.3201

General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000 of the Architectural Specification.

- a) Tolerances shall be as recommended by the system manufacturer(s) unless indicated otherwise in the Architectural Specification.
- b) Posts and uprights shall be plumb within $\pm 5\text{mm}$ over their height.
- c) Fabricated components shall not vary from the dimensions indicated on the Design Drawings by more than 2mm.
- d) Vertical elements, other than posts, shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- e) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.

- f) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- g) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- h) The average width of any panel to panel joint shall be within $\pm 2\text{mm}$ of the designed width. Any variation shall be equally distributed with no sudden changes or steps.
- i) The maximum deviation between adjacent panel surfaces either side of a joint shall be 1mm.
- j) The bow of any flat surface shall not exceed more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction.
- k) The straightness of any surface of an edge shall not deviate by more than $\pm 2\text{mm}$ from a 2000mm straightedge placed against it in any direction parallel to the long axis of the element.
- l) The centre section of any lineal element shall not bow by more than the lesser of $\pm 2\text{mm}$ or 0.075% of the length of the element measured from a straight line between the ends of the element.
- m) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- n) Cut-outs for interfacing work shall be within $\pm 1\text{mm}$ the dimensions indicated on the Design Drawings.
- o) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- p) Tolerances shall not be cumulative.
- q) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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R10 RAINWATER DRAINAGE SYSTEMS

To be read in conjunction with Section A, other related Sections of the Architectural Specification and the Design Drawings.

R10.1000 TYPE, SYSTEMS AND MATERIALS

R10.1100 ARCHITECTURAL SPECIFICATION TYPE

R10.1101 Prescriptive Work

- a) Supply, deliver, install and warrant the Works in compliance with the materials and workmanship requirements of the Architectural Specification.
- b) Where required to prepare drawings these shall be limited to final detailing of components and systems indicated on the Design Drawings, necessary to demonstrate their safe installation.
- c) Where alternative products are offered by the Contractor for acceptance by the Employer, submit full supporting documentation in respect of the complete system or installation.

R10.1200 SYSTEM DESCRIPTIONS

Architectural and Functional Requirements

R10.1201 General

- a) Design and execute the Works in accordance with the Services Engineer's documentation.
- b) Configure the Works to accommodate the architectural and functional features indicated on the Design Drawings and to achieve the performance requirements.
- c) The Works shall be covered by a single source warranty.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion and damage to interfacing or adjacent areas due to corrosion run-off staining.
- e) Gutters shall effectively contain and discharge, via their outlets, water entering them. Drainage outlets shall be designed to prevent 'blow back' occurring.
- f) Drainage outlets shall be suitable/ compatible with the roofing membrane(s) used.
- g) Drainage systems shall be inclusive of necessary components and accessories to complete the installation.

Rainwater Drainage Systems

R10.1202 Type RWS-111 External Rainwater Downpipe

External downpipes/ hopper heads.

- a) Manufacturer/ reference: To be proposed by the Contractor to the acceptance of the Employer.
- b) Material: PVC.
- c) Colour: White.
- d) Profile: Square.
- e) Dimensions: 100mm x 100mm.

R10.1300 MATERIALS

Drainage Components

R10.1301 General

High density polyethylene, or high performance polyethylene used for fabricating pipes shall be in accordance with DIN 8075 and BS EN 1519: Part 1.

Metalwork and Finishes

R10.1302 Metalwork

Refer to Section Z11.

R10.1303 Finishes

- a) Refer to Section Z30 for general finishes to metalwork.
- b) Refer to Section Z31 for powder coatings.

Fixings

R10.1304 General

- a) Refer to Section Z20.
- b) Fixings shall be in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Where necessary, fixing components shall be capable of adequate three-dimensional adjustment to accommodate building structure and system fabrication/ installation tolerances.
- d) Fixings shall be inherently corrosion resistant or fully protected to prevent corrosion.
- e) Visible fixings shall be a type agreed with the Employer prior to installation.

Adhesives

R10.1305 General

- a) Refer to Section Z20.
- b) Adhesives shall be compatible with finished surfaces and shall maintain the performance requirements of the elements to be bonded.

Sealants and Gaskets

R10.1306 Sealants

- a) Refer to Section Z22.
- b) Use sealant products in accordance with the system manufacturer's recommendations, to suit the service conditions.
- c) Elastomeric seals shall be in accordance with the relevant parts of BS EN 681.

R10.1307 Gaskets

- a) Refer to Section Z23.
- b) Gaskets shall be made of either ethylene propylene diene monomer/ ethylene propylene material (EPDM/ EP) or of silicone.

Couplings

R10.1308 General

Elastomeric seals within compression couplings shall be in accordance with BS EN 681.

R10.2000 SUBMITTALS AND TESTING

R10.2100

SUBMITTALS

Tender Submittals

R10.2101

Tender Response

Not required.

Samples, Mock-ups, Prototypes and Quality Benchmarks

R10.2102

Pre-contract Samples

Not required.

R10.2103

Post Contract Award Samples

In accordance with Section A.4000, submit post contract award samples of the following:

- a) One of each exposed component in accepted finish.
- b) Minimum 500mm of length of each type of exposed pipework in accepted finish including joint/ coupling.

R10.2104

Mock-up Requirements

Not required.

R10.2105

Prototype Requirements

Not required.

R10.2106

Quality Benchmark Requirements

Submit quality benchmarks, in location(s) to be agreed with the Employer, in accordance with Section A.4000:

- a) First complete downpipe, branch and connected outlet installation, for each type of rainwater drainage system.

R10.2200

TESTING

R10.2201

General

- a) Refer to Section A clause series A.6000 for the general requirements for testing.
- b) Undertake on-Site testing specified herein, which shall be carried out by an independent testing body accredited by the Kenya Accreditation Service (KENAS).
- c) Check that sections of the installation are free from obstruction and debris before testing.

On-Site Testing

R10.2202

Watertightness Testing

- a) Test the watertightness of the Works using a procedure recommended by the system manufacturer, to the acceptance of the Employer. The results of each test shall be recorded and issued at the end of each test.
- b) Details of the system and a proposed method statement shall be submitted for acceptance at least one month prior to the proposed testing on Site.
- c) Prior to testing, check that the Works have been completed to a stage where the integrity of the system can be tested and that obvious defects have been made good.
- d) Carry out testing when work to the areas which are to be tested are complete, including that of associated and interfacing trades.

- e) Performance under testing:
 - i) There shall be no leakage through the Works at any time during the test or within 15 minutes of completion of the test.
 - ii) If any leaks/ defects occur, mark the location on the Works. Where applicable, water shall be drained completely. Prepare a report to be submitted to the Employer together with proposals for remedial measures. Any part of the Works that is adversely affected shall be replaced or repaired; the design intent shall be maintained.
- f) After making good any defects, retest to verify integrity of repair.
- g) Witnessed air/ water pressure testing.

R10.2203

Water Obstruction Test (or 'Dead Bird' Test)

- a) Block rainwater outlets, fill gutter and/ or roof and after 48 hours, or as confirmed and agreed with the Employer, closely inspect for leakage.
- b) Check for ponded water and carry out modifications to suit.
- c) Monitor and evaluate where problems are likely to occur due to:
 - i) Water discharging into rainwater outlet or gutter from adjacent surfaces.
 - ii) Wash and splashing and bounce-back.
 - iii) Water flow disturbances.
 - iv) Water build-up.
- d) Create suitable obstruction devices of an equivalent shape, size and texture to represent 'dead birds'.
- e) Configure the 'dead birds' in various positions, attempting to trap them on obstructions and also allowing them to cascade down to other obstructions.
- f) Carry out further observations to see how water movements are affected and if further risks occur due to the presence of the 'dead birds'.
- g) Assume that the worst scenario will occur at some point in the life of the building, e.g. dead birds trapped in the same gutter or outlet position.
- h) Report back to the Employer with the findings and analysis of findings indicating the proposed improvements and changes to be made in the detailing of the installations.
- i) Carry out modifications and retest to verify that the modifications are effective.

R10.3000

EXECUTION

R10.3100

WORKMANSHIP

Fabrication

R10.3101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.
- b) Where preceding work is complete before fabrication, take site measurements. If these measurements indicate that the dimensions indicated on the Design Drawings are unachievable, seek instruction from the Employer before proceeding.
- c) Where applicable and practical, fabrication and assembly of materials/ components shall take place in equipped workshops with site work restricted to fixing.
- d) Fabricate the Works using proven methods of construction, to comply with design requirements.

- e) Form sections true to shape, accurate in size, square, free from distortions, irregularities and defects.
- f) Do not use materials/ components that are damaged or have any other physical imperfections in the Works.
- g) Fabricate joints so that the assembly shall be tight and close fitting to produce rigid materials/ components free from distortion.
- h) Adhesive joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

R10.3102

Metalwork

Refer to Section Z11.

Workmanship

R10.3103

General

- a) Workmanship shall generally be in accordance with the relevant and applicable parts of BS 8000.
- b) Where applicable, carry out the Works in accordance with the manufacturer's recommendations.
- c) Operatives shall be trained, experienced and appropriately skilled in the installation of the Works and, where applicable, be recommended by the system/ product manufacturer.

Inspection/ Preparation

R10.3104

Inspection

- a) Before commencing installation, survey the structure. Check dimensions, line, level and fixing points. Report immediately to the Employer if the existing structure is unsuitable to receive the Works.
- b) If the structure/ substrate is unsuitable, propose remedial action to make the structure suitable.

R10.3105

Suitability of Structure/ Substrate

- a) Bases/ backgrounds shall be free from dust, dirt, grease and other contaminants before systems/ products are installed.
- b) Substrates shall be rigid, dry and sound, with no loose material or significant cracks or gaps.
- c) Cutting, chasing, plugging, making good and other necessary procedures required to the substrate or to adjacent work, that cannot/ should not be undertaken after the installation of the Works specified herein, shall be completed.
- d) Tolerances of the structure/ substrate shall be suitable to permit the required configuration and indicated tolerances of the finished systems/ products.

Installation/ Application

R10.3106

General

- a) The Works shall be set out and installed square, true to line, level and plane, free from undulations, with lines and joints aligned, straight and parallel unless specified otherwise, within stated tolerances and in the correct relationship with the building structure.
- b) Where required by the manufacturer, materials/ components shall be cut without damage. Cut edges shall be kept to a minimum.
- c) Materials/ components to be installed in 'running lengths' shall be formed in single unjointed lengths wherever possible. Where running joints are unavoidable, obtain acceptance for location and method of jointing from the Employer.

- d) Inspect each material/ component of the Works immediately before installation. The Works shall be installed using materials/ components free from marks, defects, flaws, steps, waves, or damage of any nature.
- e) Do not alter materials/ components with prefinished surfaces except where agreed with the Employer and except where cut finishes can be prepared and reinstated to their original finish quality.
- f) Do not cut, drill or otherwise alter interfacing work to accommodate the system installation unless accepted by the Employer.
- g) Make provision for movements/ expansion/ contraction in accordance with the system/ product manufacturer's recommendations.
- h) Provide access fittings and rodding eyes, in accordance with the manufacturer's recommendations, in convenient locations to permit adequate cleaning and testing of pipework.
- i) Adequately protect pipework from damage and distortion during construction. Fit purpose made temporary caps to prevent ingress of debris. Fit access covers, cleaning eyes and blanking plates as work proceeds.
- j) Install rainwater drainage systems to completely discharge rainwater from the building without leaking.
- k) Pipework shall be accessible for repair or replacement as recommended by the Services Engineer and/ or system manufacturer.
- l) Completed pipelines shall be of smooth, consistent bore, clean and free from distortion, wrinkling, cracks and other defects.
- m) Joints in pipes and fittings shall be jointed and sealed in accordance with the system manufacturer's recommendations.

R10.3107

Fixing Requirements

- a) Refer to Section Z20.
- b) Install and position fixings and fastenings as recommended by the manufacturer, and where required by the Employer to be visible to the acceptance of the Employer.
- c) The Works shall be fixed securely to prevent pulling away, bowing or other movement during use and without causing stress or distortion. Include additional bracing and stiffening as required.
- d) Isolating tape, plastic washers or other suitable means shall be provided to prevent bi-metallic corrosion between dissimilar metals, or between preservative treated timber and metal.

R10.3108

Adhesives

- a) Refer to Section Z20.
- b) Use primers where recommended by the adhesive manufacturer before applying adhesives.

R10.3109

Fixing Pipework

- a) Fixings shall be at specified centres to prevent sagging within drainage runs and to maintain the required levels/ gradients.
- b) Fix branches and low gradient sections with uniform and adequate falls to drain efficiently.
- c) Fix socketed pipes/ fittings with sockets facing upstream.
- d) Provide additional pipe collars as necessary to support junctions, changes in direction and rainwater outlet tail pipes as recommended by the system manufacturer.
- e) Fix every length of pipe at or close below the socket collar or coupling.
- f) Provide a loadbearing support for vertical pipes at not less than every storey level. Tighten fixings as work proceeds so that every storey is self-supporting and undue weight is not imposed on fixings at the base of the pipe.

- g) Isolate from structure where passing through walls or floors and sleeve pipes.
- h) Make changes in direction of pipe runs only where indicated on the Design Drawings, unless otherwise accepted by the Employer.
- i) Fix pipes with the minimum number of joints, bends and offsets.
- j) Fix expansion joint pipe sockets in accordance with the manufacturer's recommendations.
- k) Provide for thermal and building movement when fixing and jointing. Clearances shall not be reduced as fixing proceeds.

