Star Academies

The Olive School, Hackney

Admin House Remodel

Specification
April 2023
BC.STH.2022.00255.001

CONTENTS

APPENDICES

DOCUMENT CONTROL

Revision	Date	Issue / Revision Details	Prepared By	Approved By
1	10/03/22	First issue	IB	RR

Section 1

Preliminaries

A10 PROJECT PARTICULARS

110 THE PROJECT
- Name: The Olive School, Hackney
- Nature: Reception/Office Remodel
- Location: Admin House, 32 St John's Church road, E9 6EJ
- Length of contract: 9 weeks.

120 EMPLOYER (CLIENT)
- Name: Star Academies
- Address: Star Academies, Shadsworth Road, Blackburn, BB1 2HT
- Contact: Charles Greenall
- Telephone: 0330 313 9167
- E-mail: Charles.greenall@staracademies.org

140 ARCHITECT/ CONTRACT ADMINISTRATOR
- Name: AHR Building Consultancy Ltd.
- Address: 31-35 Kirby Street, London, EC1N 8TE.
- Contact: Isaac Berbiers
- Telephone: 07729845996
- E-mail: Isaac.berbiers@ahr.co.uk.

150 PRINCIPAL DESIGNER
- Name: AHR Building Consultancy Ltd.
- Address: 31-35 Kirby Street, London, EC1N 8TE.
- Contact: Alan Blyth
- Telephone: 07973 721832.
- E-mail: alan.blyth@ahr.co.uk.

160 MEP ENGINEER
- Name: CPW
- Address: 5-6 Clipstone Street, Bolsover House, London, W1W 6BB.
- Contact: Kamila Wiatr
- Telephone: 07727 129 626.
- E-mail: Kamila.Wiatr@cpwp.com

A11 TENDER AND CONTRACT DOCUMENTS

110 TENDER DRAWINGS

- The tender drawings are:

- T001 – Existing Floor Plan
- T002 – Strip Out Works
- T003 – Proposed Plan
- T004 – Visitor Reception Desk
- T005 – External Works
- T006 – Signage
- T007 - Signage
- 220466-CPW-XX-00-DR-N-301001 MEP Services Enabling Works Layout
- 220466-CPW-XX-00-DR-E-220001 Proposed Lighting & Fire Alarm Layout
- 220466-CPW-XX-00-DR-E-230001 Proposed Power, Data & Security Layout
- 220466-CPW-XX-00-DR-M-121001 Proposed Mechanical Services Layout

120 CONTRACT DRAWINGS

- The Contract Drawings: The same as the tender drawings.

160 PRECONSTRUCTION INFORMATION

- Format: The Preconstruction information is described in these preliminaries in Section A34. It refers to information given elsewhere in the preliminaries and other tender documents.

A12 THE SITE/ EXISTING BUILDINGS

110 THE SITE
- Description: The office/reception for The Olive School resides in the ground floor of 32 St John's Church Road (Admin House) which is an end of terrace property.

120 EXISTING BUILDINGS ON/ ADJACENT TO THE SITE
- Description: Buildings to the rear of the property are live school buildings. The first and second floor of Admin House will also be live during the works. To the front is a residential street.

180 HEALTH AND SAFETY FILE
- Availability for inspection: The Health and Safety File for the site/ building may be seen by appointment during normal office hours at: The Olive School, Hackney.
- Other documents: N/A.
- Arrangements for inspection: Contact Contract Administrator.

200 ACCESS TO THE SITE
- Description: Access to the site is off St John's Church Road.

210 PARKING
- Restrictions on parking of the Contractor's and employees' vehicles: To be confirmed at the pre-start meeting.

220 USE OF THE SITE
- General: Do not use the site for any purpose other than carrying out the Works.
- Limitations: N/A.

230 SURROUNDING LAND/ BUILDING USES
- General: Adjacent or nearby uses or activities are as follows:
  - Residential.

250 SITE VISIT
- Assessment: Ascertain the nature of the site, access thereto and all local conditions and restrictions likely to affect the execution of the Works.
- Arrangements for visit: Contact Contract Administrator.

A13 DESCRIPTION OF THE WORK

120 THE WORKS

- Description: The works comprise of the internal refurbishment of the ground floor of 32 St John's Church Road (Admin House).The refurbishment works include but are not limited to the remodel of the ground floor office/ reception area. Works will include the strip out of existing partition walls, erection of new walls to create a new layout, new doors installed, and M&E layout adapted to suit. A new bespoke reception hatch will be built with workstation/desks and shelving to be installed.

  Externally, a new main entrance door set will be relocated on the inside face of the wall. A new wider door to match the existing is to be installed. First floor timber sash windows are to be replaced with new like for like windows with double glazed safety glazing. A new pathway is to be installed into the main entrance of Admin House to improve wheelchair access. New signage is to be installed on to the front elevation of both Admin House and 2-4 Clapton Road. Adjustments will also be made to an area of paving outside Admin house.

A20 JCT MINOR WORKS BUILDING CONTRACT WITH CONTRACTOR'S DESIGN (MWD)

JCT MINOR WORKS BUILDING CONTRACT WITH CONTRACTOR'S DESIGN

- The Contract: JCT Minor Works Building Contract with Contractor's Design 2016 Edition.
- Requirement: Allow for the obligations, liabilities and services described.

THE RECITALS

First - THE WORKS

- Comprise: Remodel of the ground floor of Admin House as identified within the tender documents.
- Location: The Olive School, Hackney.

Second - CONTRACTOR'S DESIGNED PORTION

- The Works include the design and construction of:

- The contractor will be responsible for completing the design of the visitor's reception desk/hatch. Employers requirements have been provided in *Drawing T004 – Visitor Reception Hatch* and in Schedule of Work Items 22.00 – 20.09. The contractor is to provide a full design proposal following appointment. Within the require programme at tender stage, he contractor is to allow for to incorporate time periods for providing their design proposal, client sign off of their design and lead in times of materials.
- The contractor will be responsible for completing the design of the 2no office desks. Employers requirements have been provided in *Drawing T003 – Proposed Plan* and in Schedule of Work Items 23.01 – 23.03. The contractor is to provide a full design proposal following appointment. Within the require programme at tender stage, the contractor is to allow for to incorporate time periods for providing their design proposal, client sign off of their design and lead in times of materials.
- The contractor will be responsible for completing the design of the 4no. Floating Shelves. Employers requirements have been provided in *Drawing T003 – Proposed Plan* and in Schedule of Work Items 23.05 – 23.06. The contractor is to provide a full design proposal following appointment. Within the require programme at tender stage, the contractor is to allow for to incorporate time periods for providing their design proposal, client sign off of their design and lead in times of materials.
-The contractor will be responsible for completing the design of the Main Entrance Doorframe in line with *Drawing T003 – Proposed Plan, Drawing T005 – External Works* and in Schedule of Work Items 23.08- 23.09. The contractor is to provide a full design proposal following appointment. Within the require programme at tender stage, the contractor is to allow for to incorporate time periods for providing their design proposal, client sign off of their design and lead in times of materials.
-The contractor will be responsible for completing the design of the First Floor Replacement Windows in line with *Drawing T005 – External Works* and in Schedule of Work Items 31.00 – 31.38. The contractor is to provide a full design proposal following appointment. Within the require programme at tender stage, the contractor is to allow for to incorporate time periods for providing their design proposal, client sign off of their design and lead in times of materials.
-The contractor will be responsible for completing the design of the New Main Entrance Door in line with *Drawing T005 – External Works* and in Schedule of Work Items 32.00 – 34.02. The contractor is to provide a full design proposal following appointment. Within the require programme at tender stage, the contractor is to allow for to incorporate time periods for providing their design proposal, client sign off of their design and lead in times of materials.
- The contractor will ensure all doors are measured and made in line with site requirements.
- The contractor will be responsible for all items raised within Item '1B-10-1 Contractor design portion' (Page 9) and listed under 'Appendix 1 – CDP Responsibility Schedules' (Page 23 – 27) of CPW's MEP Specification.
-The contractor will be responsible for completing the design of the ventilation in line with *Drawing T003 – Proposed Plan* and in Schedule of Work Items 27.47 & 27.48.

Third - CONTRACT DOCUMENTS

- Contract drawings: As listed in clause A11/120.
  Contract documents: The following have been prepared which show and describe the work to be done AHR specification.

Fourth - PRICED DOCUMENTS

- Documents to be priced or provided by the Contractor: Work schedules.
- Comprise: The Specification.
- Named person: The whole of the text referring to a named person as a subcontractor will be deleted.

Fifth A - PRICING BY THE CONTRACTOR

- Option A will apply: Option B will be deleted.
- Priced document: Within Option A the following words will be deleted:
  - Specification.
- Priced Activity Schedule: The words 'and has provided the Employer with a priced schedule of activities annexed to this Contract (the Activity Schedule)' will be deleted.

Ninth - INFORMATION RELEASE SCHEDULE

- The Ninth Recital will be deleted.

Eleventh - DIVISION OF THE WORKS INTO SECTIONS

- The Eleventh Recital will be deleted.

THE ARTICLES

3 - ARCHITECT/ CONTRACT ADMINISTRATOR

- Architect/ Contract Administrator: See clause A10/140.

5 - PRINCIPAL DESIGNER

- Principal Designer: See clause A10/150.

CONTRACT PARTICULARS

Fourth Recital and Schedule 2 - BASE DATE

- Base date: 01 April 2023.

Fourth Recital and clause 4.2 - CONSTRUCTION INDUSTRY SCHEME (CIS)

- Employer at the Base Date is not a 'contractor' for the purposes of the CIS.

Fifth Recital - CDM REGULATIONS

- The project is not notifiable.