R10.3110 Rainwater Outlets

- a) Outlets shall be securely fixed before connecting pipework.
- b) Outlet spigots shall be connected to the pipework in accordance with the manufacturer's recommendations using a proprietary connector.
- c) Junctions between outlets and pipework shall accommodate movement in the structure and pipework.

R10.3111 Jointing Pipework

- a) Joint using materials, fittings and techniques that will make effective and durable connections.
- b) Eccentric reducers in horizontal flows shall be installed so that the crown level of the pipes is retained. T-piece branch connections shall be made at 45° in direction of flow.
- c) Joint differing pipework systems with adaptors recommended by manufacturer(s).
- d) Cut ends of pipes shall be clean and square with burrs and swarf removed. Chamfer pipe ends before inserting into ring seal sockets.
- e) Jointing or mating surfaces shall be clean and, where necessary, lubricated immediately before assembly.
- f) Form junctions using fittings for the purpose. Do not allow jointing material to project into the bore of pipes, fittings and appliances.
- g) Remove surplus flux/ solvent/ cement/ sealant from joints.

R10.3112 Insulation

- a) Cut materials to accommodate abutments and configurations.
- b) Fix evenly, with no lipping at joints.
- c) Fit material tightly with closely butted joints, fittings and abutments. Leave no gaps.
- d) Keep dry and secure as work proceeds, maintaining continuity and leaving no gaps.

Protection

R10.3113 Temporary Protection

Finished work shall be adequately protected from damage by subsequent building operations and other factors until Practical Completion. Where appropriate, seal outlets with temporary bungs.

R10.3200 TOLERANCES

R10.3201 General

Measure tolerances against the relevant Base Reference Datum; Location Reference Point; Location Reference Plane; Location Reference Surface or Reference Element as defined in Section A.6000.

- a) The Works shall be set out to the correct position as shown on the Working Drawings, within $\pm 3\text{mm}$.

- b) Vertical elements shall be plumb, within $\pm 2\text{mm}$ or 0.1% of the height, whichever is the lesser.
- c) Horizontal elements shall be level, within $\pm 2\text{mm}$ or 0.1% of the length, whichever is the lesser.
- d) The maximum variation in gap from a straightedge applied to a flat plane shall be 2mm for a 3000mm straightedge and 1mm for a 1000mm straightedge.
- e) The maximum offset in plane, level or section between any two adjacent sections shall be $\pm 1\text{mm}$.
- f) The cross-section of any element shall not be twisted by more than 1° from the alignment.
- g) Account shall be taken of the installation tolerance requirements such that repetitive elements are located, relative to gridlines.
- h) Tolerances shall not be cumulative.
- i) Where an element/ component is subject to more than one applicable tolerance, the most onerous tolerance shall apply.

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Z10 JOINERY AND CARPENTRY

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z10.1000 MATERIALS, FABRICATION AND WORKMANSHIP

Z10.1100 MATERIALS

Z10.1101 General

- a) Timber shall be sourced in compliance with the sustainability criteria stipulated in Section A.7000.
- b) Timber shall be merchantable, seasoned, straight and free from any defects or combination of defects, natural or otherwise, making it unsuitable for its function in the Works, and sorted and selected at the time of fabrication for suitability for purpose. No damaged, decayed or rotten materials shall be used.
- c) Materials shall be relatively knot free, free from distortion, cracks or other blemishes, insect attack (including pinholes) unless stated otherwise in the specified standards.
- d) Timber shall be subjected to controlled drying so that the moisture content, if not otherwise specified, is suitable for the service conditions. When fixed it shall remain stable and free from expansion, contraction or other movements detracting from the required performance or appearance.
- e) Timber shall be marked with information as required within the specified standards. Markings shall be concealed from building user view.
- f) Materials shall either have zero formaldehyde release or conform to class E1 in accordance with BS EN 13986.

Z10.1102 Joinery Timber

- a) Timber generally shall be in accordance with BS 1186: Part 3 and BS EN 942.
- b) Timber for doors and windows shall be in accordance with BS EN 14220 and BS EN 14221.
- c) Timber for concealed joinery shall be milled from suitable species and with stock sorted to provide appropriate classes sawn in the most appropriate ways to suit the service conditions.
- d) Softwood for concealed joinery shall have no knots wider than half the width of the section.

Z10.1103 Veneers

- a) Timber of a suitable grade shall be selected so that a high quality finished surface is achieved.
- b) The batching of finished veneer shall provide consistent colour, texture and quality on individual and adjacent surfaces.
- c) Surface matching shall provide a symmetrical balanced pattern of grain and figuring across completed panels.

Z10.1104 Structural Timber

- a) Structural timberwork shall be in accordance with BS EN 1995: Part 1-1.
- b) Timber shall be strength graded, as specified, under supervision by companies that are currently registered under a third party quality management scheme operated by any of the certification bodies approved by the UK Timber Grading Committee and bear the appropriate markings.
- c) Timber shall be strength graded at a moisture content appropriate to the service conditions.
- d) Structural timber members, which are cut from larger graded sections shall be regraded for acceptance and then appropriately marked according to the new grade.

Z10.1105

Strength Graded Timber

- a) Softwood shall be strength graded either visually in accordance with BS 4978 or by machine in accordance with BS EN 14081 with further visual inspection.
- b) Hardwood shall be strength graded in accordance with BS 5756 and BS EN 16737, or other national equivalent.
- c) Strength class(es) shall be in accordance with BS EN 338.
- d) Where exposed, species and corresponding strength class(es) shall be in accordance with BS EN 1912. Timber shall also be selected to comply with the specified visual requirements for exposed joinery.

Z10.1200

FABRICATION

Z10.1201

Fabrication Generally

- a) Joinery components shall be fabricated in accordance with BS 1186: Part 2.
- b) Sections shall be formed out of the solid when not specified otherwise. Timber shall be machined to accurate lengths and profiles, free from twist and bowing. After machining, surfaces shall be smooth and free from tearing, woolliness, chip bruising and other machining defects.
- c) Joinery shall be assembled with tight, close fitting joints to produce rigid components free from distortion.
- d) Screw heads shall be countersunk not less than 2mm below timber surfaces that will be visible in completed work. Screws shall have clearance holes. Screws of 8 gauge or more and screws into hardwood shall have pilot holes.
- e) The dimensions indicated on the Design Drawings and/ or Working Drawings of timber subframes, material thicknesses, the dimensions of mullions, transoms, etc. shall be maintained within the indicated tolerances.
- f) For each material or component the total quantity shall be obtained from the same manufacturer, unless otherwise agreed with the Employer.
- g) Support systems shall be of adequate thickness and strength, not only to achieve the structural requirements, but also to eliminate any risk of distortion in the finished surfaces.
- h) Exposed timber and woodwork shall be painted or sealed prior to receiving the finished coating system where specified, in accordance with the relevant British Standards.
- i) Concealed framework/ carcassing for units shall be protected and sealed in all conditions.
- j) Treat cut edges so that the level of protection is maintained.
- k) Remedial work shall not be undertaken on visible or semi-concealed faces to timber of Class J2, J5 or CSH and 1 without acceptance by the Employer.
- l) Unsound, dead and loose knots shall not be present on any visible or semi-concealed face.

Z10.1202

Veneer Faced Panels

- a) The selection of substrate and method of veneer application shall be suitable for the service conditions.
- b) Veneers shall be bonded to substrates in presses whenever possible.
- c) Core material and veneers shall be conditioned before bonding.
- d) Unless specified otherwise, a balancing veneer with the same moisture and temperature movement characteristics as the facing veneer shall be applied to the reverse side of flat boards.
- e) Veneers shall be set out so that features and pattern are aligned and in regular, uniform symmetry unless specified otherwise.

- f) Veneers shall be applied with edges tight butted and with no gaps or other open defects and no lipping.
- g) Precautions shall be taken to prevent 'telegraphing' or other defects appearing in the finished surface.
- h) The veneer surface shall be sanded to a fine, smooth finish free from sanding marks.
- i) Finished components shall be free from bow, twist, scratches, chipping, pimpling, depressions, glue spill, staining and the like.
- j) Moisture content shall be maintained at appropriate levels in relation to the core material to suit the service conditions.
- k) Adhesives shall be in accordance with BS EN 204, type to match durability class of core material.
- l) Assess, quantify and reserve sufficient stock of veneer so that the matching requirements are maintained.
- m) The final detailing shall be co-ordinated so that the finished surface accommodates the following:
 - i) The batching of finished veneer to give consistent colour, texture and quality on individual and visual adjacent surfaces.
 - ii) Matching of surface to give a symmetrical balanced pattern of grain and figure, with consistency and direction for areas as indicated on the Design Drawings.

Z10.1203

Laminated Plastics Veneers

- a) Sheets shall be applied in accordance with 'Recommendations for the fabrication of decorative laminated sheets' published jointly by the British Plastics Federation and the British Laminate Fabricators Association Ltd.
- b) Sheets shall be conditioned before bonding. Unless specified otherwise, a balancing veneer of similar construction to the decorative veneer and from the same manufacturer shall be applied to the reverse side of flat boards.
- c) Sheets shall be bonded in presses whenever possible.
- d) Finished components shall be free from bow, twist, scratches, chipping, cracks, pimpling, depressions, glue spill, staining, defects in colour and pattern and the like.
- e) Joints exposed to view in the finished work shall be tight butted and true with no lipping. Chamfer edges at external angles.

Z10.1300

WORKMANSHIP

Z10.1301

Cross-sectional Dimensions

Cross-sectional dimensions of timber indicated on the Design Drawings are approximate sizes unless stated otherwise. Reduction to finished sizes shall be in accordance with BS EN 1313: Part 1 for softwoods and BS EN 1313: Part 2 for hardwoods. Deviation from the stated sizes is not permitted without prior acceptance by the Employer.

Z10.1302

Preservative Treated Timber

- a) As much cutting and machining as possible shall be carried out before treatment.
- b) Treated timber that is processed in any way that is detrimental to the treatment shall be retreated.
- c) Surfaces exposed by minor cutting and drilling shall be treated with two flood coats of a solution recommended for the purpose by the main treatment solution manufacturer.

Z10.1303

Moisture Content

The moisture content of timber and wood based sheets shall be maintained during manufacture and storage, within the range specified for the component.

Z10.1304

Finishing and Protecting

- a) Joinery shall be sanded to give smooth, flat surfaces suitable to receive specified finishes. Arrises shall be eased unless specified otherwise.
- b) Before assembly, end grains for external components shall be sealed with primer or sealer as specified and allowed to dry.
- c) Completed joinery shall be protected against damage, dirt, moisture and other deleterious substances.

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Z11 METALWORK

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z11.1000 MATERIALS/ PRODUCTS AND FABRICATION

Z11.1100 MATERIALS

Z11.1101 Metal Components

- a) Metal components shall be fabricated using only appropriate grades, strengths and thicknesses. The size of profile and gauge of material shall be sufficient for the rigidity required in the final installation.
- b) Cut joints/ junctions shall be clean and true without waves or deviations from the vertical and horizontal planes.
- c) Materials and components shall be durable and to the minimum standards set out in the Architectural Specification, together with the relevant British Standards.
- d) For each material or component, the total quantity shall be obtained from the same manufacturer unless otherwise agreed with the Employer.
- e) Support systems shall be of adequate thickness and strength, to achieve the structural requirements and eliminate risk of distortion in finished surfaces.
- f) Adequate measures shall be taken to prevent bimetallic corrosion between dissimilar metals and to isolate aluminium components from cementitious surfaces. To this end attention is drawn to publication PD 6484 'Commentary on corrosion at bimetallic contacts and its alleviation'.

Z11.1102 Finishes and Corrosion Protection

- a) Metalwork that is to receive coatings shall be designed and fabricated in accordance with BS 4479.
- b) Preparation of surfaces to receive finishes and coatings shall be in accordance with the finishes and/ or coating manufacturer's recommendations.
- c) Exposed metalwork shall be finished in accordance with the relevant British Standards.
- d) Unless otherwise specified, items formed from aluminium in internal conditions shall be mill finished.
- e) Unless otherwise specified, concealed items formed from mild steel shall be hot dip galvanised steel in accordance with BS EN ISO 1461.
- f) Inaccessible metalwork shall be protected against corrosion for the design life of the Works.
- g) Metal components shall be protected against the effects of corrosion during and after fabrication until application of finishes.
- h) Protective coatings and finishes on joints shall be to the same standard as the main assemblies.
- i) Treat cut edges so that the level of protection is maintained.

Z11.1103 Aluminium

- a) Aluminium shall be capable of withstanding atmospheric conditions as specified and authenticated test certificates from the manufacturer shall be provided to confirm compliance.
- b) Extruded aluminium alloy members shall be fabricated from the appropriate grade of aluminium alloy in accordance with BS EN 754: Parts 3-5 and BS EN 755: Parts 1-9 unless otherwise specified.
- c) Unless specified otherwise, aluminium sheeting shall be a minimum of 3mm thick and be in accordance with the requirements of BS EN 485: Parts 1-4, BS EN 515 and BS EN 573: Parts 1-3.

- d) Extruded precision profiles in alloys EN AW-6060 and EN AW-6063 shall be in accordance with BS EN 12020: Parts 1 and 2.
- e) Only appropriate grades, strengths and thicknesses of aluminium shall be used so that structural and finishing requirements of the Architectural Specification are met. The wall thicknesses of aluminium extrusions shall be sufficient for the rigidity required in the final installation.
- f) Aluminium fixing brackets and cleats shall be manufactured from the appropriate grade of alloy in accordance with the requirements of BS EN 515, BS EN 573: Part 3, and BS EN 755: Parts 1-9. If visible, they shall be finished to match the metal panels and framing members.
- g) Structural aluminium shall be in accordance with BS EN 1999.
- h) Exposed aluminium shall be protected with low tack adhesive film during construction and prior to handover.
- i) Where aluminium is to be anodised, aluminium sheeting and flat panels shall be manufactured using alloy grade J57S, or acceptable equivalent, and aluminium extrusions shall be manufactured using alloy grade 6063, or acceptable equivalent.
- j) Aluminium panels shall be manufactured such that the grain on each runs in the same direction.
- k) Issue 'Die Drawings' to the Employer for review. These shall be considered as Working Drawings. The 'Die Drawings' shall indicate polished surfaces and shape.
- l) Aluminium extrusions containing score lines resulting from poorly polished surfaces shall not be acceptable.
- m) Aluminium sheets shall not suffer bowing, dimpling, oil canning, sagging, pillowing, rippling, warp, abrupt transitions or other visible deformation or irregularity.
- n) Aluminium shall be separated from concrete by bitumen paint or similar methods, acceptable to the Employer.

Z11.1104

Mild Steel

- a) Mild steelwork shall be in accordance with BS EN 1993, unless stated otherwise.
- b) Bright steel shall be in accordance with BS EN 10277.
- c) Long and flat products:
 - i) Hot rolled structural steels (excluding structural hollow sections and tubes) in accordance with BS EN 10025: Parts 1 and 2.
 - ii) Fine grain steels including special steels in accordance with BS EN 10025: Parts 3 and 4.
 - iii) Steels with improved atmospheric corrosion resistance in accordance with BS EN 10025: Part 5.
- d) Plate, sheet and strip:
 - i) High yield strength steel plates and wide flats in accordance with BS EN 10025: Part 6.
 - ii) Hot rolled products:
 - High yield strength steel flat products for cold forming in accordance with BS EN 10149.
 - Carbon steel sheet and strip for cold forming in accordance with BS EN 10111.
 - Narrow strip steel products for forming and general engineering purposes in accordance with BS 1449: Part 1.
 - iii) Cold rolled products:

- Steel sections in accordance with BS EN 10162.
 - High yield strength micro-alloyed steel flat products for cold forming in accordance with BS EN 10268.
 - Carbon steel flat products for cold forming in accordance with BS EN 10130 and BS EN 10131.
 - Uncoated carbon steel narrow strip for cold forming in accordance with BS EN 10139 and BS EN 10140.
 - Narrow strip for general engineering purposes in accordance with BS EN 10132.
 - Carbon steel flat products for vitreous enamelling in accordance with BS EN 10209.
- iv) Coated flat products:
- Hot dip zinc coated carbon steel sheet and strip for cold forming in accordance with BS EN 10143.
 - Hot dip zinc coated structural steel sheet and strip in accordance with BS EN 10143.
 - Hot dip coated sheet and strip in accordance with BS EN 10346.
 - Organic coated flat products in accordance with BS EN 10169.
- e) Structural hollow sections (SHS):
- i) Hot finished non-alloy and fine grain steels in accordance with BS EN 10210: Parts 1 and 2.
 - ii) Cold formed welded non-alloy and fine grain steels in accordance with BS EN 10219: Part 2.
 - iii) Hot finished weather resistant steels in accordance with BS 7668.
- f) Tubes:
- i) Seamless circular tubes in accordance with BS EN 10297: Part 1.
 - ii) Seamless cold drawn tubes in accordance with BS EN 10305: Part 1.
 - iii) Welded and cold sized square and rectangular tubes in accordance with BS EN 10305: Part 3.
 - iv) Welded circular tubes in accordance with BS EN 10296: Part 1.
 - v) Welded cold drawn tubes in accordance with BS EN 10305: Part 2.
 - vi) Welded cold sized tubes in accordance with BS EN 10305: Part 3.
- g) Equal flange tees in accordance with BS EN 10055.
- h) Equal and unequal angles in accordance with BS EN 10056: Parts 1 and 2.
- i) General wire and wire products in accordance with BS EN 10218: Part 2.
- j) Carbon steel wire for general engineering purposes in accordance with BS 1052.
- k) Open steel die forgings for general engineering purposes shall be in accordance with BS EN 10250: Part 2 for non-alloy quality and special steels and BS EN 10250: Part 3 for alloy special steels.
- l) Fabrication of steelwork shall be in accordance with the Architectural Specification.

- m) Before and after making permanent connections in frames and other structural elements, which are assembled before delivery to Site, the fit shall be checked for accuracy.
- n) Welding procedures shall be such that distortion is reduced to a minimum and local distortion rendered negligible in the final fabrication. Corrections, if necessary, shall be undertaken by a method which has been agreed to by the Employer.
- o) No welds other than those shown on the Working Drawings, even for temporary attachments or repairs, shall be acceptable unless agreed in advance by the Employer. If welded temporary connections are agreed upon, then the welding and removal of the connection shall be in accordance with BS EN 1011: Parts 1 and 2.
- p) Vent holes in hollow sections shall be sealed in a manner that shall prevent the ingress of moisture. The proposed method of achieving this requirement shall be submitted for review by the Employer.
- q) External visible lines and depressions caused by the internal welding of hollow section steelwork shall be positioned in the Works so as to be non-visible.

Z11.1105

Stainless Steel

- a) Unless otherwise specified, stainless steel shall be austenitic and non-magnetic in accordance with BS EN 10088.
 - i) Sheet, strip and plate in accordance with BS EN 10088: Part 2.
 - ii) Bars, rods, wire and sections in accordance with BS EN 10088: Part 3.
 - iii) Welded circular tube in accordance with BS EN 10296: Part 2.
 - iv) Seamless circular tube in accordance with BS EN 10297: Part 2.
- b) Specific grade designations shall be either as specified in the relevant sections of the Architectural Specification or, where not identified specifically, selected to achieve the performance criteria specified for the particular element or components as follows:
 - i) Stainless steel for internal use or for use in an external environment where the component is not visible shall be austenitic grade 1.4301 in accordance with BS EN 10088: Part 1.
 - ii) Stainless steel fixings and fasteners for internal use or for use in external environment where the fixing or fastener is not visible shall be A2 grade in accordance with BS EN ISO 3506.
 - iii) Stainless steel for external use where the component is visible shall be austenitic grade 1.4401 in accordance with BS EN 10088: Part 1.
 - iv) Stainless steel fixings and fasteners for external use where the fixing or fastener is visible shall be A4 grade in accordance with BS EN ISO 3506.
- c) Stainless steel fasteners, bolts, screws, nuts and other fixings shall be in accordance with BS EN ISO 3506: Parts 1 and 2. The property class of fastenings shall be selected to achieve the performance requirements as specified.
- d) Stainless steel shall be produced to achieve the minimum dimensional tolerances indicated in BS EN 10095, BS EN 10029, BS EN 10048, BS EN 10051 and BS EN ISO 9445: Parts 1 and 2 as appropriate.
- e) Finish to stainless steel shall be classified in accordance with Table 6 of BS EN 10088: Part 4 (sheet and plate) or Table 7 of BS EN 10088: Part 5 (bars and sections), to accepted samples. Surface roughness shall be ≤ 0.5 microns.
- f) Unless otherwise specified, welds to visible areas of stainless steel shall be ground smooth to achieve a seamless surface. Heat tints shall be removed using light abrasives, pickling paste, wire brushing or similar to achieve continuity with the specified finish. Areas difficult to access shall be manually finished if necessary.

- g) Welds shall be in accordance with BS EN 1011: Part 3 and the definitions given in BS 499: Part 1 and Part 1 Supplement. Distortion due to thermal movement shall be minimised using jigs or other methods as appropriate during welding. Welding methods and consumables shall be chosen as most appropriate to the type, thickness, shape and location of joints to achieve the performance levels required and have mechanical properties at least equal to the original base metal. In addition, consumables shall have an equal or superior corrosion resistance to the base metal being welded. Welding recommendations required to achieve other relevant standards as specified shall also apply. Electrodes for manual metal arc welding shall be in accordance with BS EN ISO 3581.
- h) Stress corrosion or cracking shall not occur and necessary precautions in the fabrication and installation of stainless steel elements/ materials shall be undertaken, avoiding the simultaneous presence of any of the following:
 - i) Tensile stresses.
 - ii) Residual stresses after cold working or welding.
 - iii) Aggressive local environmental conditions.
 - iv) Metal temperatures that in conjunction with the above may induce stress corrosion cracking.
- i) Stainless steel castings:
 - i) Shall be in accordance with BS EN 10283 and BS 3146: Part 2.
 - ii) Shall be of austenitic stainless steel and the casting alloy shall be determined by the Contractor to achieve the requirements of the Architectural Specification but shall be equal or superior to grade 1.4408 with respect to corrosion resistance.
 - iii) Shall be manufactured using the lost wax process or such other process as may be proposed by the Contractor and accepted by the Employer.
 - iv) Exposed feeder ports and die lines shall not be acceptable in the finished castings.
 - v) The surface finish of the castings shall be determined by the submission of samples for review and acceptance by the Employer. Samples once accepted should be the standard required for subsequent castings to be used in the Works.
 - vi) The surface roughness of the casting surface prior to any subsequent finishing process shall be SCRATA A2 or better.
 - vii) Make allowance for two post production finishing processes to be utilised. The processes shall be agreed with the Employer and shall include blast finishes (including bead blasting) and electropolishing or acid pickling.
- j) Open steel die forgings for general engineering purposes shall be in accordance with BS EN 10250: Part 4.
- k) Stainless steel wire, cold-forged fasteners and similar components shall be in accordance with BS EN 10263: Part 5.
- l) Stainless steel for wall ties and other components associated with masonry construction shall be in accordance with BS EN 845: Part 1.
- m) Stainless steel shall be protected using appropriate adhesive film, to the film manufacturer's written recommendations.
- n) If stainless steel has not been protected by adhesive film, thoroughly clean prior to presentation to the Employer for acceptance.

Z11.1106

Terne Coated Stainless Steel

- a) Terne coated stainless steel shall be in accordance with the requirements of BS EN 502 and BS EN 508: Part 3.

- b) Stainless steel shall be either continuously hot dip coated with a lead-tin alloy or continuously coated with tin by electrodeposition to comply with the requirements of the Architectural Specification, and provide a consistent uniform finish as accepted by the Employer.

Z11.1107

Weathering Steel

- a) Weathering steel such as Cor-ten registered to the United States Steel Corporation (USS) or acceptable equivalent.
- b) Steel shall be high strength, low alloy, atmospheric corrosion resistant steel in accordance with ASTM A242/ A242M, ASTM A588/ A588M, ASTM A606 and as described in BS EN 10025: Parts 1 and 2.
- c) The protective oxide shall provide a consistent, uniform finish to components including perforations, welds and fixings.
- d) Steel surfaces shall be prepared by blast-cleaning or pickling to remove mill scale. Contamination from grease, oil or shop marking shall be avoided.
- e) Welds shall be carried out with techniques compatible with the corrosion resistant steel as recommended in writing by the manufacturer and finished by power grinding or blast cleaning to remove welding slag and spatter. Weld-points shall weather at the same rate as the other materials.
- f) There shall be consistent corrosion rates and appearance for the design life of the building.

Z11.1108

Copper

- a) Copper shall be in accordance with BS EN 1172 and BS EN 1652.
- b) Where specified to be pre-patinated, copper shall have consistency in appearance and composition of naturally aged copper and shall achieve the visual requirements of the Employer.
- c) Copper shall be free from inclusions, laminations and pinholes.

Z11.1109

Bronze

- a) Bronze (alloy of copper and tin) shall be in accordance with BS EN 1172 and BS EN 1652.
- b) Bronze shall be free from inclusions, laminations and pinholes.

Z11.1110

Brass

- a) Brass (alloy of copper and zinc) shall be in accordance with BS EN 1172 and BS EN 1652.
- b) Brass shall be free from inclusions, laminations and pinholes.

Z11.1111

Zinc

- a) Zinc and zinc alloys shall be in accordance with BS EN 988 and BS EN 501.
- b) Zinc shall be free from inclusions, laminations and pinholes.

Z11.1200

WORKMANSHIP

Z11.1201

Fabrication Generally

- a) Fabricate components for compliance with the Design and the Architectural Specification.
- b) Do not permit contact between dissimilar metals in components that are to be fixed where moisture may be present or occur.
- c) Finished components shall be rigid and free from distortion, cracks, burrs and sharp arrises. Moving parts shall move freely and without binding.
- d) Unless specified otherwise, mitre corner junctions of identical sections.

- Z11.1202 Cold Formed Work
- Use brake presses or cold rolling to produce accurate profiles with straight arrises.
- Z11.1203 Adhesive Bonding
- a) Prepare surfaces of metals to receive adhesives by degreasing and abrading mechanically or chemically.
 - b) Use adhesives to manufacturer's written recommendations.
 - c) Form bond under pressure.
- Z11.1204 Thermal Cutting of Stainless Steel
- After cutting, grind off material that is liable to corrode.
- Z11.1205 Welding/ Brazing Generally
- a) Thoroughly clean surfaces to be joined.
 - b) For accurate fit use clamps and jigs where practicable. Use tack welds only for temporary attachment.
 - c) Make joints with parent and filler metal fully bonded throughout with no inclusions, holes, porosity or cracks.
 - d) Prevent weld spatter falling on surfaces of materials that will be self-finished and visible in completed work.
 - e) Remove flux residue, slag and weld spatter.
- Z11.1206 Welding
- a) Welding shall be inert gas tungsten-arc welding, carried out in accordance with BS EN ISO 15614: Part 1 and BS EN 1011, by welders tested in accordance with BS EN ISO 9606.
 - b) Welds shall be continuous and of a material and technique suitable to the sections being assembled.
 - c) Welded joints shall be ground and polished smooth with no surface defects (e.g. undercut, porosity, deep ridges).
 - d) Site welding shall be avoided.
- Z11.1207 Brazing
- Brazing shall be in accordance with BS EN 14324.
- Z11.1208 Finishing Welded/ Brazed Joints
- a) Visible butt joints in completed work shall be smooth, flush with adjacent surfaces.
 - b) Execute visible fillet joints in completed work neatly. Grind smooth where specified.
- Z11.1209 Applying Coatings/ Finishes
- a) Coatings/ finishes shall be applied after fabrication is complete and fixing holes have been drilled, unless otherwise specified.
 - b) Prior to coating application, remove paint, grease, flux, rust, burrs and sharp arrises.
 - c) Make good defects that would show after application of coating and finish surfaces smooth.