Seventh Recital and Schedule 3 - SUPPLEMENTAL PROVISIONS

- Collaborative working: Supplemental Provision 1 applies.
- Health and safety: Supplemental Provision 2 applies.
- Cost savings and value improvements: Supplemental Provision 3 applies.
- Sustainable development and environmental considerations: Supplemental Provision 4 applies.
- Performance indicators and monitoring: Supplemental Provision 5 does not apply.
- Notification and negotiation of disputes: Supplemental Provision 6 applies. Where Supplemental Provision 6 applies, the respective nominees of the parties are:
  - Employer's nominee: Chairperson of the RICS.
  - Contractor's nominee: _____.

  Or such replacement as each party may notify to the other from time to time.

Article 7 - ARBITRATION

- Article 7 and Schedule 1 apply.

Clause 2.2 - COMMENCEMENT AND COMPLETION

- Works Commencement date: 24th July 2023.

- Date for completion: 1st September 2023

Clause 2.8 - LIQUIDATED DAMAGES
- At the rate of £4,000 per calendar week or pro-rata thereto.

Clause 2.10 - RECTIFICATION PERIOD
- Period: Twelve Months from the date of practical completion.

Clause 4.3 - INTERIM PAYMENTS
- Interim Valuation Dates:
  - The first Interim Valuation Date is: One month following the commencement of works.
  - Thereafter at intervals of: 4 weeks.
- Payments due prior to practical completion:
  - Percentage of total value of the work etc.: 95 per cent.
- Payments becoming due on or after practical completion:
  - Percentage of the total amount to be paid: 97½ per cent.

Clause 4.8.1 - SUPPLY OF DOCUMENTATION FOR COMPUTATION OF AMOUNT TO BE FINALLY CERTIFIED
- Period: Three months from the date of practical completion.

Clause 5.3 - CONTRACTOR'S PUBLIC LIABILITY INSURANCE - INJURY TO PERSONS OR PROPERTY
- The required level of cover for any one occurrence or series of occurrences arising out of one event:
  - Not less than: £5,000,000.

Clauses 5.4A, 5.4B and 5.4C - INSURANCE OF THE WORKS, ETC. - ALTERNATIVE PROVISIONS
- Clause 5.4B applies.
- Where clause 5.4.A or 5.4B applies. percentage to cover professional fees: 15 per cent.
- Where clause 5.4.C applies:
  - insurance arrangements - details of the required policy or policies: N/A.

Clause 7.2 - ADJUDICATION
- The Adjudicator is: Chairperson.
- Nominating body: Royal Institution of Chartered Surveyors.

Schedule 1 paragraph 2.1 - ARBITRATION
- Appointor of Arbitrator (and of any replacement): President or a Vice president of the: The Royal Institution of Chartered Surveyors.

THE CONDITIONS

SECTION 1: DEFINITIONS AND INTERPRETATION

SECTION 2: CARRYING OUT THE WORKS

SECTION 3: CONTROL OF THE WORKS

SECTION 4: PAYMENT

SECTION 5: VARIATIONS

SECTION 6: INJURY, DAMAGE AND INSURANCE

SECTION 7: ASSIGNMENT AND COLLATERAL WARRANTIES

SECTION 8: TERMINATION

SECTION 9: SETTLEMENT OF DISPUTES

EXECUTION

- The Contract: Will be executed as a deed.

A30 TENDERING/ SUBLETTING/ SUPPLY

MAIN CONTRACT TENDERING

110 SCOPE
- General: These conditions are supplementary to those stated in the Invitation to Tender and on the form of tender.

145 TENDERING PROCEDURE
- General: In accordance with NBS Guide to Tendering for Construction Projects.
- Errors: Alternative 2 is to apply.

160 EXCLUSIONS
- Inability to tender: Immediately inform if any parts of the work as defined in the tender documents cannot be tendered.
- Relevant parts of the work: Define those parts, stating reasons for the inability to tender.

170 ACCEPTANCE OF TENDER
- Acceptance: No guarantee is offered that any tender will be recommended for acceptance or be accepted, or that reasons for non acceptance will be given.
- Costs: No liability is accepted for any cost incurred in the preparation of any tender.

190 PERIOD OF VALIDITY
- Period: After submission or lodgement, keep tender open for consideration (unless previously withdrawn) for not less than 90 days.
- Date for possession/ commencement: See section A20.

PRICING/ SUBMISSION OF DOCUMENTS

250 PRICED DOCUMENTS
- Alterations: Do not alter or qualify the priced documents without written consent. Tenders containing unauthorised alterations or qualifications may be rejected.
- Measurements: Where not stated, ascertain from the drawings.
- Deemed included: Costs relating to items, which are not priced, will be deemed to have been included elsewhere in the tender.
- Submit: With tender.

310 TENDER
- General: Tenders must include for all work shown or described in the tender documents as a whole or clearly apparent as being necessary for the complete and proper execution of the Works.

480 PROGRAMME
- Programme of work: Prepare a summary showing the sequence and timing of the principal parts of the Works and periods for planning and design. Itemize any work which is excluded.
- Submit: With tender.

530 SUBSTITUTE PRODUCTS

- Details: If products of different manufacture to those specified are proposed, submit details with the tender giving reasons for each proposed substitution. Substitutions, which have not been notified at tender stage, may not be considered.
- Compliance: Substitutions accepted will be subject to the verification requirements of clause A31/200.

550 HEALTH AND SAFETY INFORMATION

- Content: Describe the organisation and resources to safeguard the health and safety of operatives, including those of subcontractors, and of any person whom the Works may affect.
- Include:
  - A copy of the contractor's health and safety policy document, including risk assessment procedures.
  - Accident and sickness records for the past five years.
  - Records of previous Health and Safety Executive enforcement action.
  - Records of training and training policy.
  - The number and type of staff responsible for health and safety on this project with details of their qualifications and duties.
- Submit: Two weeks prior to commencement on site.

570 OUTLINE CONSTRUCTION PHASE HEALTH AND SAFETY PLAN

- Content: Submit the following information within one week of request:
  - Method statements on how risks from hazards identified in the pre-construction information and other hazards identified by the contractor will be addressed.
  - Details of the management structure and responsibilities.
  - Arrangements for issuing health and safety directions.
  - Procedures for informing other contractors and employees of health and safety hazards.
  - Selection procedures for ensuring competency of other contractors, the self-employed and designers.
  - Procedures for communications between the project team, other contractors and site operatives.
  - Arrangements for cooperation and coordination between contractors.
  - Procedures for carrying out risk assessment and for managing and controlling the risk.
  - Emergency procedures including those for fire prevention and escape.
  - Arrangements for ensuring that all accidents, illness and dangerous occurrences are recorded.
  - Arrangements for welfare facilities.
  - Procedures for ensuring that all persons on site have received relevant health and safety information and training.
  - Arrangements for consulting with and taking the views of people on site.
  - Arrangements for preparing site rules and drawing them to the attention of those affected and ensuring their compliance.
  - Monitoring procedures to ensure compliance with site rules, selection and management procedures, health and safety standards and statutory requirements.
  - Review procedures to obtain feedback.

599 FREEDOM OF INFORMATION

- Records: Retain, make available for inspection and supply on request information reasonably required to allow response to requests made under the provisions of the Freedom of Information Act.
- Determination: Submit requests received. Do not supply information to anyone other than the project participants without express written permission.
- Confidentiality: Maintain at all times.

SUBLETTING/ SUPPLY

630 DOMESTIC SUBCONTRACTS

- General: Comply with the Construction Industry Board 'Code of Practice for the selection of subcontractors'.
- List: Provide details of all subcontractors and the work for which they will be responsible.
- Submit: With tender.

A31 PROVISION, CONTENT AND USE OF DOCUMENTS

DEFINITIONS AND INTERPRETATIONS

110 DEFINITIONS
- Meaning: Terms, derived terms and synonyms used in the preliminaries/ general conditions and specification are as stated therein or in the appropriate British Standard or British Standard glossary.

120 COMMUNICATION
- Definition: Includes advise, inform, submit, give notice, instruct, agree, confirm, seek or obtain information, consent or instructions, or make arrangements.
- Format: In writing to the person named in clause A10/140 unless specified otherwise.
- Response: Do not proceed until response has been received.

130 PRODUCTS
- Definition: Materials, both manufactured and naturally occurring, and goods, including components, equipment and accessories, intended for the permanent incorporation in the Works.
- Includes: Goods, plant, materials, site materials and things for incorporation into the Works.

135 SITE EQUIPMENT
- Definition: All appliances or things of whatsoever nature required in or about the construction for completion of the Works but not materials or other things intended to form or forming part of the Permanent Works.
- Includes: Construction appliances, vehicles, consumables, tools, temporary works, scaffolding, cabins and other site facilities.

140 DRAWINGS
- Definitions: To BSRIA BG 6 A design framework for building services. Design activities and drawing definitions.
- CAD data: In accordance with BS 1192.

145 CONTRACTOR'S CHOICE
- Meaning: Selection delegated to the Contractor, but liability to remain with the specifier.

150 CONTRACTOR'S DESIGN
- Meaning: Design to be carried out or completed by the Contractor and supported by appropriate contractual arrangements, to correspond with specified requirements.

155 SUBMIT PROPOSALS
- Meaning: Submit information in response to specified requirements.

160 TERMS USED IN SPECIFICATION

- Remove: Disconnect, dismantle as necessary and take out the designated products or work and associated accessories, fixings, supports, linings and bedding materials. Dispose of unwanted materials. Excludes taking out and disposing of associated pipework, wiring, ductwork or other services.
- Fix: Receive, unload, handle, store, protect, place and fasten in position and disposal of waste and surplus packaging including all labour, materials and site equipment for that purpose.
- Supply and fix: As above, but including supply of products to be fixed. All products to be supplied and fixed unless stated otherwise.
- Keep for reuse: Do not damage designated products or work. Clean off bedding and jointing materials. Stack neatly, adequately protect and store until required by the Employer/ Purchaser or for use in the Works as instructed.
- Make good: Execute local remedial work to designated work. Make secure, sound and neat. Excludes redecoration and/ or replacement.
- Replace: Supply and fix new products matching those removed. Execute work to match original new state of that removed.
- Repair: Execute remedial work to designated products. Make secure, sound and neat. Excludes redecoration and/ or replacement.
- Refix: Fix removed products.
- Ease: Adjust moving parts of designated products or work to achieve free movement and good fit in open and closed positions.
- Match existing: Provide products and work of the same appearance and features as the original, excluding ageing and weathering. Make joints between existing and new work as inconspicuous as possible.
- System: Equipment, accessories, controls, supports and ancillary items, including installation, necessary for that section of the work to function.