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Z12 PRESERVATIVE/ FIRE RETARDANT TREATMENT

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z12.1000 MATERIALS/ PRODUCTS AND APPLICATION

Z12.1100 TYPE(S) OF PRESERVATIVE/ FIRE RETARDANT TREATMENT

Z12.1101 Organic Solvent Preservative Treatment

- a) The moisture content of timber at the time of treatment shall be as specified for the component at the time of delivery. After treatment, the timber shall be surface dry before use.
- b) Application: Double vacuum/ low pressure.

Z12.1102 Water Based Microemulsion Preservative Treatment

- a) Based on copper and organic biocides.
- b) The moisture content of the timber at the time of treatment shall be not more than 28%. Allow timber to dry for at least 14 days before use and until dry.
- c) Application: Double vacuum/ pressure treated.

Z12.1103 Boron Compound Preservative Treatment

- a) Based on boron compounds.
- b) The moisture content of the timber at the time of treatment shall be not more than 28%. Allow timber to dry for at least 14 days before use and until dry.
- c) Application: High pressure impregnation.

Z12.1104 Fire Retardant Treatment

- a) The moisture content at the time of treatment shall be as specified for the timber at the time of fixing. After treatment, timber shall be dried slowly at temperatures not exceeding 65°C to minimise degradation and distortion.
- b) Application: Vacuum/ hydraulic and low pressure.

Z12.1105 Leach Resistant Fire Retardant Treatment

- a) The moisture content at the time of treatment shall be as specified for the timber at the time of fixing or:
 - i) 22% for timbers up to 50mm thick.
 - ii) 25% for thicker timbers.
- b) Application: Vacuum/ hydraulic and low pressure.

Z12.1200 MATERIALS

Z12.1201 Wood Preservative Treatments Generally

- a) Wood preservative products shall conform to the efficacy requirements of BS EN 599: Part 1 and BS 8417.
- b) Products shall be treated in accordance with the penetration and retention guidance given in BS EN 351: Part 1 to give a desired service life in the selected hazard class.
- c) Hazard classes are defined in BS EN 335.
- d) The preservative treatment shall be compatible with applied finishes.

Z12.1300 WORKMANSHIP

Z12.1301

General

- a) Application shall be carried out after cutting and machining, but before assembly, by a processor licensed by the treatment solution manufacturer for the specified treatment.
- b) For each batch of timber a certificate of assurance shall be submitted to show that the treatment has been carried out as specified.

Z12.1302

WPA Commodity Specifications

Where specified, WPA Commodity Specifications are those defined in the latest edition of the Wood Protection Association's 'Manual: Industrial Wood Preservation. Specification and Practice'. Solution strengths and treatment cycles shall be selected to achieve the service life (if specified) and to suit timber treatability.

END OF SECTION

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Z20 FIXINGS/ ADHESIVES

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z20.1000 MATERIALS/ PRODUCTS AND FABRICATION

Z20.1100 MATERIALS

Fixings

Z20.1101 Fixing Generally

- a) Fixings shall be of sufficient strength, appropriate to their location, and shall be provided at adequate positions for the required performance of the elements being attached.
- b) Unless otherwise specified, observe the following requirements:
 - i) Durability - fixings shall be selected such that adequate protection against any corrosion likely to occur in their position of use is provided for the service life specified.
 - ii) Rigidity - fixings shall be used which are suited to the likely stresses, movements and vibrations in use.
 - iii) Appearance - unless otherwise specified, fixings shall not be visible; where fixings are visible these shall match or suit the items being fixed or comply with the Design Drawings.
 - iv) Removable items that require accessibility or removal shall be fixed with hidden screws and/ or bolts, unless otherwise specified.
- c) Use fixings that are suitable for their intended purpose and adequate to comply with the requirements stated in the Architectural Specification.
- d) Bolts, screws, nuts, anchors and other fixings shall be of adequate strength for their designed purpose and shall, unless specified otherwise, be manufactured from the most appropriate grade of austenitic stainless steel or other materials as specified. Where specified, structural steel fixings shall comply with the grades specified.
- e) Fixing components shall be of dimensions not less than those recommended by their manufacturer.
- f) The Works shall include fastenings and fixings necessary for safe and proper installation.
- g) Fixings shall conform to statutory requirements both as to strength and type and shall be designed to achieve the requirements of the Architectural Specification.
- h) Adequate measures shall be taken to prevent bimetallic corrosion between dissimilar metals and to isolate aluminium components from cementitious surfaces. To this end attention is drawn to publication PD 6484 'Commentary on corrosion at bimetallic contacts and its alleviation'.
- i) Visible fixings shall be of a type acceptable to the Employer.
- j) Provide cast-in channel fixings in concrete and fixings directly made to structural steelwork.
- k) Where required to be tested by the Employer or Structural Engineer, fixings shall be tested by an independent Testing Authority acceptable to the Employer or Structural Engineer.

Z20.1102 Fasteners

- a) Steel:
 - i) Bolts, screws and nuts shall be in accordance with BS 4190, BS EN ISO 4016 and BS EN ISO 4034.

ii) Mechanical properties of fasteners shall be in accordance with BS EN 20898: Part 7 and BS EN ISO 898: Parts 1, 2 and 5.

b) Mechanical properties of corrosion-resistant stainless steel fasteners (bolts, screws, studs and nuts) shall be in accordance with BS EN ISO 3506.

c) Aluminium rivets, bolts and screws shall be in accordance with BS 1473.

Z20.1103 Powder Actuated Fixing Systems

Do not use powder actuated fixing systems without acceptance by the Employer.

Z20.1104 Screw Fixings

a) Machine screws and machine screw nuts shall be in accordance with BS 4183.

b) Pan head screws shall be in accordance with BS EN ISO 7045 and BS EN ISO 1580.

c) Washers and screw cups, where specified, shall be of the same material as the screw.

Z20.1105 Packings Generally

a) Provide suitable, tight packings at fixing points to take up tolerances and prevent distortion.

b) Use non-compressible, rot-proof, non-corrodible materials positioned adjacent to fixing points.

Z20.1106 Types of Nail

Nails shall be in accordance with BS 1202.

Z20.1107 Masonry Nails

Do not use without acceptance by the Employer.

Z20.1108 Plugs Generally

Use proprietary types selected to suit the background, loads to be supported and conditions expected in use.

Adhesives

Z20.1109 General

a) Adhesive for flexible wallcoverings: In accordance with BS 3046, or type as recommended by the manufacturer.

b) Adhesives for floor coverings shall be in accordance with BS EN 14259.

c) Hot-setting phenolic and aminoplastic based adhesives shall be in accordance with BS 1203.

d) Thermosetting wood adhesives shall be in accordance with BS EN 12765.

e) Polyvinyl acetate thermoplastic adhesive shall be in accordance with BS EN 204.

f) Animal glues shall be in accordance with BS EN ISO 9665.

g) Adhesives shall be compatible with finished surfaces, preservative/ fire retardant treatments and shall maintain the performance requirements of the elements to be bonded.

Z20.1110 Non-loadbearing Applications

a) Durability class/ strength requirements of adhesives used in non-loadbearing uses of wood and derived timber products shall be in accordance with BS EN 205.

b) Adhesives used in non-loadbearing applications shall be tested in accordance with BS EN 205.

Z20.1111 Loadbearing Applications

- a) Glued joints shall be in accordance with BS EN 1995: Part 1-1.
- b) Durability class/ strength requirements of adhesives used in loadbearing uses of wood and derived timber products shall be in accordance with BS EN 301.
- c) Adhesives used in loadbearing applications shall be tested in accordance with BS EN 302.

Z20.2000 EXECUTION

Z20.2100 APPLICATION

Z20.2101 Adhesives

- a) Surfaces to receive adhesive shall be sound, unfrozen and free from dust, grease and any other contamination likely to affect bond. Where necessary, clean surfaces using methods and materials recommended by the adhesive manufacturer.
- b) Surfaces shall be sufficiently smooth and even to suit the gap-filling and bonding characteristics of the adhesive. Prepare as necessary.
- c) Operatives shall observe both the manufacturers' and statutory requirements for storage and safe usage of adhesives.
- d) No adhesives shall be used in unsuitable environmental conditions or beyond the manufacturer's recommended maximum shelf life or open-pot time periods.
- e) For correct coverage, adhesives shall be applied using recommended spreaders/ applicators. Bring surfaces together within the recommended time period and apply pressure evenly over the full area of contact surfaces for full bonding.
- f) Surplus adhesive shall be removed using methods and materials recommended by the adhesive manufacturer and without damage to affected surfaces.

Z20.2102 Fixings

- a) Carry out necessary preparation work such as drilling, plugging, screwing, bolting, cutting for anchor bolts or sockets to be cast-in and for making good, including grouting-in of anchor bolts and fixings where necessary.
- b) The method of fixing shall not damage anything being fixed or anything receiving fixings.
- c) Welding shall not be permitted, unless accepted by the Employer.
- d) Fasteners shall be installed with a co-ordinated purpose design tooling system that incorporates a mechanical depth locator for consistent depth setting and perpendicular installation. The fastener manufacturer shall be capable of providing on-Site instruction in the use of the fastener installation tooling system.
- e) Fixings and attachments shall be secured against vibrating loose.
- f) Fixings shall comply with Section 2 of Approved Document A of the Building Regulations and any subsequent amendments thereto.
- g) Submit quality management procedures for inspection of fixings to the Employer to include, but not be limited to, checking each fixing for correct torques, depth of mortices, alignment, etc.
- h) No lock-up stresses shall be generated.

Z20.2103 Powder Actuated Fixing

- a) Tools shall be used in accordance with BS 4078: Part 1. Operatives shall be trained and certified as competent by the Contractor.
- b) Operatives shall take full precautions against injury to themselves and others.
- c) Remove unspent cartridges from the Site when no longer required.
- d) Apply zinc rich primer to heads of fasteners used externally in external walls or in other locations subject to dampness.

- e) Use top hat section plastic washers to isolate cartridge-fired nails from stainless steel components fixed externally, in external walls or in other locations subject to dampness.

Z20.2104

Screw Fixings

- a) Screws shall have clearance holes. Screws of 8 gauge or more and screws into hardwood shall have pilot holes approximately half the diameter of the shank.
- b) Before using brass, aluminium or other soft metal wood screws, pre-cut the thread with a matching steel wood screw.
- c) Do not hammer screws unless specifically designed to be hammered.
- d) Countersink screw heads not less than 2mm below timber surfaces that will be visible in the completed work, unless specified otherwise.

Z20.2105

Packings Generally

Packings shall not intrude into zones that are to be filled with sealants.

Z20.2106

Nail Fixing

- a) In joints, use not less than two nails and opposed skew nailing unless specified otherwise.
- b) Drive nails fully in without splitting or crushing the material being fixed.
- c) Punch nail heads below surfaces that will be visible in the completed work.

Z20.2107

Plugs Generally

Locate plugs in holes in accordance with the manufacturer's recommendations.

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Z21

MORTARS

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z21.1000

MATERIALS/ PRODUCTS/ TESTING

Z21.1100

MATERIALS

Z21.1101

Mortar Generally

- a) Site-mixed masonry mortar mix proportions shall be in accordance with NA to BS EN 1996: Part 1-1.
- b) Proprietary factory formed masonry mortar shall be in accordance with BS EN 998: Part 2.
- c) If pre-mixed mortars are used, the characteristics, product data, and testing criteria shall be submitted to the Employer for review.

Z21.1102

Materials

- a) Sand for mortar:
 - i) Sand shall be from one source and graded 0/ 2 (FP or MP) in accordance with BS EN 13139, unless specified otherwise.
 - ii) Where the proportion of sand in a mortar mix is specified as a range (e.g. 1:1:5-6), the fines content shall be:
 - Lower proportion of sand: Category 3 in accordance with BS EN 13139.
 - Higher proportion of sand: Category 2 in accordance with BS EN 13139.
 - iii) Marine sand shall not be used with sulphate resisting or super sulphated cement.
- b) Portland cements shall be in accordance with BS EN 197: Part 1. Unless otherwise stated the cement shall be of Ordinary Portland Cement and be delivered in the original sealed bags of the manufacturer or in suitable bulk containers.
- c) Lime shall be in accordance with BS EN 459: Part 1.
- d) Any mortar plasticiser used shall be to the acceptance of the Employer and used in accordance with the manufacturer's recommendations. Mortar mixes shall also be altered in accordance with the manufacturer's recommendations. The suitability of the mixture for use in any mortar shall be demonstrated to the acceptance of the Employer.
- e) Admixtures shall not be used in mortar unless accepted by the Employer. Calcium chloride, or any admixtures containing calcium chloride, shall not be used. Admixtures, if specified, shall be in accordance with BS EN 934: Part 3.
- f) Pigments for coloured mortars shall be in accordance with BS EN 12878.