170 MANUFACTURER AND PRODUCT REFERENCE

- Definition: When used in this combination:
  - Manufacturer: The firm under whose name the particular product is marketed.
  - Product reference: The proprietary brand name and/ or reference by which the particular product is identified.
- Currency: References are to the particular product as specified in the manufacturer's technical literature current on the date of the invitation to tender.

200 SUBSTITUTION OF PRODUCTS

- Products: If an alternative product to that specified is proposed, obtain approval before ordering the product.
- Reasons: Submit reasons for the proposed substitution.
- Documentation: Submit relevant information, including:
  - manufacturer and product reference;
  - cost;
  - availability;
  - relevant standards;
  - performance;
  - function;
  - compatibility of accessories;
  - proposed revisions to drawings and specification;
  - compatibility with adjacent work;
  - appearance;
  - copy of warranty/ guarantee.
- Alterations to adjacent work: If needed, advise scope, nature and cost.
- Manufacturers' guarantees: If substitution is accepted, submit before ordering products.

210 CROSS REFERENCES
- Accuracy: Check remainder of the annotation or item description against the terminology used in the section or clause referred to.
- Related terminology: Where a numerical cross-reference is not given the relevant sections and clauses of the specification will apply.
- Relevant clauses: Clauses in the referred to specification section dealing with general matters, ancillary products and execution also apply.
- Discrepancy or ambiguity: Before proceeding, obtain clarification or instructions.

220 REFERENCED DOCUMENTS
- Conflicts: Specification prevails over referenced documents.

230 EQUIVALENT PRODUCTS
- Inadvertent omission: Wherever products are specified by proprietary name the phrase 'or equivalent' is to be deemed included.

240 SUBSTITUTION OF STANDARDS
- Specification to British Standard or European Standard: Substitution may be proposed complying with a grade or category within a national standard of another Member State of the European Community or an international standard recognised in the UK.
- Before ordering: Submit notification of all such substitutions.
- Documentary evidence: Submit for verification when requested as detailed in clause A31/200. Any submitted foreign language documents must be accompanied by certified translations into English.

250 CURRENCY OF DOCUMENTS AND INFORMATION
- Currency: References to published documents are to the editions, including amendments and revisions, current on the date of the Invitation to Tender.

260 SIZES
- General dimensions: Products are specified by their co-ordinating sizes.
- Timber: Cross section dimensions shown on drawings are:
  - Target sizes as defined in BS EN 336 for structural softwood and hardwood sections.
  - Finished sizes for non-structural softwood or hardwood sawn and further processed sections.

DOCUMENTS PROVIDED ON BEHALF OF EMPLOYER

410 ADDITIONAL COPIES OF DRAWINGS/ DOCUMENTS
- Additional copies: Issued free of charge.

440 DIMENSIONS
- Scaled dimensions: Do not rely on.

450 MEASURED QUANTITIES
- Ordering products and constructing the Works: The accuracy and sufficiency of the measured quantities is not guaranteed.
- Precedence: The specification and drawings shall override the measured quantities.

460 THE SPECIFICATION
- Coordination: All sections must be read in conjunction with Main Contract Preliminaries/ General conditions.

DOCUMENTS PROVIDED BY CONTRACTOR/ SUBCONTRACTORS/ SUPPLIERS

630 TECHNICAL LITERATURE

- Information: Keep on site for reference by all supervisory personnel:
  - Manufacturers' current literature relating to all products to be used in the Works.
  - Relevant British, EN or ISO Standards.

640 MAINTENANCE INSTRUCTIONS AND GUARANTEES

- Components and equipment: Obtain or retain copies, register with manufacturer and hand over on or before completion of the Works.
- Information location: In Building Manual.
- Emergency call out services: Provide telephone numbers for use after completion. Extent of cover: twenty-four hours seven days a week.

A32 MANAGEMENT OF THE WORKS

GENERALLY

110 SUPERVISION
- General: Accept responsibility for coordination, supervision and administration of the Works, including subcontracts.
- Coordination: Arrange and monitor a programme with each subcontractor, supplier, local authority and statutory undertaker, and obtain and supply information as necessary for coordination of the work.

115 CONSIDERATE CONSTRUCTORS SCHEME
- Registration: Before starting work, register the site and pay the appropriate fee:
- Contact:
  - Address: Considerate Constructors Scheme Office, PO Box 75, Great Amwell, Ware, Hertfordshire, SG12 0YX.
  - Tel. 01920 485959.
  - Fax. 01920 485958.
  - Free phone 0800 7831423
  - Web. www.ccscheme.org.uk
  - E mail. enquiries@ccscheme.org.uk
- Standard: Comply with the Scheme's Code of Considerate Practice.
  - Minimum compliance level: Compliance.

120 INSURANCE
- Documentary evidence: Before starting work on site submit details, and/ or policies and receipts for the insurances required by the Conditions of Contract.

130 INSURANCE CLAIMS
- Notice: If any event occurs which may give rise to any claim or proceeding in respect of loss or damage to the Works or injury or damage to persons or property arising out of the Works, immediately give notice to the Employer, the person named in clause A10/140 and the Insurers.
- Failure to notify: Indemnify the Employer against any loss, which may be caused by failure to give such notice.

140 CLIMATIC CONDITIONS
- Information: Record accurately and retain:
  - Daily maximum and minimum air temperatures (including overnight).
  - Delays due to adverse weather, including description of the weather, types of work affected and number of hours lost.

150 OWNERSHIP
- Alteration/ clearance work: Materials arising become the property of the Contractor except where otherwise stated. Remove from site as work proceeds.

PROGRAMME/ PROGRESS

210 PROGRAMME

- Master programme: When requested and before starting work on site, submit in an approved form a master programme for the Works, which must include details of:
  - Design, production information and proposals provided by the Contractor/ Subcontractors/ Suppliers, including inspection and checking (see section A31).
  - Planning and mobilization by the Contractor.
  - Earliest and latest start and finish dates for each activity and identification of all critical activities.
  - Running in, adjustment, commissioning and testing of all engineering services and installations
  - Work resulting from instructions issued in regard to the expenditure of provisional sums (see section A54)
  - Work by or on behalf of the Employer and concurrent with the Contract (see section A50). The nature and scope of which, the relationship with preceding and following work and any relevant limitations are suitably defined in the Contract Documents.
- Exclusions: Where and to the extent that the programme implications for work which is not so defined are impossible to assess, the Contractor should exclude it and confirm this when submitting the programme.
- Submit: one copy.

230 SUBMISSION OF PROGRAMME

- Further information: Submission of the programme will not relieve the Contractor of the responsibility to advise of the need for further drawings or details or instructions in accordance with the Contract.

240 COMMENCEMENT OF WORK

- Notice: Before the proposed date for commencement of work on site give minimum notice of two weeks.

260 SITE MEETINGS

- General: Site meetings will be held to review progress and other matters arising from administration of the Contract.
- Frequency: Every month.
- Location: On Site.
- Accommodation: Ensure availability at the time of such meetings.
- Attendees: Attend meetings and inform subcontractors and suppliers when their presence is required.
- Chairperson (who will also take and distribute minutes): Contract Administrator.

265 CONTRACTOR'S PROGRESS REPORT

- General: Submit a progress report at least 1 day before the site meeting.
- Content: Notwithstanding the Contractor's obligations under the Contract the report must include:
  - A progress statement by reference to the master programme for the Works.
  - Details of any matters materially affecting the regular progress of the Works.
  - Subcontractors' and suppliers' progress reports.
  - Any requirements for further drawings or details or instructions to fulfil any obligations under the Conditions of Contract.

270 CONTRACTOR'S SITE MEETINGS

- General: Hold meetings with appropriate subcontractors and suppliers shortly before main site meetings to facilitate accurate reporting of progress.

290 NOTICE OF COMPLETION
- Requirement: Give notice of the anticipated dates of completion of the whole or parts of the Works.
- Associated works: Ensure necessary access, services and facilities are complete.
- Period of notice (minimum): Two weeks.

310 EXTENSIONS OF TIME
- Notice: When a notice of the cause of any delay or likely delay in the progress of the works is given under the contract, written notice must also be given of all other causes which apply concurrently.
- Details: As soon as possible submit:
  - Relevant particulars of the expected effects, if appropriate, related to the concurrent causes.
  - An estimate of the extent, if any, of the expected delay in the completion of the Works beyond the date for completion.

  All other relevant information required.

CONTROL OF COST

420 REMOVAL/ REPLACEMENT OF EXISTING WORK
- Extent and location: Agree before commencement.
- Execution: Carry out in ways that minimize the extent of work.

430 PROPOSED INSTRUCTIONS
- Estimates: If a proposed instruction requests an estimate of cost, submit without delay and in any case within seven days.
- Include:
  - A detailed breakdown of the cost, including any allowance for direct loss and expense.
  - Details of any additional resources required.
  - Details of any adjustments to be made to the programme for the Works.
  - Any other information as is reasonably necessary to fully assess the implications of issuing such an instruction.
- Inability to comply: Inform immediately if it is not possible to comply with any of the above requirements.