Z21.1200

TESTING

Z21.1201

Mortar Testing

- a) Tests:
 - i) Testing of mortars shall be carried out in accordance with BS 4551 and BS EN 1015, or to equivalent standards acceptable to the Employer.
 - ii) Testing shall be carried out by a Kenya Accreditation Service (KENAS) accredited laboratory.
 - iii) Specimens for preliminary tests of the mortars shall be prepared at least six weeks in advance of any walling commencing.

- iv) Material sources shall be identified to the Employer for acceptance prior to commencement of preliminary tests.
- v) Samples shall be taken at the point of mixing or use.
- vi) Additional tests and sampling shall be performed if the mortar does not comply with the Architectural Specification.
- vii) Subject to the test results, the mix proportions shall be adjusted and tested.
- viii) Unless otherwise accepted by the Employer, the consistency of fresh mixed mortar shall be in accordance with BS EN 1015: Part 4.
- ix) Tests for cement content shall be carried out using the BREMORTEST method described in BRE Information Paper 8/ 89, or other equivalent agreed with the Employer. Tests shall be instructed by the Employer.
- b) Testing apparatus: On Site the following apparatus shall be maintained in good repair:
 - i) Maximum and minimum thermometers as and where required.
 - ii) Soil thermometers as required for measuring the mortar and ground temperatures.
 - iii) Apparatus for taking test samples and carrying out tests in accordance with BS EN 1015 and BS 4551.
- c) Frequency of testing: Test samples shall be prepared for each type of mortar and for each type of brick/ block walling or for every storey of the building, whichever is the more frequent. In any event the minimum frequency of testing shall be no less than that specified herein.
- d) Failure of mortars: Brick/ block walling containing mortar that does not comply with the requirements of the Architectural Specification shall be demolished, debris carted away, and rebuilt.

Z21.2000

EXECUTION

Z21.2100

TRANSPORTATION, HANDLING AND STORAGE OF MATERIALS

Z21.2101

Storage of Materials

- a) Cements and lime shall be stored off the ground, under cover, away from damp and in such a manner as to enable them to be used in order of delivery.
- b) Sands shall be stored separately, according to type, on clean, hard, dry standings and shall be protected from contamination.
- c) Pre-mix mortars, if used, shall be stored in accordance with the manufacturer's recommendations.

Z21.2200

WORKMANSHIP

Z21.2201

General

- a) Mixing plant, tools and banker boards shall be kept clean at all times.
- b) Materials shall be measured by volume using clean gauge boxes. Proportions of mixes shall be for dry sand making allowance for bulking if it is damp.
- c) Ingredients shall be mixed thoroughly to a consistency suitable for the Works and free from lumps.
- d) Mortars containing air-entraining admixtures shall be mixed by machine, but not overmixed.
- e) Retarded mortar shall be used within the time recommended by the manufacturer.
- f) The required amount of water shall be determined to achieve a workable mix.

END OF SECTION

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Z22

SEALANTS

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z22.1000

MATERIALS/ PRODUCTS

Z22.1100

MATERIALS

Z22.1101

Types and Method

- a) Sealant shall be suitable for purpose and used in accordance with the manufacturer's recommendations.
- b) Sealants shall not be in any way a potential health hazard. Maintain full up-to-date records of current published research and legislation in this respect. Obtain information from the sealant manufacturer regarding storage, handling, use and disposal of sealants.
- c) Wet applied sealants shall only be used in the locations indicated on the Design Drawings or shown on the Working Drawings or as and where agreed with the Employer, provided that the requirements of the Architectural Specification are satisfied.
- d) Sealants shall be the most appropriate type and grade suitable for the intended application.
- e) Written confirmation from the sealant manufacturer shall be obtained and submitted to the Employer for consideration as to the suitability of the sealant for the application intended.
- f) Where sealant is visible within the Works, submit proposals and reference samples to the Employer of the type and colour of the sealant prior to ordering.
- g) Agree with the Employer the period during which the sealant shall not change in appearance or colour. Any discolouration of sealant during this time shall not be acceptable.
- h) The chemical composition of the sealant and primers, where any, shall be compatible with the joint substrate, and with adjacent surface treatments or building components with which they may come into contact.
- i) Determine the appropriate hardness, compressibility or consistency of sealants in consultation with the manufacturer, considering the joint movement and exposure for the size of joint. Provide information concerning theoretical joint movement related to the calculated temperatures at which sealants shall be installed and cured.
- j) Demonstrate to the satisfaction of the Employer that the sealant joints can accommodate and are compatible with any movements to which they may be subjected.
- k) Sealants shall have the lowest modulus of elasticity which is consistent with the degree of exposure to wear, abrasion and vandalism. Any sealant exposed to traffic shall have strength and modulus sufficiently high to resist damage by traffic, including indentation.
- l) Sealants that are likely to stain, discolour or bleed into adjacent building materials shall not be used. Submit independent testing evidence to this effect.
- m) Where the sealant location involves special requirements, comply with the following:
 - i) Where the sealant is used in trafficked surfaces and/ or is required to be fuel resistant, it shall be in accordance with BS EN 14188: Part 1 for hot applied sealants and BS EN 14188: Part 2 for cold applied sealants.
 - ii) Where the sealant is required to achieve a period of fire resistance, submit independent UK performance certification of the proposed sealants to show the sealant satisfies the required fire resistance requirement.
 - iii) Where sealants are in contact with drinking water, submit evidence of compliance with UK water quality standards.
 - iv) Resistance to permanently wet service environments.

- n) Sealant performance shall be verified by provision of current independent test certificates.
- o) Manufacturers' product descriptions shall confirm compliance with performance standards including the BS EN ISO 11600 coding and be confirmed on the package labels, in the technical data sheets and on any certificates demonstrating performance capability.
- p) Sealants complying with the Architectural Specification shall be manufactured within an independently assessed BS EN ISO 9000 series quality system. Each pack supplied shall have a batch number and date of manufacture.

Z22.1102

Testing

Carry out testing to assess sealant cure and/ or adhesion to joint surfaces in accordance with BS 3712: Parts 1-4.

Z22.2000

EXECUTION

Z22.2100

WORKMANSHIP

Z22.2101

Application

- a) Prepare surfaces to receive sealant, using correct degreasing solvents, primers and bonding agents as necessary.
- b) Where sealants are applied, either on or off Site, they shall be in accordance with BS 6213, BS 6093 or BS 8000: Part 16 and BS EN ISO 11600 as appropriate.
- c) The application of sealants shall be in accordance with the manufacturer's written preparatory and application procedures and the British Adhesives and Sealants Association (BASA) 'Industry Guide to the Professional Application of Construction Sealants on Site' or acceptable equivalent.
- d) Excess sealant shall be removed and joints shall be neat and clean. Only liquids approved by the sealant manufacturer shall be used to tool freshly applied sealants.
- e) Sealant shall be evenly applied without bubbles in joints.
- f) Sealants shall be adequately protected during the curing process to avoid contamination or damage from other activities or conditions on Site.
- g) Joint fillers, when placed in the joint, shall provide a gap consistent with the required depth of sealant. The cross section of sealant in the joint shall be of 2:1 width to depth unless otherwise accepted. Joint fillers shall be as follows:
 - i) Compatible with the sealant used and surrounding construction elements.
 - ii) Formed from closed cell foam.
 - iii) Non-adherent to cured sealant, otherwise bond breaker tape shall be used.
- h) Applicators shall operate within an approved BS EN ISO 9001 scheme.
- i) Only materials achieving the Architectural Specification requirements and stored under appropriate conditions shall be used for installation.

END OF SECTION

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Z23

GASKETS

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z23.1000

MATERIALS/ PRODUCTS AND FABRICATION

Z23.1100

MATERIALS TYPE AND USE

Z23.1101

Materials

- a) Gaskets and seals shall maintain the performance of the system in which they occur.
- b) The gaskets shall accommodate the maximum movements applicable.
- c) Gasket to gasket joints shall be butt jointed and heat sealed. The bonding of gaskets using other materials shall not be acceptable. The gaskets shall perform and appear as a single continuous material.
- d) The gasket system shall comprise either extruded or moulded elements. These shall perform and appear as a single element.
- e) Gaskets shall be formed from suitable materials and fabricated to the most appropriate grade and hardness. Design and select gaskets to:
 - i) Comply with the requirements of BS 4255.
 - ii) Be most appropriate to the extrusion design.
 - iii) Be capable of maintaining their elastic qualities and dimensions.
 - iv) Maintain glass retention and weatherproofing requirements by dry solid materials and/ or structural silicone.
 - v) Not permanently distort over the working life of the Works.
- f) Gaskets shall be free from contact with materials that have stain characteristics and be compatible with substrate, sealants and other materials used in the Works.
- g) Provide written confirmation from the gasket manufacturer that the gasket material and designs are wholly suitable for their specific use in any part of the Works and are compatible with other materials and sealants used within the installation and at interfaces with other materials/ components.
- h) The colour of gaskets shall be black unless specified otherwise.
- i) Gaskets shall not shrink nor warp and shall not deteriorate between the periods stated in the Contractor's stated times for replacement.
- j) Gaskets and seals used to achieve the required airtightness shall be selected to accommodate fully the range of dimensional tolerances and movements associated with the design, fabrication and installation of the Works.

END OF SECTION

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Z25

GLASS AND COATINGS

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z25.1000

MATERIALS/ PRODUCTS AND FABRICATION

Z25.1100

TYPES OF GLASS

Z25.1101

Glazing Generally

- a) Each item of glass shall be manufactured and processed in a factory where the quality management procedures are in accordance with BS EN ISO 9001 and are independently maintained.
- b) Glass manufacture shall generally be in accordance with the following standards:
 - i) BS EN 572 for float (annealed glass).
 - ii) BS EN 1096 for coated glass.
 - iii) BS EN 1863 for heat strengthened glass.
 - iv) BS EN ISO 12543 for laminated glass.
 - v) BS EN 12150 for toughened glass.
 - vi) BS EN 14179 for heat soak tested toughened glass.
 - vii) BS ISO 11485 for curved glass.
- c) Visual quality: Unless specified otherwise, visual quality shall be, as a minimum, in accordance with the 'Guideline to Assess the Visible Quality of Glass in Buildings' 2009, prepared by the 'Institute of the Glazing Trade for Glazing Technology and Window Manufacture, Hadamar'. Visual quality inspections shall be carried out at a minimum distance of 1000mm.
- d) Glass types shall be cut to accurate sizes with clean cut, arrised edges.
- e) There shall be no damage such as shark teeth, serration hackle, sharp flare, flake chips, rough chips, feathered edges, shells or other imperfections if detrimental to the visual and performance criteria of the glass.
- f) Glass delivered to Site shall be of the required size. There shall be no cutting or nipping of glass on Site.
- g) Variations in manufacture and performance of the glass shall not affect its colour or appearance, while glass of the same type shall be visually consistent in appearance and colour at all times, having due regard to the direction and angle of view within manufacturing tolerances and the agreed range of samples or observations of previous installations of the same type of glass.
- h) Glass shall be of the type specified in the relevant standard and the glazing shall be carried out in accordance with the manufacturer's recommendations.
- i) Glass panes within frames shall be installed to give the necessary edge cover and clearance for a permanent and safe installation. Glass panes with damaged edges, including shelling and impact markings, shall not be fixed into the building under any circumstances.
- j) Provide a warranty, which states that the glazing systems comply with the Architectural Specification, and indicates the time to first maintenance of the glass, interlayers, spacers and other components.
- k) Stresses in glazing:
 - i) No glass or glazing combination shall develop stresses that may lead to damage of glass, glazing materials, components and/ or framing systems.

- ii) Conduct a thermal stress analysis and make due allowance for any thermally treated or edge working of annealed glass which may be required.
- iii) Take into account shading stresses that might occur from adjacent components, including solar shading devices, internal blinds, interstitial blinds and applied films.
- l) Glass shall be capable of replacement without undue difficulty. Submit a method statement showing the method of removing damaged glass and any associated metal framework and of installing new components.
- m) Provide glass with a colour rendering index (Ra) as specified, both for the transmittance and the reflected spectrum and provide detailed reflected and transmitted spectrum data for the purpose of identifying/ anticipating the possible problems with colour reflection. Demonstrate this by provision of full size samples of each glass type, which are to be viewed under representative lighting conditions and accepted prior to material manufacture.
- n) Provide glass from a single manufacturer unless agreed otherwise by the Employer and provide certification proving the origin of the glass.
- o) Glass shall not contain impurities that would detract in any way from the performance of the glazing system.
- p) Exposed glass edges shall be ground and arised.
- q) Glass shall be free from bubbles, smoke vanes, air holes, scratches or any other visible defects unless described as acceptable elsewhere in the Architectural Specification.
- r) Prior to placing an order for any glazing materials, obtain necessary confirmation and/ or calculations in writing from the glass manufacturer, on all aspects of the glazing systems for review, as but not limited to the following:
 - i) Ventilating and draining provisions of the glazing rebates.
 - ii) Thickness of individual glass panes and of insulating glass units due to consideration of the wind loadings specified.
 - iii) Snow and access loads for horizontal/ inclined glazing conditions with consideration of the wind loadings specified.
 - iv) Determination as to whether or not heat strengthening or toughening of glass will be required.
 - v) Thickness and number of PVB interlayers (laminated glass).
 - vi) Thermal and shading performance of insulating glass units.
 - vii) Thermal safety of insulating glass units.
 - viii) Hardness, location, shape and dimensions of setting blocks and glazing gaskets.
 - ix) Depth and width of glazing rebates.
 - x) Expansion, tolerances, glass bite and clearance to achieve performance requirements.