440 MEASUREMENT
- Covered work: Give notice before covering work required to be measured.

470 PRODUCTS NOT INCORPORATED INTO THE WORKS
- Ownership: At the time of each valuation, supply details of those products not incorporated into the Works which are subject to any reservation of title inconsistent with passing of property as required by the Conditions of Contract, together with their respective values.
- Evidence: When requested, provide evidence of freedom of reservation of title.

475 LISTED PRODUCTS STORED OFF SITE
- Evidence of Title: Submit reasonable proof that the property in 'listed items' is vested in the Contractor.
- Include for products purchased from a supplier:
  - A copy of the contract of sale and a written statement from the supplier that any conditions of the sale relating to the passing of property have been fulfilled and the products are not subject to any encumbrance or charge.
- Include for products purchased from a supplier by a subcontractor or manufactured or assembled by any subcontractor:
  - Copies of the subcontract with the subcontractor and a written statement from the subcontractor that any conditions relating to the passing of property have been fulfilled.

A33 QUALITY STANDARDS/ CONTROL

STANDARDS OF PRODUCTS AND EXECUTIONS

110 INCOMPLETE DOCUMENTATION

- General: Where and to the extent that products or work are not fully documented, they are to be:
  - Of a kind and standard appropriate to the nature and character of that part of the Works where they will be used.
  - Suitable for the purposes stated or reasonably to be inferred from the project documents.

  Contract documents: Omissions or errors in description and/ or quantity shall not vitiate the Contract nor release the Contractor from any obligations or liabilities under the Contract.

120 WORKMANSHIP SKILLS

- Operatives: Appropriately skilled and experienced for the type and quality of work.
- Registration: With Construction Skills Certification Scheme.
- Evidence: Operatives must produce evidence of skills/ qualifications when requested.

130 QUALITY OF PRODUCTS

- Generally: New. (Proposals for recycled products may be considered).
- Supply of each product: From the same source or manufacturer.
- Whole quantity of each product required to complete the Works: Consistent kind, size, quality and overall appearance.
- Tolerances: Where critical, measure a sufficient quantity to determine compliance.
- Deterioration: Prevent. Order in suitable quantities to a programme and use in appropriate sequence.

135 QUALITY OF EXECUTION

- Generally: Fix, apply, install or lay products securely, accurately, plumb, neatly and in alignment.
- Colour batching: Do not use different colour batches where they can be seen together.
- Dimensions: Check on-site dimensions.
- Finished work: Not defective, e.g. not damaged, disfigured, dirty, faulty, or out of tolerance.
- Location and fixing of products: Adjust joints open to view so they are even and regular.

140 COMPLIANCE

- Compliance with proprietary specifications: Retain on site evidence that the proprietary product specified has been supplied.
- Compliance with performance specifications: Submit evidence of compliance, including test reports indicating:
  - Properties tested.
  - Pass/ fail criteria.
  - Test methods and procedures.
  - Test results.
  - Identity of testing agency.
  - Test dates and times.
  - Identities of witnesses.

  Analysis of results.

150 INSPECTIONS

- Products and executions: Inspection or any other action must not be taken as approval unless confirmed in writing referring to:
  - Date of inspection.
  - Part of the work inspected.
  - Respects or characteristics which are approved.
  - Extent and purpose of the approval.
  - Any associated conditions.

160 RELATED WORK

- Details: Provide all trades with necessary details of related types of work. Before starting each new type or section of work ensure previous related work is:
  - Appropriately complete.
  - In accordance with the project documents.
  - To a suitable standard.
  - In a suitable condition to receive the new work.
- Preparatory work: Ensure all necessary preparatory work has been carried out.

170 MANUFACTURER'S RECOMMENDATIONS/ INSTRUCTIONS

- General: Comply with manufacturer's printed recommendations and instructions current on the date of the Invitation to tender.
- Changes to recommendations or instructions: Submit details.
- Ancillary products and accessories: Use those supplied or recommended by main product manufacturer.
- Agrément certified products: Comply with limitations, recommendations and requirements of relevant valid certificates.

180 WATER FOR THE WORKS

- Mains supply: Clean and uncontaminated.
- Other: Do not use until:
  - Evidence of suitability is provided.
  - Tested to BS EN 1008 if instructed.

SAMPLES/ APPROVALS

210 SAMPLES

- Products or executions: Comply with all other specification requirements and in respect of the stated or implied characteristics either:
  - To an express approval.
  - To match a sample expressly approved as a standard for the purpose.

220 APPROVAL OF PRODUCTS

- Submissions, samples, inspections and tests: Undertake or arrange to suit the Works programme.
- Approval: Relates to a sample of the product and not to the product as used in the Works. Do not confirm orders or use the product until approval of the sample has been obtained.
- Complying sample: Retain in good, clean condition on site. Remove when no longer required.

230 APPROVAL OF EXECUTION
- Submissions, samples, inspections and tests: Undertake or arrange to suit the Works programme.
- Approval: Relates to the stated characteristics of the sample. (If approval of the finished work as a whole is required this is specified separately). Do not conceal, or proceed with affected work until compliance with requirements is confirmed.
- Complying sample: Retain in good, clean condition on site. Remove when no longer required.

ACCURACY/ SETTING OUT GENERALLY

320 SETTING OUT
- General: Submit details of methods and equipment to be used in setting out the Works.
- Levels and dimensions: Check and record the results on a copy of drawings. Notify discrepancies and obtain instructions before proceeding.
- Inform: When complete and before commencing construction.

330 APPEARANCE AND FIT
- Tolerances and dimensions: If likely to be critical to execution or difficult to achieve, as early as possible either:
  - Submit proposals; or
  - Arrange for inspection of appearance of relevant aspects of partially finished work.
- General tolerances (maximum): To BS 5606, tables 1 and 2.

SERVICES GENERALLY

410 SERVICES REGULATIONS
- New or existing services: Comply with the Byelaws or Regulations of the relevant Statutory Authority.

435 ELECTRICAL INSTALLATION CERTIFICATE
- Submit: When relevant electrical work is completed.
- Original certificate: To be lodged in the Building Manual.

440 GAS, OIL AND SOLID FUEL APPLIANCE INSTALLATION CERTIFICATE
- Before the completion date stated in the Contract: Submit a certificate stating:
  - The address of the premises.
  - A brief description of the new installation and/ or work carried out to an existing installation.
  - Any special recommendations or instructions for the safe use and operation of appliances and flues.
  - The Contractor's name and address.
  - A statement that the installation complies with the appropriate safety, installation and use regulations.
  - The name, qualification and signature of the competent person responsible for checking compliance.
  - The date on which the installation was checked.
- Certificate location: Health and Safety File.

445 SERVICE RUNS
- General: Provide adequate space and support for services, including unobstructed routes and fixings.
- Ducts, chases and holes: Form during construction rather than cut.
- Coordination with other works: Submit details of locations, types/ methods of fixing of services to fabric and identification of runs and fittings.

450 MECHANICAL AND ELECTRICAL SERVICES

- Final tests and commissioning: Carry out so that services are in full working order at completion of the Works.
- Building Regulations notice: Copy to be lodged in the Building Manual.

SUPERVISION/ INSPECTION/ DEFECTIVE WORK

510 SUPERVISION

- General: In addition to the constant management and supervision of the Works provided by the Contractor's person in charge, all significant types of work must be under the close control of competent trade supervisors to ensure maintenance of satisfactory quality and progress.
- Replacement: Give maximum possible notice before changing person in charge or site agent.

520 COORDINATION OF ENGINEERING SERVICES

- Suitability: Site organisation staff must include one or more persons with appropriate knowledge and experience of mechanical and electrical engineering services to ensure compatibility between engineering and the Works generally.
- Evidence: Submit when requested CVs or other documentary evidence relating to the staff concerned.

530 OVERTIME WORKING

- Notice: Prior to overtime being worked, submit details of times, types and locations of work to be done.
  - Minimum period of notice: Three days.
- Concealed work: If executed during overtime for which notice has not been given, it may be required to be opened up for inspection and reinstated at the Contractor's expense.

540 DEFECTS IN EXISTING WORK

- Undocumented defects: When discovered, immediately give notice. Do not proceed with affected related work until response has been received.
- Documented remedial work: Do not execute work which may:
  - Hinder access to defective products or work; or
  - Be rendered abortive by remedial work.

550 ACCESS FOR INSPECTION

- Removal: Before removing scaffolding or other facilities for access, give notice of not less than one week.

560 TESTS AND INSPECTIONS

- Timing: Agree and record dates and times of tests and inspections to enable all affected parties to be represented.
- Confirmation: One working day prior to each such test or inspection. If sample or test is not ready, agree a new date and time.
- Records: Submit a copy of test certificates and retain copies on site.

580 CONTINUITY OF THERMAL INSULATION

- Record and report: Confirm that work to new, renovated or upgraded thermal elements has been carried out to conform to specification. Include:
  - The address of the premises.
  - The Contractor's name and address.
  - The name, qualification and signature of the competent person responsible for checking compliance.
  - The date on which the installation was checked.
- Submit: Before completion of the Works.
- Copy: To be lodged in the Building Manual.

610 PROPOSALS FOR RECTIFICATION OF DEFECTIVE PRODUCTS/ EXECUTIONS

- Proposals: Immediately any work or product is known, or appears, to be not in accordance with the Contract, submit proposals for opening up, inspection, testing, making good, adjustment of the Contract Sum, or removal and re-execution.
- Acceptability: Such proposals may be unacceptable and contrary instructions may be issued.

620 MEASURES TO ESTABLISH ACCEPTABILITY

- General: Wherever inspection or testing shows that the work, materials or goods are not in accordance with the contract and measures (e.g. testing, opening up, experimental making good) are taken to help in establishing whether or not the work is acceptable, such measures:
  - Will be at the expense of the Contractor.
  - Will not be considered as grounds for revision of the completion date.

630 QUALITY CONTROL

- Procedures: Establish and maintain to ensure that the Works, including the work of subcontractors, comply with specified requirements.
- Records: Maintain full records, keep copies on site for inspection, and submit copies on request.
- Content of records:
  - Identification of the element, item, batch or lot including location in the Works.
  - Nature and dates of inspections, tests and approvals.
  - Nature and extent of nonconforming work found.
  - Details of corrective action.

WORK AT OR AFTER COMPLETION

710 WORK BEFORE COMPLETION

- General: Make good all damage consequent upon the Works.
  Temporary markings, coverings and protective wrappings: Remove unless otherwise instructed.
- Cleaning: Clean the Works thoroughly inside and out, including all accessible ducts and voids. Remove all splashes, deposits, efflorescence, rubbish and surplus materials.
- Cleaning materials and methods: As recommended by manufacturers of products being cleaned, and must not damage or disfigure other materials or construction.
- COSHH dated data sheets: Obtain for all materials used for cleaning and ensure they are used only as recommended by their manufacturers.
- Minor faults: Touch up in newly painted work, carefully matching colour and brushing out edges. Repaint badly marked areas back to suitable breaks or junctions.
- Moving parts of new work: Adjust, ease and lubricate as necessary to ensure easy and efficient operation, including doors, windows, drawers, ironmongery, appliances, valves and controls.

720 SECURITY AT COMPLETION

- General: Leave the Works secure with, where appropriate, all accesses closed and locked.
- Keys: Account for and adequately label all keys and hand over to Employer with itemized schedule, retaining duplicate schedule signed by Employer as a receipt.

730 MAKING GOOD DEFECTS

- Remedial work: Arrange access with Contract Administrator.
- Rectification: Give reasonable notice for access to the various parts of the Works.
- Completion: Notify when remedial works have been completed.

A34 SECURITY/ SAFETY/ PROTECTION

SECURITY, HEALTH AND SAFETY

110 PRECONSTRUCTION INFORMATION

- Location: Integral with the project Preliminaries, including but not restricted to the following sections:
  - Description of project: Sections A10 and A11.
  - Client's consideration and management requirements: Sections A12, A13 and A36.
  - Environmental restrictions and on-site risks: Section A12, A35 and A34.
  - Significant design and construction hazards: Section A34.

  The Health and Safety File: Section A37.

140 CONSTRUCTION PHASE HEALTH AND SAFETY PLAN

- Submission: Present to the Employer/ Client no later than Two weeks prior to the commencement of works.
- Confirmation: Do not start construction work until the Employer has confirmed in writing that the Construction Phase Health and Safety Plan includes the procedures and arrangements required by the CDM Regulations.
- Content: Develop the plan from and draw on the Outline Construction Phase Health and Safety Plan, clause A30/570, and the Pre-tender Health and Safety Plan/ Preconstruction information.

160 STABILITY

- Responsibility: Maintain the stability and structural integrity of the Works and adjacent structures during the Contract.
- Design loads: Obtain details, support as necessary and prevent overloading.

170 OCCUPIED PREMISES

- Extent: Existing buildings will be occupied and/ or used during the Contract as follows: After 31st October 2021 the school will be live. There will be operations within the school throughout the contract period.
- Works: Carry out without undue inconvenience and nuisance and without danger to occupants and users.
- Overtime: If compliance with this clause requires certain operations to be carried out during overtime, and such overtime is not required for any other reason, the extra cost will be allowed, provided that such overtime is authorized in advance.

190 OCCUPIER'S RULES AND REGULATIONS

- Compliance: Conform to the occupier's rules and regulations affecting the site.
- Copies:
  - Location: With in the tender documents.

  Arrangements for inspection: With in the tender documents.

200 MOBILE TELEPHONES AND PORTABLE ELECTRONIC EQUIPMENT

- Restrictions on use:
  - Use only for business purposes.

210 EMPLOYER'S REPRESENTATIVES SITE VISITS
- Safety: Submit details in advance, to the Employer or the person identified in clause A10/140, of safety provisions and procedures (including those relating to materials, which may be deleterious), which will require their compliance when visiting the site.
- Protective clothing and/ or equipment: Provide and maintain on site for the Employer and the person stated in clause A10/140 and other visitors to the site.

PROTECT AGAINST THE FOLLOWING

340 POLLUTION
- Prevention: Protect the site, the Works and the general environment including the atmosphere, land, streams and waterways against pollution.
- Contamination: If pollution occurs inform immediately, including to the appropriate Authorities and provide relevant information.

360 NUISANCE
- Duty: Prevent nuisance from smoke, dust, rubbish, vermin and other causes.
- Surface water: Prevent hazardous build-up on site, in excavations and to surrounding areas and roads.

370 ASBESTOS CONTAINING MATERIALS
- Duty: Report immediately any suspected materials discovered during execution of the Works.
  - Do not disturb.
  - Agree methods for safe removal or encapsulation.

371 DANGEROUS OR HAZARDOUS SUBSTANCES
- Duty: Report immediately suspected materials discovered during execution of the Works.
  - Do not disturb.
  - Agree methods for safe removal or remediation.

380 FIRE PREVENTION
- Duty: Prevent personal injury or death, and damage to the Works or other property from fire.
- Standard: Comply with Joint Code of Practice 'Fire Prevention on Construction Sites', published by Construction Industry Publications and The Fire Protection Association (The 'Joint Fire Code').

390 SMOKING ON SITE
- Smoking on site: Not permitted.

400 BURNING ON SITE
- Burning on site: Not permitted.

410 MOISTURE
- Wetness or dampness: Prevent, where this may cause damage to the Works.
- Drying out: Control humidity and the application of heat to prevent:
  - Blistering and failure of adhesion.
  - Damage due to trapped moisture.

  Excessive movement.

420 INFECTED TIMBER/ CONTAMINATED MATERIALS

- Removal: Where instructed to remove material affected by fungal/ insect attack from the building, minimize the risk of infecting other parts of the building.
- Testing: carry out and keep records of appropriate tests to demonstrate that hazards presented by concentrations of airborne particles, toxins and other micro organisms are within acceptable levels.

430 WASTE

- Includes: Rubbish, debris, spoil, surplus material, containers and packaging.
- General: Minimize production. Prevent accumulations. Keep the site and Works clean and tidy.
- Handling: Collect and store in suitable containers. Remove frequently and dispose off site in a safe and competent manner:
  - Non-hazardous material: In a manner approved by the Waste Regulation Authority.
  - Hazardous material: As directed by the Waste Regulation Authority and in accordance with relevant regulations.
- Recyclable material: Sort and dispose at a Materials Recycling Facility approved by the Waste Regulation Authority.
- Voids and cavities in the construction: Remove rubbish, dirt and residues before closing in.
- Waste transfer documentation: Retain on site.

450 LASER EQUIPMENT

- Construction laser equipment: Install, use and store in accordance with BS EN 60825-1 and the manufacturer's instructions.
- Class 1 or Class 2 laser equipment: Ensure laser beam is not set at eye level and is terminated at the end of its useful path.
- Class 3A and Class 3B laser equipment: Do not use without approval and subject to submission of a method statement on its safe use.

PROTECT THE FOLLOWING

510 EXISTING SERVICES

- Confirmation: Notify all service authorities, statutory undertakers and/ or adjacent owners of proposed works not less than one week before commencing site operations.
- Identification: Before starting work, check and mark positions of utilities/ services. Where positions are not shown on drawings obtain relevant details from service authorities, statutory undertakers or other owners.
- Work adjacent to services:
  - Comply with service authority's/ statutory undertaker's recommendations.
  - Adequately protect, and prevent damage to services: Do not interfere with their operation without consent of service authorities/ statutory undertakers or other owners.
- Identifying services:
  - Below ground: Use signboards, giving type and depth;
  - Overhead: Use headroom markers.
- Damage to services: If any results from execution of the Works:
  - Immediately give notice and notify appropriate service authority/ statutory undertaker.
  - Make arrangements for the work to be made good without delay to the satisfaction of service authority/ statutory undertaker or other owner as appropriate.
  - Any measures taken to deal with an emergency will not affect the extent of the Contractor's liability.
- Marker tapes or protective covers: Replace, if disturbed during site operations, to service authority's/ statutory undertakers recommendations.

520 ROADS AND FOOTPATHS

- Duty: Maintain roads and footpaths within and adjacent to the site and keep clear of mud and debris.
- Damage caused by site traffic or otherwise consequent upon the Works: Make good to the satisfaction of the Employer, Local Authority or other owner.

570 EXISTING WORK

- Protection: Prevent damage to existing work, structures or other property during the course of the work.
- Removal: Minimum amount necessary.
- Replacement work: To match existing.

580 BUILDING INTERIORS

- Protection: Prevent damage from exposure to the environment, including weather, flora, fauna, and other causes of material degradation during the course of the work.

630 EXISTING STRUCTURES

- Duty: Check proposed methods of work for effects on adjacent structures inside and outside the site boundary.
- Supports: During execution of the Works:
  - Provide and maintain all incidental shoring, strutting, needling and other supports as may be necessary to preserve stability of existing structures on the site or adjoining, that may be endangered or affected by the Works.
  - Do not remove until new work is strong enough to support existing structure.
  - Prevent overstressing of completed work when removing supports.
- Adjacent structures: Monitor and immediately report excessive movement.
- Standard: Comply with BS 5975 and BS EN 12812.

640 MATERIALS FOR RECYCLING/ REUSE

- Duty: Sort and prevent damage to stated products or materials, clean off bedding and jointing materials and other contaminants.
- Storage: Stack neatly and protect until required by the Employer or for use in the Works as instructed.

A35 SPECIFIC LIMITATIONS ON METHOD/ SEQUENCE/ TIMING

110 SCOPE

- General: The limitations described in this section are supplementary to limitations described or implicit in information given in other sections or on the drawings.