Z25.1102

Safety Glass

- a) Select safety glass categories for use in critical locations as defined and recommended in BS 6262, BS EN ISO 12543: Parts 1-6 and BS EN 1279 as required to comply with the Building Regulations, Local Authority requirements and other relevant health and safety requirements. The selection of the glass type and thickness shall be undertaken to achieve the performance requirements of the Architectural Specification and to minimise the risk to persons both during construction and during the service life of the Works. The risk of failure and the consequences of failure shall be documented and prepared by the Contractor for review.

- b) Safety glass shall be 'Kite', or other internationally recognised standard, marked and labelled in a visible and consistent position on the glass to the acceptance of the Employer. Safety glass shall be in accordance with the relevant standards and shall achieve the requirements of Building Regulations Approved Document K for safety glass.
- c) Annealed float glass used as safety glass shall be in accordance with BS 6262 and BS 6206 or BS EN 12600 including any labelling requirements.
- d) Safety glass shall be tested to achieve the requirements of BS 6206 or BS EN 12600.
- e) Where it is necessary to achieve the requirements of BS 6262, the Building Regulations and any other health and safety requirements, manifestation shall be provided. The type of manifestation shall be agreed with the Employer and samples submitted for acceptance.
- f) Manifestation:
 - i) Location: As required by Approved Document K.
 - ii) Application:
 - Factory applied: Ceramic fritting, screen printed.
 - Factory or site applied: Acid etched/ vinyl adhesive backed film/ sand blasting.
 - iii) Colour: As defined in the requirements.
 - iv) Setting out: Set out to scan across panels to give a consistent rhythm and spacing across the length of the façade.

Z25.1103

Annealed Glass

- a) Unless otherwise specified and accepted in advance by the Employer, sheet glass shall be manufactured by the float process. Other sheet glass shall not be acceptable without the prior written agreement of the Employer.
- b) Untinted glass sheets shall provide a clear, undistorted vision and reflection.
- c) The tolerances on thickness shall be as reproduced in BS 952: Part 1.
- d) The tolerances on cut sizes for different thicknesses of material shall be as BS EN 572: Part 8.

Z25.1104

Laminated Glass

- a) Utilise expertise and experience for the selection of glass to comply with the performance requirements of the Architectural Specification.
- b) Laminated glass shall be in accordance with BS 952, BS EN 572 and BS EN ISO 12543: Parts 1-6.
- c) Laminated glass shall consist of a number of sheets of flat glass with polyvinylbutyral (PVB) of not less than 0.375mm thick, or methyl metacrylate resin interleaving between each layer. The layers can be clear, translucent or coloured depending on the design intentions of the glazing. The glass may be annealed, heat strengthened or heat soak toughened, as required to achieve the performance requirements of the Architectural Specification.
 - i) Polymer interlayers shall be in accordance with BS EN 16613.
- d) Where the laminated glass includes sheets of glass that may have distortion due to the manufacturing process, the distortion shall be:
 - i) Within parameters, as specified for the particular type of glass.
 - ii) Orientated in the same direction and aligned.

- e) The Design Drawings shall indicate the visual requirements of the Employer. Final selection of glass type and thickness of each layer, together with type, opacity, density and location of interlayer and coatings shall be to the acceptance of the Employer prior to ordering materials.
- f) Glass shall achieve the colour and quality standards set by the Control Samples.
- g) Laminated glass edges shall be sealed with materials compatible with the interlayer.
- h) Delamination shall not exceed 5mm at practical completion or 10mm at the end of the warranty period when measured in the externally or internally visible area of glazing.
- i) The bottom supported edges of laminated glass panes shall be cut flush over the width of the pane to provide even distribution of vertical load to the setting blocks.

Z25.1105

Toughened Glass

- a) Justify the use of toughened glass by submitting risk assessments and include calculations, to the acceptance of the Employer. The general aim is for minimising its use.
- b) Toughened glass shall be heat soak tested in accordance with BS EN 14179: Part 1 paying particular attention to temperature and duration of treatment.
- c) The glass shall be in accordance with BS EN 12150 and the following requirements in the horizontal toughening process:
 - i) Maximum overall bow: 0.002mm per millimetre measured along the glass edge.
 - ii) Maximum local bow: The maximum deviation for flatness from peak to trough shall not exceed 0.3mm per 300mm or 0.15mm at the edge.
 - iii) Rollerwave:
 - Glass shall be sized to provide for the consistent and horizontally aligned orientation of ripples throughout the Works.
 - The maximum deviation for flatness from peak to trough shall not exceed the following tolerances for thickness relative to a length of 300mm: 0.08mm for glass greater than 8mm thickness; 0.12mm for glass greater than 6mm but less than 8mm thick; and 0.15mm for glass less than 6mm thick.
 - In any event, state in the tender submission proposals to control the extent of rollerwave, if any.
 - Provide full size samples of specified heat treated glass to signify the range of rollerwave throughout the Works, prior to commencing production of the glass.
 - iv) Edge dip: 0.25mm maximum.
- d) Exposed edge working shall be flat ground with small ground arris and have a frosted appearance. Small shells and/ or chips, exceeding a maximum diameter of 2mm, shall be ground out prior to toughening.
- e) The surface compressive stress shall be demonstrated by non-destructive testing, to be controlled at the glass processing works at greater than 69N/ mm² and suitable for the service conditions.
- f) Glass shall be cut to accurate sizes and delivered to the Site in the required sizes. No on-Site cutting or nipping shall be allowed. The glass shall be clearly marked to show its final position and orientation.
- g) Glass heat treatment requirements shall be satisfactory to achieve wind, impact, thermal or other loads determined for the Works. The manufacturer of the toughened glass shall be made aware of its intended use in the construction. Any drilling and notching shall be carried out with the agreement of the manufacturer of the toughened glass and prior to the toughening being carried out. Toughened glass shall be tempered on a roller hearth furnace and shall be in accordance with BS 6206 or BS EN 12600 Class A/ Class 1C1.

- h) The toughening process shall not produce iridescence, distortion, roll marks or ripples in the glass that are unacceptable to the Employer. Such anticipated imperfections shall be demonstrated by the provision of full size samples prior to commencement of glass production. The Employer will examine the samples provided and reasonably advise what is acceptable and what is unacceptable. Glass produced for the Works shall comply with the acceptable samples as a minimum standard.
- i) Prior to commencement of manufacture, advise the Employer of the glass manufacturer and the premises where fabrication and processing shall be carried out.
- j) Prior to installation of the toughened glass, documentary evidence shall be in place which demonstrates that the glass has been heat soaked for the prescribed periods. Such evidence shall also include, as a minimum, the following:
 - i) Source of supply and evidence of batching.
 - ii) Dates and records of toughening/ heat soaking of glass.
 - iii) Keep records of heat soaking for each batch for quality management inspection purposes before dispatch to site.
 - iv) Temperature diagrams for each processed batch.
 - v) Production line information for each heat soaked batch shall be retained by the Contractor for a minimum period of seven years.
 - vi) Certification that the glass shall achieve the performance requirements of the Architectural Specification.
 - vii) Records to include details of units that failed during the heat soak test.
- k) The Employer shall be given the opportunity of visiting the glass manufacturer's premises during fabrication and/ or processing.
- l) The toughening process shall not create any stresses in the glass that are visible within the limits specified.
- m) The toughening process shall not affect the appearance of the coating.
- n) No cooling jet marks shall be visible on the finished surface of the toughened glass.
- o) Any discolouration or distortion caused by the toughening process shall be unacceptable outside of rollerwave distortion and glass bow specified.
- p) Take reasonable measures to control the toughening process so as to control the occurrence of anisotropy at the time of manufacture. Glass shall be rejected if it does not fall within the range of accepted samples.

Z25.1106

Heat Strengthened Glass

- a) Unless otherwise specified, heat strengthened glass shall be in accordance with the requirements of BS EN 1863, and the following requirements in the horizontal heat strengthening process:
 - i) Maximum overall bow: 0.002mm per millimetre measured along the glass edge.
 - ii) Maximum local bow: The maximum deviation for flatness from peak to trough shall not exceed 0.3mm per 300mm or 0.15mm at the edge.
 - iii) Rollerwave:
 - Glass shall be sized to provide for the consistent and horizontally aligned orientation of ripples throughout the Works.
 - The maximum deviation for flatness from peak to trough shall not exceed 0.08mm relative to a length of 300mm.
 - In any event, state in the tender submission proposals to control the extent of rollerwave, if any.

- Provide full size samples of specified heat treated glass to signify the range of rollerwave throughout the Works, prior to commencing production of the glass.

iv) Edge dip: 0.25mm maximum.

- b) When subject to a fracture test in accordance with BS 6206 or BS EN 12600, the fracture characteristics shall be similar to annealed glass and therefore, heat strengthened glass shall not be considered as a 'safety' glass. If heat strengthened glass is proposed for use in a situation that requires a safety glazing material, it shall be laminated.
- c) Take reasonable measures to control the heat strengthening process so as to control the occurrence of anisotropy at the time of manufacture. Glass shall be rejected if it does not fall within the range of accepted samples.

Z25.1107

Wired Glass

- a) Wired glass shall comprise 'polished wired glass' as defined in BS 952: Part 1 and BS EN 572: Part 1.
- b) Glass shall be annealed.
- c) Glass shall be of the thickness specified and, unless otherwise specified, with 1.3mm 'Georgian' wire embedded within the glass thickness.
- d) Tolerances on wired glass thickness shall be to the minimum specified in BS 952: Part 1 and the length, breadth and squareness as specified in BS EN 572: Part 3 for polished glass and BS EN 572: Part 6 for patterned glass.

Z25.1108

Fire Resistant Glass

- a) Fire resisting glass shall provide the fire resistance specified, tested in accordance with BS 476: Parts 20 and 22.
- b) Fire resisting glazing shall also be classified as safety glass in accordance with BS 6206 or BS EN 12600, minimum category Class B/ Class 2B2.
- c) Fire resisting glazing shall incorporate fire resistance beading and fixing methods to match the fire resistance specified. It shall also be tested or certified or assessed as being equal to the relevant parts of BS 476.
- d) Unless otherwise specified, wired glass shall not be used. Glass shall be clear, with fire resisting properties as specified above.
- e) Submit technical/ product information on all fire resisting glass proposed for review by the Employer. It is recognised that the glass will not necessarily achieve the visual quality requirements set out in the Architectural Specification. Submit details of the visual quality and dimensional limits of any proposed fire resistant glass for review by the Employer.
- f) Where insulation is specified in addition to stability/ integrity this shall be in accordance with Approved Document B of the Building Regulations tested in accordance with the relevant parts of BS 476.

Z25.1109

Curved Glass (Tolerances)

- a) The maximum variation in curved form shall be $\pm 4\text{mm}$ from the theoretical form.
- b) The maximum variation in adjacent glass edges when installed shall be 1mm per 1000mm.
- c) The maximum difference between curved adjacent glass edges when installed shall be 3mm.
- d) Curved glass panels shall be continuously curved from edge to edge for the full radius with no straight returns.
- e) The maximum allowed deviation of the length and width of sheets shall be $\pm 4\text{mm}$ for dimensions up to and including 2000mm and $\pm 4.5\text{mm}$ for dimensions over 2000mm.
- f) The maximum allowed deviation of the diagonal dimension of any sheet shall be $\pm 7\text{mm}$ for dimensions over 2000mm.

- g) The maximum allowed deviation of the top and bottom edges (i.e. the curved edges) measured on the face of the glass and perpendicularly to the curvature shall be $\pm 3\text{mm}$.

Z25.1200

COATINGS AND TINTING

Z25.1201

Glass Coatings Generally

- a) Submit to the Employer detailed proposals in respect of coatings.
- b) Surface coatings: A highly uniform, low reflection and durable quality is required of any surface modified glass. Such coatings shall be consistent in colour, durable and sufficiently hard on exposed surfaces to avoid damage.
- c) Ceramic frit coatings:
- i) Individual applications of ceramic coating forming the required pattern shall be distinct without blurring, smearing or phasing.
 - ii) Tolerances for positioning and sizes of prints shall comply with optical quality determined viewing from a distance of 3000mm using daylight without direct sunlight or direct spotlight, perpendicularly to the glass, for no more than 20 seconds.
 - iii) Apply smoothly and consistently over the whole, or part, of each glazed area as indicated on the Design Drawings. Use a screen printing application method unless otherwise agreed.
 - iv) Fuse into the surface of the glass, thus providing a permanent layer, which shall maintain the required appearance for the duration of the service life.
 - v) The coatings shall have similar sheen, chromaticity and luminosity, to give non-discernible colour difference when viewed by eye and illuminated by a standard light source, and shall colour match. Ceramic fritting shall be opaque and to a colour to be agreed with the Employer.
 - vi) Extent: Unless noted otherwise, the frit pattern shall extend to the glass edges. There shall be no clear border.
- d) Requirements for coatings/ surface modified glass:
- i) A highly uniform, low reflection and durable quality is required of any surface modified glass. Such coatings shall be neutral in colour, durable and sufficiently hard on exposed surfaces to avoid damage. For the purposes of the Architectural Specification, neutral shall be defined as a colour having no unacceptable hue quantified by range of samples and being capable of refracting light without chromatic aberration when viewed from any direction.
 - ii) High performance and low emissivity (low E) glass shall be produced from a single source on a single process.
 - iii) Glass coatings shall be provided from a single manufacturer unless agreed otherwise by the Employer.
- e) Prior to commencement of the glass coating, submit the name of the manufacturer and applicator to the Employer and the location of the premises where the application will take place.

Z25.1202

High Performance Glass Coatings

- a) Coated glass shall be in accordance with BS EN 1096 as relevant.
- b) Where soft coatings are applied to glass panes they shall be suitably protected up until time of installation.

Z25.1203

Glass Body Tints

- a) Submit evidence from the glass manufacturer that the correct body tinting has been incorporated at the appropriate stage into the materials used by the glass manufacturer when this has been specified on the Design Drawings.

- b) Submit evidence that the correct surface modified tinting has been applied by the glass manufacturer, where this has been specified on the Design Drawings.

Z25.1300

INSULATING GLASS UNITS

Z25.1301

Insulating Glass Units Generally

- a) Unless otherwise specified, insulating glass units shall be hermetically sealed units in accordance with BS EN 1279.
- b) Take precautions to minimise pillowing distortion, such as by making outer panes thicker or stronger than inner panes.
- c) Where the insulating glass units include multiple layers of glass that may have distortion due to the manufacturing process, the distortion shall be:
- i) Within parameters, as specified for the particular type of glass.
 - ii) Orientated in the same direction and aligned within the same insulating glass unit and with adjacent insulating glass units.
- d) Optical interference and associated spectral colours due to superposition of two or more light waves at a single point shall be kept to an absolute minimum. Glass shall be rejected if it does not fall within the range of accepted samples.
- e) Spacers shall be of adequate rigidity for their purpose, be continuous, with bent corners and shall have welded joints sealed for the integrity of the seal and to provide a consistent moisture seal around the entire perimeter of the unit. They shall accommodate the seal and contain desiccant, allowing both to operate at maximum efficiency.
- f) Spacers shall separate glass panes and the units shall have a mechanically applied primary seal between glass and spacer. This shall provide a continuous vapour-proof barrier to a minimum width of 2mm and a secondary seal to the perimeter of the units.
- g) Materials used in primary and secondary seals shall be mutually compatible. This shall be demonstrated by the manufacturer by accelerated testing, or by the submission of acceptable previous test results.
- h) Spacers shall be black.
- i) Drainage of water along edge seals shall not be permitted.
- j) Insulating glass units shall be assembled in controlled temperature and humidity conditions. Breather tubes shall be used, if necessary, during manufacture and transportation. These shall be thereafter removed and the units sealed prior to installation.
- k) With regard to mechanically restrained glazing systems, the manufacturer shall confirm the maximum compression allowable on the edge of the units.
- l) State the maximum concavity and convexity that will occur under the ambient climatic conditions and barometer pressure differentials anticipated by the requirements of the Architectural Specification. The insulating glass units shall be flat (with a maximum deviation of 1/ 1000 at the centre of the glass pane when measured diagonally) when finally installed.
- m) The bottom supported edges of laminated glass panes within vertical insulating glass units shall be ground flush over the width of the pane to provide even distribution of load to the setting blocks.
- n) Load transfer/ spacer blocks/ setting blocks shall not be visible in the finished work.
- o) Load transfer/ spacers blocks under insulating glass units shall be positioned to fully support both internal and external panes so that neither pane is cantilevered on an edge seal.
- p) Insulating glass units shall carry a test certificate/ report carried out by an independent authority, showing compliance with BS EN 1279: Part 2.
- q) Soft coatings at unit perimeter:
- i) No discolouration to the coating shall occur due to the primary seal.

- ii) Coloured lines shall not be acceptable to the Employer.

Z25.1400 STRUCTURAL SILICONE GLAZING

Z25.1401 General

- a) Be responsible for the structural silicone glazing based upon the Design Drawings and the requirements of the Architectural Specification.
- b) Be responsible for the final selection of materials, testing, fabrication, transportation and installation of the structural silicone glazing, in accordance with BS EN 13022 and/or other standards specified and detailed in the Architectural Specification and submit samples for review by the Employer prior to manufacture.
- c) Structural silicone glazing application shall only be carried out in an appropriate working environment. The environment shall be controlled in accordance with the manufacturer's recommendations to maintain temperature, humidity, dust and dirt free conditions in the working environment.

Z25.1402 Materials

- a) Provide structural silicone adhesive, which shall be obtained from a single source manufacturer and applied in accordance with the manufacturer's written recommendations.
- b) For marine, or similar environments, the structural silicone shall be resistant to damage from algae or attack by birds.

Z25.1403 Installation/ Fabrication

- a) Structural silicone glazing application shall not be carried out on Site unless agreed otherwise with the Employer.
- b) Submit documentation of the sealant manufacturer's requirements for the particular substrate of the construction including joint sizes, limitations and requirements for mixing, cleaning, surface preparation, priming and application.
- c) Joint design shall be in accordance with the sealant manufacturer's written recommendations for glue-line and bite to glue-line ratio, taking into consideration the design wind pressures and panel sizes.
- d) Glazing procedures shall include frame assembly, cleaning, priming (if necessary), gunning, tooling and frame handling after glazing and curing. Sealants shall not be applied when the temperature is below 4°C and units shall not be moved until the silicone has achieved a level of cure recommended by the silicone manufacturer.

Z25.1404 Quality Management

- a) Prior to installation of the structural silicone glazed assemblies, documentary evidence shall be submitted. Such evidence shall include, as a minimum, the following:
 - i) Scheme identification number and panel fabrication code.
 - ii) The structural silicone manufacturer, type, batch number and date of manufacture, and arrival date of each batch of structural silicone at the fabrication work.
 - iii) Confirmation that the sealant has been selected taking into account the sealant manufacturer's recommendations as to use and compatibility with the contact surfaces.
 - iv) Glazier's name and address.
 - v) Date of assembly/ fabrication of the structural silicone glazed unit.
 - vi) Temperature and humidity measured inside the factory at the time of assembly.
 - vii) Details of tests carried out and associated results.
 - viii) Submit details of tensometer and any other testing equipment as required.

- b) Every structural silicone glazed panel shall have an identification mark with a unique number, or other method acceptable to the Employer, this shall be consistent across the Works and inconspicuously located but readable from the inside of the building for the life of the building. The method of marking shall enable the documentary evidence to be traced against individual structural silicone glazed panels.
- c) Using the identification marking methodology, identify the location of each structural silicone glazed panel in the As-built information and cross reference with the Operation and Maintenance Manuals.

Z25.1405

Maintenance

Recommend a periodic maintenance regime for agreement with the Employer. This shall be incorporated in the O & M manuals. Acceptance criteria shall be consistent with the requirements of the testing criteria, which as a minimum shall be:

- a) A standard 'peel test' on any broken panels that require replacement.
- b) A close visual inspection, to be carried out externally from the cleaning apparatus, including application of hand pressure to verify continued adhesion. This exercise shall be carried out for 1% of the cladding, at a yearly frequency for the first three years, then at a frequency of five years following. The panels shall be randomly selected around the elevations at varying heights.
- c) The tests shall be carried out by the sealant manufacturer, or other qualified body.

END OF SECTION

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Z30 METALWORK FINISHES

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z30.1000 MATERIALS/ PRODUCTS AND APPLICATION

Z30.1100 MATERIALS

Z30.1101

Appearance

- a) Finishes shall be stable, fade resistant and not affected by ultraviolet light. Submit data and samples for review by the Employer.
- b) Finishes shall be durable, of uniform texture and colour and be resilient to known and/or specified environmental and pollution effects. This shall include scratching and cigarette smoke and burns. Submit data and samples for review by the Employer.
- c) Minor scratches and blemishes shall be repaired using the coating manufacturer's recommended products and system, matching original finish for colour, texture and gloss. Repair coatings shall be visually acceptable to the Employer.
- d) Confirmation shall be provided that the repair to the damaged finish complies with the requirements of the Architectural Specification. Guarantee in writing that the damaged or defective coating is satisfactory for the proposed remedial paint system.
- e) Employ an independent finishing consultant to carry out an inspection and any necessary tests and supply a full report to the Employer.
- f) Finishes shall be within the limits of the agreed samples and without irregularities or distortions. Fixings, stiffeners, etc. which are not intended to be visible shall be treated so that there is no discontinuity in the finished surface appearance.

Z30.1102

Surface Preparation of Steelwork

- a) Rust, scale and surface contamination shall be removed to leave a surface equivalent in cleanliness to Sa 2.5 quality of Swedish standard SIS 05-59-00 (BS EN ISO 8501: Part 1).
- b) Preparatory methods shall not be evident in the final surface finish applied to the steelwork.

Z30.1200 FINISHES

Z30.1201

Liquid Organic Coating

For aluminium alloy components in accordance with BS 4842.

Z30.1202

Plating of Surfaces

- a) Cadmium/ zinc plating of iron and steel surfaces shall be in accordance with BS EN ISO 2081 and BS EN ISO 2082.
- b) Chromium plating shall be in accordance with BS EN ISO 1456.
- c) Do not use chromium VI for chromium plating. Submit a statement to the Employer confirming that any chromium plating carried out on the project is free from chromium VI.

Z30.1203

Galvanising Generally

- a) In accordance with BS EN ISO 1461.
- b) Coating thicknesses shall be in accordance with BS EN ISO 1461 and BS EN ISO 14713 to achieve the requirements of the Architectural Specification.

Z30.1204

Galvanised Self Finish Surfaces

- a) Blast clean in accordance with BS EN ISO 8504: Parts 1 and 2 and BS EN ISO 8503, Sa 2.5 where applied thickness of coating is greater than 86 microns.

- b) Preparation: Edge grind, remove grease, oil and varnish and any other surface contaminants so that any oil or silicone based anti-weld spatter is removed. Remove weld spatter, grind welds as required and fill pits and other surface imperfections that may cause the premature failure of the coating system.
- c) Where galvanising is visible, the final finish shall be smooth, continuous, consistent and free from flux staining and other forms of staining. Coating weight shall be as consistent maintaining a uniform appearance throughout the service life of the Works.
- d) Uniformity: The galvanising shall be carried out in such a way as to maximise the smoothness and uniformity of the deposited coating. Only use double dipping where no alternative exists.
- e) Touching-up is not allowed unless agreement is given by the Employer. In which case it shall be in accordance with Annex C of BS EN ISO 1461.
 - i) Where acceptance is given, use the Zilt-Stick system in accordance with the manufacturer's current recommendations. Zilt-Stick is a self-fluxing and galvanising system, which is applied by hand. The stick is made up of a galvanising compound, which has a 'foil' wrapping, and is rubbed over the affected area until completely covered. The black flux residue can be removed using a damp cloth.
 - ii) The maximum size of an area of touch-up shall be determined by locating the point on the damaged surface that is furthest from an intact galvanised coating. If the distance from this point to the galvanising is in excess of 10mm, then the member shall be re-galvanised or rejected.
 - iii) Galvafrond or paint applied finishes are not permitted under any circumstances.
- f) Comply with the recommendations of the Zinc Information Centre for galvanising and zinc metal-spraying.
- g) Immersion process: This shall be discussed and agreed with the Employer and submitted for formal comment. During the galvanising process drips are not allowed to run off fair-faced surfaces and thus disfigure them. Fair-faced surfaces are those surfaces that will be visible in the completed work. Agree location of fair-faced surfaces with the Employer before application.
- h) Breathing holes: Locate in unobtrusive places. Agree the location of these holes with the Employer and mark clearly on the Working Drawings.
- i) Distortion: No distortion of fabricated elements shall occur during galvanising. Advise the Employer on the possibility for distortion of the steelwork elements during the galvanising process to enable design modifications of components to be made before fabrication of these components.

Z30.1205 Galvanised Surfaces to be Over Painted

Galvanised steelwork to be painted.

- a) Preparation: As recommended by the manufacturer of the applied coating system.
- b) In accordance with BS EN ISO 1461 and BS EN ISO 12944: Parts 1 to 8.

Z30.1206 Sprayed Metal Coatings

- a) Sprayed metal coatings shall be in accordance with BS EN ISO 2063: Part 1 and BS EN ISO 2063: Part 2.
- b) Minimum coating thickness shall be in accordance with Table 1 of BS EN ISO 17834.

END OF SECTION

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Z31 POWDER COATINGS

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z31.1000 MATERIALS/ PRODUCTS AND APPLICATION

Z31.1100 BRITISH STANDARD COMPLIANT TYPE POWDER COATINGS

Z31.1101 General

- a) Powder coating shall be applied using only materials suitable for purpose. Aluminium alloys shall be selected so that the finished visual appearance of components is consistent and identical.
- b) The alloy for extrusions shall be grade 6063 or 6060 or acceptable equivalent, complying with BS EN 754: Parts 3-5 and BS EN 755: Parts 1-9, and for sheet material grade 1200/ 3103 complying with BS EN 485: Parts 1-4, BS EN 515 and BS EN 573: Parts 1-3.
- c) Aluminium shall be in a condition suitable for the application of the coating process. The sheet shall be of a suitable and agreed thickness and of suitable temper to withstand the stoving process.