140 SCAFFOLDING

- Scaffolding: Make available to subcontractors and others at all times.

180 COMPLETION IN SECTIONS OR IN PARTS

- General: Where the Employer is to take possession of any Section or part of the Works and such Section or part will, after its practical completion, depend for its adequate functioning on work located elsewhere on the site: Complete such other work in time to permit such possession to take place.
- Remainder of the Works: During execution, ensure that completed Sections or parts of the Works have continuous and adequate provision of services, fire precautions, means of escape and safe access.

A36 FACILITIES/ TEMPORARY WORK/ SERVICES

ACCOMMODATION

230 TEMPORARY ACCOMMODATION
- Proposals for temporary accommodation and storage for the Works: Submit two weeks prior to starting on site.
- Details to be included: Type of accommodation and storage, its siting and the programme for site installation and removal.

TEMPORARY WORKS

340 NAME BOARDS/ ADVERTISEMENTS
- Name boards/ advertisements: Not permitted.

SERVICES AND FACILITIES

410 LIGHTING
- Finishing work and inspection: Provide temporary lighting, the intensity and direction of which closely resembles that delivered by the permanent installation.

420 LIGHTING AND POWER
- Supply: Electricity from the Employer's mains may be used for the Works as follows:
  - Metering: Free of charge.
  - Point of supply: TBC.
  - Available capacity: TBC.
  - Frequency: 50 Hz.
  - Phase: TBC.
  - Current: Alternating.
- Continuity: The Employer will not be responsible for the consequences of failure or restriction in supply.

430 WATER
- Supply: The Employer's mains may be used for the Works as follows:
  - Metering: Free of charge.
  - Source: TBC.
  - Location of supply point: TBC.
  - Conditions/ Restrictions: TBC.
- Continuity: The Employer will not be responsible for the consequences of failure or restriction in supply.

530 BENEFICIAL USE OF INSTALLED SYSTEMS
- Permanent systems: Unless specific permission is given by the Employer and installer, do not use for any purpose other than running in, testing and commissioning.
- Other uses: If permission is given for any other use of a system before the Works are accepted as complete, enter into a separate written agreement recording details of the terms and conditions of use.

570 PERSONAL PROTECTIVE EQUIPMENT

- General: Provide for the sole use of those acting on behalf of the Employer, in sizes to be specified:
  - Safety helmets to BS EN 397, neither damaged nor time expired. Number required: 3.
  - High visibility waistcoats to BS EN ISO 20471 Class 2. Number required: 3.
  - Safety boots with steel insole and toecap to BS EN ISO 20345. Pairs required: 3.
  - Disposable respirators to BS EN 149.FFP1S.
  - Eye protection to BS EN 166.
  - Ear protection - muffs to BS EN 352-1, plugs to BS EN 352-2

  Hand protection - to BS EN 388, 407, 420 or 511 as appropriate.

A37 OPERATION/ MAINTENANCE OF THE FINISHED WORKS

GENERALLY

110 THE BUILDING MANUAL

- Purpose: The Manual is to be a comprehensive information source and guide for owners and users of the completed Works. It should provide an overview of the main design principles and describe key components and systems to enable proper understanding, efficient and safe operation and maintenance.
- Scope:
  - Part 1: General: Content as clause 120.
  - Part 2: Fabric: Content as clause 130.
  - Part 3: Services: Content as clause 140.
  - Part 4: The Health and Safety File: Content as clause 150.
  - Part 5: Building User Guide: Content as clause 151.
- Responsibility: The Building Manual is to be produced by Tyhe contractor and must be complete no later than 2 months following practical completion.
- Information provided by others: Details: N/A.
- Compilation:
  - Prepare all information for Contractor designed or performance specified work including as-built drawings.
  - Obtain or prepare all other information to be included in the Manual.
- Reviewing the Manual: Submit a complete draft. Amend in the light of any comments and resubmit. Do not proceed with production of the final copies until authorized.
- Final copies of the Manual:
  - Number of copies: One.
  - Format: Paper.
  - Latest date for submission: Two weeks before the date for completion stated in the contract.
- As-built drawings and schedules:
  - Number of copies: One.
  - Format: Paper.

115 THE HEALTH AND SAFETY FILE

- Responsibility: the contractor.
- Content: Obtain and provide the following information: Please see PCIP.
- Format: Paper
- Delivery to: CA By (date): Two months following PC.

140 CONTENT OF THE BUILDING MANUAL PART 3: BUILDING SERVICES

- Content: Obtain and Provide the following, including all relevant details not included in other parts of the manual:
- Detailed design criteria and description of the systems, including:
  - Services capacity, loadings and restrictions
  - Services instructions.
  - Services log sheets.
  - Manufacturers' instruction manuals and leaflets index.
  - Fixtures, fittings and component schedule index.
- Detailed description of methods and materials used.
- As-built drawings for each system recording the construction, together with an index, including:
  - Diagrammatic drawings indicating principal items of plant, equipment and fittings
  - Record drawings showing overall installation
  - Schedules of plant, equipment, valves, etc. describing location, design performance and unique identification cross referenced to the record drawings.
  - Identification of services – a legend for colour coded services.
- Product details, including for each item of plant and equipment:
  - Name, address and contact details of the manufacturer.
  - Catalogue number or reference
  - Manufacturer's technical literature, including detailed operating and maintenance instructions.
  - Information and guidance concerning dismantling, repair, renovation or decommissioning.
- Operation: A description of the operation of each system, including:
  - Starting up, operation and shutting down
  - Control sequences
  - Procedures for seasonal changeover
  - Procedures for diagnostics, troubleshooting and faultfinding.
- Guarantees, warranties and maintenance agreements – obtain from manufacturers, suppliers and subcontractors.
- Commissioning records and test certificates list for each item of plant, equipment, valves, etc. used in the installations – including:
  - Electrical circuit tests.
  - Corrosion tests.
  - Type tests.
  - Work tests.
  - Start and commissioning tests.
- Equipment settings: Schedules of fixed and variable equipment settings established during commissioning.
- Preventative maintenance: Recommendations for frequency and procedures to be adopted to ensure efficient operation of the systems
- Lubrication: Schedules of all lubricated items
- Consumables: A list of all consumable items and their source.
- Spares: A list of recommended spares to be kept in stock, being those items subject to wear and tear or deterioration and which may involve an extended delivery time when replacements are required.
- Emergency procedures for all systems, significant items of plant and equipment.
- Annual maintenance summary chart.
- Other specific requirements: N/A.
- Timescale for completion: Two months following PC

160 PRESENTATION OF BUILDING MANUAL

- Format: A4 size, plastics covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover titled.
- Selected drawings needed to illustrate or locate items mentioned in the Manual: Where larger than A4, to be folded and accommodated in the binders so that they may be unfolded without being detached from the rings.
- As-built drawings: The main sets may form annexes to the Manual.

250 TOOLS

- General: Provide tools and portable indicating instruments for the operation and maintenance of all services plant and equipment (except any installed under Named Subcontracts) together with suitable means of identifying, storing and securing.
- Quantity: Two complete sets.
- Time of submission: At completion.

Section 2

Preambles

C20 Demolition

5 SURVEY

- Scope: Before starting deconstruction/ demolition work, examine available information, and carry out a survey of:
  - the structure or structures to be deconstructed/ demolished,
  - the site on which the structure or structures stand, and
  - the surrounding area.
- Report and method statements: Submit, describing:
  - Form, condition and details of the structure or structures, the site and the surrounding area.
    Extent: /
  - Type, location and condition of features of historical, archaeological, geological or ecological importance.
  - Type, location and condition of adjoining or surrounding premises that might be adversely affected by removal of the structure or structures or by noise, vibration and/ or dust generated during deconstruction/ demolition.
  - Identity and location of services above and below ground, including those required for the Contractor's use, and arrangements for their disconnection and removal.
  - Form and location of flammable, toxic or hazardous materials, including lead-based paint, and proposed methods for their removal and disposal.
  - Form and location of materials identified for reuse or recycling, and proposed methods for removal and temporary storage.
  - Proposed programme of work, including sequence and methods of deconstruction/ demolition.
  - Details of specific pre-weakening required.
  - Arrangements for protection of personnel and the general public, including exclusion of unauthorized persons.
  - Arrangements for control of site transport and traffic.

10 EXTENT OF DECONSTRUCTION/ DEMOLITION

- General: Subject to retention requirements specified elsewhere, deconstruct/ demolish structures down to Floor level.

25 LOCATION OF SERVICES

- Services affected by the Works: Locate and mark positions.
- Mains services marking: Arrange with the appropriate authorities for services to be located and marked.

30 SERVICES DISCONNECTION ARRANGED BY CONTRACTOR

- Responsibility: Before starting deconstruction/ demolition arrange with the appropriate authorities for disconnection of services owned by those authorities and removal of associated fittings and equipment.

32 DISCONNECTION OF DRAINS

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

50 WORKMANSHIP

- Standard: Demolish structures in accordance with BS 6187.
- Operatives: Appropriately skilled and experienced for the type of work. Holding, or in training to obtain, relevant CITB Certificates of Competence.
- Site staff responsible for supervision and control of work: Experienced in the assessment of risks involved and methods of deconstruction/ demolition to be used.

55 SITE HAZARDS

- Precautions: Prevent fire and/ or explosion caused by gas and/ or vapour from tanks, pipes, etc.
- Dust: Reduce by periodically spraying with an appropriate wetting agent, or contain.
  - Lead dust: Submit method statement for control, containment and clean-up regimes.
- Site operatives and general public: Protect from vibration, dangerous fumes and dust arising during the course of the Works.

70 PARTLY DECONSTRUCTED/ DEMOLISHED STRUCTURES

- General: Leave partly in a stable condition, with adequate temporary support at each stage to prevent risk of uncontrolled collapse. Make secure outside working hours.
- Temporary works: Prevent overloading due to debris.
- Access: Prevent access by unauthorized persons.