Z31.1102 Materials

- a) Colour consistency: Colour consistency shall be assured from batch to batch for the Works, in accordance with the conditions described in BS 950: Part 1.
- b) Colour uniformity: Limits for acceptable colour variations in production shall be established and accepted by the Employer from samples submitted by the Contractor prior to production. When metallic colours are used, top and bottom limits of colour variation and appearance shall be established and agreed prior to coating commencement. Colour samples shall be submitted and accepted by the Employer before coating commences.
- c) For multi-component metallic finishes, a single batch of powder shall be used for the project and all components shall be coated using automatic application. Components shall be coated in as few batch runs as possible and installed on Site in order of application.
- d) The minimum and maximum local dry film thickness on adjacent panels shall not vary by more than 20%. If this is not achievable, submit samples to the Employer for review showing the maximum variation in coating thickness.
- e) The powder coating shall be consistent throughout in all respects within the upper and lower levels agreed which shall be based on samples submitted and agreed with the Employer.
- f) Protective tapes/ films: Adhesive/ protective tapes/ films shall be low tack type applied at room temperature, remaining in contact with the surface for a maximum period of six months. Should longer periods be required, then the tape/ film shall be removed and replaced. Where adhesive/ protective tapes/ films are used, then the colour shall be white or lighter in tone than the powder coating.
- g) Hexavalent chromium VI shall not be used for any powder coating on the project. The Contractor shall confirm to the Employer that all powder coating on the project is free from chromium VI.

Z31.1103 Workmanship

- a) The selected coating shall carry a current British Board of Agrément Approval Certificate or acceptable equivalent. A copy, signed by the Managing Director of the coating applicator company, shall be made available to the Employer, prior to commencement of coating.
- b) Applicator requirements: The powder coating application and stoving shall be carried out in accordance with BS EN 12206: Part 1 and/ or BS EN 13438. Only one coating plant shall be used for the Works along with one batch of powder, unless otherwise accepted by the Employer.

- c) Guarantees: Make available to the Employer, fully documented and signed copies of the coating guarantees. The duration of the guarantees shall be 25 years or as otherwise agreed with the Employer.
- d) Cleaning frequency: The normal cleaning frequency associated with the guarantees detailed above shall be 12 months unless agreed otherwise by the Employer.
- e) Repair of damage: Damage shall be repaired immediately. Site rectification of damage shall generally not be acceptable and only be carried out with the Employer's agreement carrying a guarantee for colour retention, gloss retention and adhesion for the remaining period of the guarantee.
- f) In addition to the requirements of BS EN 12206: Part 1 the pretreatment shall use a chromate process.

Z31.1104

Testing

Demonstrate compliance with the following test requirements:

- a) Artificial weathering: There shall be no chalking in excess of the minimum illustrated in the photographic reference standards of ASTM D 4214 when tested in accordance with BS EN 12206: Part 1 or BS EN 13438. In addition, the coating shall show no cracking, checking or flaking and any change in colour shall not exceed one step in hue, value or chroma in the Munsell atlas from the original colour.
- b) Natural weathering: There shall be no chalking in excess of the minimum illustrated in the photographic reference standards of ASTM D 4214 when tested for three years in accordance with BS EN 12206: Part 1 or BS EN 13438. In addition, the coating shall show no checking, cracking or flaking and any change in colour shall not exceed one step in hue, value or chroma in the Munsell atlas from the original colour.
- c) Exterior exposure: When viewed from a distance of 1m, there shall be no blisters, dirt, entrapped particles, craters, pinholes, porosity, scratches or other visual defects on significant surfaces when measured in accordance with BS EN 12206: Part 1.
- d) Impact resistance: There shall be no sign of cracking or detachment of film, when measured in accordance with BS EN 12206: Part 1.
- e) Cupping test: There shall be no sign of detachment when measured in accordance with BS EN 12206: Part 1.
- f) Scratch test: There shall be no penetration to the substrate when tested in accordance with BS EN 12206: Part 1.
- g) Adhesion: The coating shall have a classification of Class 0 and there shall be no removal of the coating when tested in accordance with BS EN 12206: Part 1.
- h) Flexibility: There shall be no cracking, flaking or film deformation above 6mm when tested in accordance with BS EN ISO 6860.
- i) Salt spray resistance: No blistering, softening or detachment of the coating shall occur when tested for 1000 hours on aluminium in accordance with BS EN 12206: Part 1 or for 500 hours on galvanised steel in accordance with BS EN 13438.
- j) Humidity resistance: No blistering, softening or detachment of the film shall occur when tested in accordance with BS EN 12206: Part 1.
- k) Permeability: The coating, when tested in accordance with BS EN 12206: Part 1, shall show no blistering of the coating, except within 3mm of any edge.
- l) Mortar resistance: There shall be no blistering, softening or detachment of the coating, etc. when tested in accordance with BS EN 12206: Part 1.
- m) Film thickness: The minimum film thickness at any point shall be 60 microns.
 - i) Where hazardous environments are involved, the minimum shall be increased to 80 microns.
 - ii) No seeding or double coating of work shall be accepted.
- n) Gloss levels: The gloss level, when measured using a 60° gloss meter, shall read 25% ±5% for matts, 70% ±5% for satins and 85% ±5% for gloss.

- o) Spread of flame: The powder coating, when tested in accordance with BS 476: Part 7, shall have a Class 1 rating.
- p) Building Regulations: The powder coating shall have a Class 0 rating in accordance with the Building Regulations.
- q) Product tests shall achieve the requirements of the Architectural Specification.
- r) Test pieces shall consist of finished panels or extrusions representative of product-coated aluminium. Test pieces shall be at least 150mm long and 75mm wide with a flat coated/ significant surface, as defined in BS EN ISO 2064, on which to conduct instrumental measurements. The Working Drawings shall indicate exposed/ significant surfaces.
- s) Tests shall be performed on exposed/ significant surfaces as defined in BS EN ISO 2064 as indicated, and shall achieve the requirements of BS EN 12206: Part 1 or BS EN 13438.
- t) Test reports shall be produced at the time of coating and made available to the Employer. These reports shall include:
 - i) Date when tests were performed and date of issue of report.
 - ii) Identification of the coating system tested, including product manufacturer, colour reference, product code and batch reference.
 - iii) Statement indicating that the coating system tested passed all tests, or failed one or more.
 - iv) In the case of failure, which test(s) and description of failure(s).
 - v) Statement that tests were conducted in accordance with the Architectural Specification.
 - vi) Name and address of the laboratory which conducted the tests and issued the reports.
 - vii) The Contractor shall commission an independent testing authority, acceptable to the Employer, to carry out the tests.
- u) To gain acceptance of the finished products for use, carry out a minimum of three independent acceptance inspections, sampling procedures and plans as set out in BS 6001: Part 1/ ISO 2859: Part 1 for general inspection level 2. AQL (Acceptable Quality Level) = 1% on each colour and finish used in the Works.
 - i) These inspections shall be carried out at the finishing plant prior to fabrication by an independent, consultant or acceptance laboratory.
 - ii) In addition, the Contractor shall make allowance for Site inspections where, due to damage or non-supply of the production test reports, the Employer may require independent investigation of finishes on Site-fixed units. This investigation shall be carried out within the guidelines of BS ISO 2859: Part 2, LQ (Limited Quality) (Pa = 10%) + 5%.
 - iii) For the purpose of this inspection, each section in the window curtain wall or other fabrication shall be taken as an individual component in assessing the overall batch number to allow the acceptance inspection laboratory to certify that the Works comply with the Architectural Specification.
 - iv) For units that are finished in fewer than three production runs, acceptance inspections shall also be made using BS ISO 2859: Part 2 to the same LQ.
 - v) Certificates of Practical Completion or any other document of authority accepting responsibility may not be signed by the Employer until they have received these reports.

END OF SECTION

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Z33

ANODISING

To be read in conjunction with Section A and other related Sections of the Architectural Specification.

Z33.1000

PRODUCTS AND APPLICATION

Z33.1100

ALUMINIUM ANODISING

Z33.1101

Materials

- a) Aluminium anodising shall be in accordance with BS 3987, unless specified otherwise. Provide a certificate of assurance that each batch of anodising has been carried out.
- b) The colour anodising process shall be agreed with the Employer. Colouring of the anodic film shall be achieved by use of a two-stage electrolytic process utilising cobalt or nickel as the colouring metal or by use of a single stage integral process.
- c) On no account shall anodic films coloured by the use of tin electrolytes be used. Any proposal by the Contractor for the use of an alternative colouring technique can only be considered if the anodiser confirms in writing that the alternative process will achieve the visual, physical and documentary requirements detailed within the Architectural Specification.
- d) Provide satisfactory independent evidence and samples to prove that an alternative colouring process will provide an equal or superior standard of performance and time to first maintenance period.
- e) Colour control limits shall be submitted as samples with the tender for review and comment by the Employer. The anodic finish shall be within these limits agreed and held by the Employer.
- f) Aluminium alloys shall be selected so that the finished visual appearance of components is identical. The alloy for extrusions shall be grade 6063, or acceptable equivalent, and for sheet material grade J57S, or acceptable equivalent, and a certificate shall be obtained from the material manufacturer stating the grade of material.
- g) Base metal batching shall be controlled in order that areas match. Critical visible areas shall be from a single batch. Agree base metal batching with the Employer in advance of production.

Z33.1102

Workmanship

- a) Anodic oxidation coating shall be carried out at a single place of manufacture. Critical visible areas shall be anodised in a single batch.
- b) Anodising shall commence after fabrication/ machining is complete wherever possible.
- c) Any fabrication of prefinished lengths shall be previously agreed with the Employer. Uncoated edges shall not be visible in assemblies or exposed to the atmosphere. Fabricated pieces shall achieve the thickness requirements of BS 3987.
- d) The processes adopted shall be compatible, offering weather resistance, abrasion resistance, impact resistance and protection against chemical attacks as follows:
 - i) Corrosion resistance shall be equal to or greater than that of an anodised aluminium finish thickness of minimum average 30 microns and sealing in accordance with BS 3987 and the Architectural Specification.
 - ii) For production control the abrasion resistance of the anodising shall be determined in accordance with BS EN ISO 18771. Films, which when tested by this method continue to be scratched by glass coated abrasive paper do not conform to the Architectural Specification. In the event of a dispute, a referee test described in BS EN ISO 8251 shall be carried out on test pieces cut from eight components whose results from the abrasive paper test indicate that they have suspect low abrasion resistance. The wear index obtained from the referee test shall be no greater than 1.4.

- iii) For production control the sealing value of the anodising shall be determined in accordance with BS EN ISO 2931. In the event of a dispute, the referee test described in BS EN ISO 3210 shall be carried out. The maximum weight loss from the referee test shall be no greater than 30mg/ dm². Impregnated cold sealing processes shall not be used.
- iv) For production control the film thickness of the anodising shall be determined in accordance with BS EN ISO 2360. In the event of a dispute the referee test described in BS EN ISO 1463 shall be carried out. The minimum local film thickness shall be 25 microns with a maximum of 35 microns.
- v) Anodic oxidation coating shall be carried out by the sulphuric acid bath process. The temperatures of the anodising bath and chemical content shall be set and maintained to achieve good quality management of the finished product in accordance with BS 3987.
- vi) Notwithstanding BS 3987 visible surfaces shall be free from coating or metallurgical defects when viewed from 1 metre.
- e) A quality management system for cleaning extrusion dies shall be adopted such that no lines appear on the face of the extrusions. As a minimum check every 5th extrusion.
- f) Rejected anodised extrusions shall only be reprocessed once.
- g) Anodised finishes shall be within the control limits (established from range samples) or standards accepted by the Employer.
- h) The finish shall be agreed with the Employer from the range samples submitted.
- i) The finish shall be sealed in accordance with BS 3987.
- j) Finishes shall be tested in accordance with BS EN ISO 6581.
- k) Variation of final surface finish shall be limited to tolerances agreed with the Employer prior to commencement. If such variations do occur then such components that, in the opinion of the Employer, fail to achieve a uniform final surface finish shall be replaced by the Contractor at their own expense.
- l) Lines produced at the location of die connection points shall only occur on non-visible surfaces in the installed work. The contact marks on sections resulting from electrical connection shall not be on visible surfaces of the installed work.
- m) Cleaning frequency: The normal cleaning frequency shall be as required to maintain the finish warranty.
- n) Repair of damage: Surface areas likely to be damaged during handling, fixing or by other building trades shall be fully protected until completion of other work in the area of the installation.
- o) If during fixing or glazing any damage does occur, this shall be rectified immediately and not left until the end of the installation. Site rectification of damage shall only be carried out with the Employer's acceptance and shall carry a 25-year guarantee for colour retention, avoidance of discolouration and corrosion resistance.

Z33.1103

Testing

- a) The Contractor shall commission an independent testing authority, acceptable to the Employer, to carry out the tests.
- b) To gain acceptance of the finished products for use, carry out a minimum of three independent acceptance inspections, sampling procedures and plans as set out in BS 6001: Part 1/ ISO 2859: Part 1 for general inspection level 2. AQL (Acceptable Quality Level) = 1% on each colour and finish used in the Works.
- c) These inspections shall be carried out at the finishing plant prior to fabrication by a competent independent inspector from one of the approved laboratories listed in the Architectural Advisory Service Centre (AASC) Technical Information Sheet No. 8a.
- d) Carry out a Site inspection and independent investigation of finishes on Site-fixed units. This investigation shall be carried out within the guidelines of BS ISO 2859: Part 2, LQ (Limited Quality) (Pa = 10%) = 5%.

- e) For the purpose of this inspection each section in the window curtain wall or other fabrication shall be taken as an individual component in assessing the overall batch number to allow the consultant to certify that the completed Contract complies with the Architectural Specification.
- f) For units that are finished in fewer than three production runs, acceptance inspections shall also be made using BS ISO 2859: Part 2 to the same LQ.
- g) Certificates of Practical Completion or any other document of authority accepting responsibility may not be signed by the Employer until they have received these reports.

END OF SECTION

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