76 ASBESTOS-CONTAINING MATERIALS – UNKNOWN OCCURENCES

- Discovery: Give notice immediately of suspected asbestos-containing materials when discovered during deconstruction/ demolition work. Avoid disturbing such materials.
- Removal: Submit statutory risk assessments and details of proposed methods for safe removal.

78 UNFORESEEN HAZARDS

- Discovery: Give notice immediately when hazards, such as unrecorded voids, tanks, chemicals are discovered during deconstruction/ demolition.
- Removal: Submit details of proposed methods for filling, removal, etc.

85 SITE CONDITION AT COMPLETION

- Debris: Clear away and leave the site tidy on completion.
- Special requirements: /.

90 CONTRACTOR'S PROPERTY

- Components and materials arising from the deconstruction/ demolition work: Property of the Contractor except where otherwise provided.
- Action: Remove from site as work proceeds where not to be reused or recycled for site use.

95 RECYCLED MATERIALS

- Materials arising from deconstruction/ demolition work: Can be recycled or reused elsewhere in the project, subject to compliance with the appropriate specification and in accordance with any site waste management plan.

G20 Carpentry/ timber framing/ first fixing

GENERAL

105 TIMBER PROCUREMENT
- Timber (including timber for wood based products): Obtained from well managed forests/ plantations in accordance with:
  - The laws governing forest management in the producer country or countries.
  - International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).
- Documentation: Provide either:
  - Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied, or
  - Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood based products.

150 STRENGTH GRADING OF TIMBER
- Grader: A company currently registered under a third party quality assurance scheme operated by a certification body approved by the UK Timber Grading Committee.

160 GRADING AND MARKING OF SOFTWOOD
- Timber of a target/ finished thickness less than 100 mm and not specified for wet exposure: Graded at an average moisture content not exceeding 20% with no reading being in excess of 24% and clearly marked as 'DRY' or 'KD' (kiln dried).
- Timber graded undried (green) and specified for installation at higher moisture contents: Clearly marked as 'WET' or 'GRN'.
- Structural timber members cut from large graded sections: Regraded to approval and marked accordingly.

WORKMANSHIP GENERALLY

401 CROSS SECTION DIMENSIONS OF STRUCTURAL SOFTWOOD AND HARDWOOD
- Dimensions: Dimensions in this specification and shown on drawings are target sizes as defined in BS EN 336.
- Tolerances: The tolerance indicators (T1) and (T2) specify the maximum permitted deviations from target sizes as stated in BS EN 336, clause 4.3:
  - Tolerance class 1 (T1) for sawn surfaces.
  - Tolerance class 2 (T2) for further processed surfaces.

402 CROSS SECTION DIMENSIONS OF NONSTRUCTURAL SOFTWOOD
- Dimensions: Dimensions in this specification and shown on drawings are finished sizes.
- Maximum permitted deviations from finished sizes: As stated in BS EN 1313-1, clause 6 for sawn sections.

403 CROSS SECTION DIMENSIONS OF NONSTRUCTURAL HARDWOOD
- Dimensions: Dimensions in this specification and shown on drawings are finished sizes.
- Maximum permitted deviations from finished sizes: As stated in BS EN 1313-2:
  - Clause 6 for sawn sections.

  Clause NA.3 for further processed sections.

420 WARPING OF TIMBER

- Bow, spring, twist and cup: Not greater than the limits set down in BS 4978, BS EN 14081-1 and BS EN 844-3.

430 SELECTION AND USE OF TIMBER

- Timber members damaged, crushed or split beyond the limits permitted by their grading: Do not use.

435 NOTCHES, HOLES AND JOINTS IN TIMBER

- Notches and holes:
  - General: Avoid if possible.
  - Sizes: Minimum needed to accommodate services.
  - Position: Do not locate near knots or other defects.
  - In same joist: Minimum 100 mm apart horizontally.
  - Notches in joists:

    Position: Locate at top. Form by sawing down to a drilled hole.
    Depth (maximum): 0.15 x joist depth.
    Distance from supports: Between 0.1 and 0.2 x span.
  - Holes in joists:

    Position: Locate on neutral axis.
    Diameter (maximum): 0.25 x joist depth.
    Centres (minimum): 3 x diameter of largest hole.
    Distance from supports: Between 0.25 and 0.4 of span.
  - Notches in roof rafters, struts and truss members: Not permitted.
  - Holes in struts and columns: Locate on neutral axis.

    Diameter (maximum): 0.25 x minimum width of member.
    Centres (minimum): 3 x diameter of largest hole.
    Distance from ends: Between 0.25 and 0.4 of span.
- Scarf joints, finger joints and splice plates: Do not use without approval.

440 PROCESSING TREATED TIMBER

- Cutting and machining: Carry out as much as possible before treatment.
- Extensively processed timber: Retreat timber sawn lengthways, thicknessed, planed, ploughed, etc.
- Surfaces exposed by minor cutting/ drilling: Treat with two flood coats of a solution recommended by main treatment solution manufacturer.

450 MOISTURE CONTENT

- Moisture content of wood and wood based products at time of installation: Not more than:
  - Covered in generally unheated spaces: 24%.
  - Covered in generally heated spaces: 20%.
  - Internal in continuously heated spaces: 20%.

451 MOISTURE CONTENT TESTING

- Procedure: When instructed, test timber sections with an approved electrical moisture meter.
- Test sample: Test 5% but not less than 10 lengths of each cross-section in the centre of the length.
- Test results: 90% of values obtained to be within the specified range. Provide records of all tests.

510 PROTECTION

- Generally: Keep timber dry and do not overstress, distort or disfigure sections or components during transit, storage, lifting, erection or fixing.
- Timber and components: Store under cover, clear of the ground and with good ventilation. Support on regularly spaced, level bearers on a dry, firm base. Open pile to ensure free movement of air through the stack.
- Trussed rafters: Keep vertical during handling and storage.

JOINTING TIMBER

570 JOINTING/ FIXING GENERALLY
- Generally: Where not specified precisely, select methods of jointing and fixing and types, sizes and spacings of fasteners in compliance with section Z20.

630 BOLTED JOINTS
- Bolt spacings (minimum): To BS EN 1995-1-1, section 8.5.
- Holes for bolts: Located accurately and drilled to diameters as close as practical to the nominal bolt diameter and not more than 2 mm larger.
- Washers: Placed under bolt heads and nuts that would otherwise bear directly on timber. Use spring washers in locations which will be hidden or inaccessible in the completed building.
- Bolt tightening: So that washers just bite the surface of the timber. Ensure that at least one complete thread protrudes from the nut.
  Checking: At agreed regular intervals up to Completion. Tighten as necessary.

670 ANTI-CORROSION FINISHES FOR FASTENERS
- Galvanizing: To BS 7371-6, with internal threads tapped and lightly oiled following treatment.
- Sherardizing: To BS 7371-8, Class 1.
- Zinc plating: To BS EN ISO 4042 and passivated.

ERECTION AND INSTALLATION

740 PRE-ERECTION CHECKING
- Timing: Not less than 10 days before proposed erection start date.
- Checklist:
  - Foundations and other structures to which timber structure will be attached: Check for accuracy of setting out.
  - Holding down bolts: Check for position, protruding length, condition and slackness.
- Inaccuracies and defects: Report without delay.
- Erection: Obtain permission to commence.

750 MODIFICATIONS/REPAIRS
- Defects due to detailing or fabrication errors: Report without delay.
- Methods of rectification: Obtain approval of proposals before starting modification or remedial work.
- Defective/damaged components: Timber members/ components may be rejected if the nature and/or number of defects would result in an excessive amount of site repair.

760 TEMPORARY BRACING
- Provision: As necessary to maintain structural timber components in position and to ensure complete stability during construction.

770 ADDITIONAL SUPPORTS
- Provision: Position and fix additional studs, noggings and/ or battens to support edges of sheets materials, and wall/ floor/ ceiling mounted appliances, fixtures, etc. shown on drawings
- Material properties: Additional studs, noggings and battens to be of adequate size and have the same treatment, if any, as adjacent timber supports.

775 BEARINGS
- Timber surfaces which are to transmit loads: Finished to ensure close contact over the whole of the designed bearing area.
- Packings: Where provided, to cover the whole of the designed bearing area.
  - Crushing strength: Not less than timber being supported.
  - In external or inaccessible locations: Rot and corrosion proof.

780 WALL PLATES
- Position and alignment: To give the correct span and level for trusses, joists, etc.
- Bedding: Fully in fresh mortar.
- Joints: At corners and elsewhere where joints are unavoidable use nailed half lap joints. Do not use short lengths of timber.

784 JOISTS GENERALLY
- Centres: Equal, and not exceeding designed spacing.
- Bowed joists: Installed with positive camber.
- End joists: Positioned approximately 50 mm from masonry walls.

786 JOISTS ON HANGERS
- Hangers: Bedded directly on and hard against supporting construction. Do not use packs or bed on mortar.
- Joists: Cut to leave not more than 6 mm gap between ends of joists and back of hanger. Rebated to lie flush with underside of hangers.
- Fixing to hangers: A nail in every hole.

795 TRIMMING OPENINGS
- Trimmers and trimming joists: When not specified otherwise, not less than 25 mm wider than general joists.

850 INSPECTION GENERALLY
- Structural timber-work: Give reasonable notice before covering up.

860 BOLTED JOINTS INSPECTION
- Timing: Inspect all accessible bolts at the end of the Defects Liability Period and tighten if necessary.

K10 Plasterboard dry linings/ partitions/ ceilings

30 METAL STUD PARTITIONS
- Manufacturer: British Gypsum.
  - Product reference: Gypframe.
- Stud types: 94C50 Floor and ceiling channels and 92S50 'C' Studs.
  - Centres: 600mm.
- Insulation: Isover Acoustic Roll.
  - Recycled content: Not applicable.
- Linings: One layer 12.5 mm Gyproc SoundBloc plasterboard.
  - Recycled content: Not applicable.
  - Screw centres: 300 mm generally, reduced to 200 mm at external angles.
- Finishing: Seamless jointing.
  - Primer/ Sealer: Primer to painted areas.

  Accessories: Metal beads/ stops recommended by board manufacturer.

65 DRY LINING GENERALLY
- General: Use fixing, jointing, sealing and finishing materials, components and installation methods recommended by board manufacturer.
- Plasterboards: To BS EN 520.
- Cutting plasterboards: Neatly and accurately without damaging core or tearing paper facing. Minimize cut edges.
- Two layer boarding: Stagger joints between layers.
- Finishing: Neatly to give flush, smooth, flat surfaces free from bowing and abrupt changes of level.

69 INSTALLING BEADS/ STOPS
- Cutting: Neatly using mitres at return angles.
- Fixing: Securely using longest possible lengths, plumb, square and true to line and level, ensuring full contact of wings with substrate.
- Finishing: After joint compounds/ plasters have been applied, remove surplus material while still wet from surfaces of beads exposed to view.

70 ADDITIONAL SUPPORTS
- Framing: Accurately position and securely fix to give full support to:
  - Partition heads running parallel with, but offset from main structural supports.
  - Fixtures, fittings and services.
  - Board edges and lining perimeters.

87 SEALING GAPS AND AIR PATHS
- Sealing: Apply sealant to perimeter abutments and around openings as a continuous bead with no gaps.

90 SEAMLESS JOINTING
- Filling and taping: Fill joints, gaps and internal angles with jointing compound and cover with continuous lengths of tape, fully bedded.
- Finishing: Feather out jointing compound to give a flush, smooth, seamless surface.
- Nail/ screw depressions and minor indents: Fill to give a flush surface.

K45 Suspended ceiling system alterations

12 EXISTING SUSPENDED CEILING SYSTEM To be adapted as part of the erection of the partitions

- Structure over: Concrete.
- Ceiling type: Exposed grid with mineral fibre infill units.
  - Manufacturer: Determine on site.

  Product reference: Determine on site.

62 EXECUTION GENERALLY

- Designated ceiling system components: Remove carefully without affecting surrounding areas.
- Disposal of removed components: Set aside for reuse.
- Retained components: Do not distort or damage.
- Reuse of ceiling system components:
  - Condition: Undamaged, free from distortion, clean.
  - Units and boards: Match adjacent areas where appropriate.
- Cutting units, boards and components: Cut neatly and accurately. Maintain edge profiles.

  Openings: Suit sizes and edge details of fittings.

65 SETTING OUT

- General: Maintain ceiling system accurately, continuous, even, and jointed at regular intervals. Provide level soffits free from undulations, lipping and distortions in grid members.
- Infill units, access units, integrated services: Fit and align correctly.
- Minimum size for edge and perimeter infill units: Half standard width or length where practicable.
- Grid: Position to suit infill unit sizes. Allow for permitted deviations from nominal sizes.
- Infill joints and exposed suspension members: Straight, aligned and parallel to walls or setting out lines.

67 INSTALLING SUSPENSION

- Fixing:
  - Angle or strap hangers: Do not rivet for top fixing.
  - Wire hangers: Tie securely at top with tight bends to loops to prevent vertical movement.
- Installation:
  - Alignment: Vertical or near vertical without bends or kinks.
  - Maintain straight, with suitable tension and without bends or kinks.
  - Do not allow hangers to press against fittings, services and insulation covering ducts and pipes.
- Obstructions: Where obstructions prevent vertical installation, either:
  - brace diagonal hangers against lateral movement; or
  - hang ceiling system on an appropriate rigid sub-grid bridging across obstructions and supported to prevent lateral movement.
- Extra hangers: Provide as required to carry additional loads.

71 INTEGRATED SERVICES

- General: Position services accurately, support adequately. Align and level in relation to the ceiling. Alterations must not diminish performance of ceiling system.
- Reaction to fire rating of additional supporting material: Match ceiling material.
- Services outlets:
  - Supported by ceiling system: Provide additional hangers.

  Independently supported: Provide flanges to support altered ceiling system.

L20 Doors/ shutters/ hatches

10 TIMBER PROCUREMENT

- Timber (including timber for wood-based products): Obtained from well-managed forests and/ or plantations in accordance with:
  - The laws governing forest management in the producer country or countries.
  - International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).
- Documentation: Provide either:
  - Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied.
  - Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood-based products.
- Certification scheme: UK Timber procurement policy Category A evidence certification scheme..
- Other evidence: None.

20 WOOD FLUSH DOORS Acoustic doors to office

- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Facings: Maple Hardwood veneer.
- Lippings: Exposed lippings to long edges.
- Preservative treatment: Not required.
- Finish as delivered: Full factory finish.
- Glazing/ Infill details: Clear single glazing to meet acoustic requirements of minimum 45RwdB's.
  - Manifestation: Not required.
  - Beading: Bolection beading.
- Thermal performance (U-value maximum): Manufacturer's standard.
- Other requirements: Acoustic rating of miniumu 45RwdB.

20A WOOD FLUSH DOORS To Office

- Manufacturer: Submit proposals as per SoW.
  - Product reference: Submit proposals.
- Facings: Hardwood veneer.
- Lippings: Exposed lippings to long edges.
- Preservative treatment: Not required.
- Finish as delivered: Full factory finish.
- Glazing/ Infill details: Clear single glazing.
  - Manifestation: Not required.
  - Beading: Not required.
- Thermal performance (U-value maximum): Manufacturer's standard.
- Other requirements: None.

50 WOOD DOOR FRAMES AND ARCHITRAVES

- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Species: European whitewood.
- Preservative treatment: Not required.
- Finish as delivered: Full factory finish.
- Perimeter seals: Acoustic.
- Thermal performance: Manufacturer's standard.

- Fixing: Plugged and screwed.
  - Spacing of fixings (frames not predrilled): Maximum 150 mm from ends of each jamb, adjacent to each hanging point and at 600 mm maximum centres.

50A WOOD DOOR FRAMES To Office Circulation Doors

- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Species: European whitewood.
- Preservative treatment: Not required.
- Finish as delivered: Full factory finish.
- Perimeter seals: Fire and smoke seal.
- Thermal performance: Manufacturer's standard.
- Fixing: Plugged and screwed.
  - Spacing of fixings (frames not predrilled): Maximum 150 mm from ends of each jamb, adjacent to each hanging point and at 600 mm maximum centres.

70 FIRE AND SMOKE RESISTANCE

- Requirement: Specified performance to be the minimum period attained when tested for integrity in accordance with BS 476-22, BS EN 1634-1 or BS EN 1634-3.
- Components and assemblies will be marked to the relevant product standard and/ or third party certification rating.

75 FIRE RESISTING/ SMOKE CONTROL DOORS/ DOORSETS

- Gaps between frames and supporting construction: Filled as necessary in accordance with door/ doorset manufacturer's instructions.

85 FIXING IRONMONGERY GENERALLY

- Fasteners: Supplied by ironmongery manufacturer.
  - Finish/ Corrosion resistance: To match ironmongery.
- Holes for components: No larger than required for satisfactory fit/ operation.
- Adjacent surfaces: Undamaged.
- Moving parts: Adjusted, lubricated and functioning correctly at completion.

L40 General glazing

GENERAL REQUIREMENTS

111 PREGLAZING
- Preglazing of components: Permitted.
- Prevention of displacement: Submit details of precautions to be taken to protect glazing and compound/ seals during delivery and installation.
- Defective/ displaced glazing/ compound/ seals: Reglaze components in situ.

150 WORKMANSHIP GENERALLY
- Glazing generally: To BS 6262.
- Integrity: Glazing must be wind and watertight under all conditions with full allowance made for deflections and other movements.
- Dimensional tolerances: Panes/ sheets to be within ± 2 mm of specified dimensions.
- Materials:
  - Compatibility: Glass/ plastics, surround materials, sealers, primers and paints/ clear finishes to be used together to be compatible. Avoid contact between glazing panes/ units and alkaline materials such as cement and lime.
  - Protection: Keep materials dry until fixed. Protect insulating glass units and plastics glazing sheets from the sun and other heat sources.

152 PREPARATION
- Surrounds, rebates, grooves and beads: Clean and prepare before installing glazing.

155 GLASS GENERALLY
- Standards: To BS 952 and relevant parts of:
  - BS EN 572 for basic soda lime silicate glass.
  - BS EN 1096 for coated glass.
  - BS EN 1748-1 for borosilicate glass.
  - BS EN 1748-2 for ceramic glass.
  - BS EN 1863 for heat strengthened soda lime silicate glass.
  - BS EN 12150 for thermally toughened soda lime silicate safety glass.
  - BS EN 12337 for chemically strengthened soda lime silicate glass.
  - BS EN 13024 for thermally toughened borosilicate safety glass.
  - BS EN ISO 12543 for laminated glass and laminated safety glass.
- Panes/ sheets: Clean and free from obvious scratches, bubbles, cracks, rippling, dimples and other defects.
  - Edges: Generally undamaged. Shells and chips not more than 2 mm deep and extending not more than 5 mm across the surface are acceptable if ground out.

180 BEAD FIXING WITH PINS
- Pin spacing: Regular at maximum 150 mm centres, and within 50 mm of each corner.
- Exposed pin heads: Punched just below wood surface.

181 BEAD FIXING WITH SCREWS
- Screw spacing: Regular at maximum 225 mm centres, and within 75 mm of each corner.

520 FIRE RATING

- Assessment of capability: Submit proposed construction details of designated items to a UKAS/ NAMAS accredited laboratory or other approved authority for assessment of capability of achieving specified fire ratings.
  - Test standard: To BS EN 1364-1.
- Assessment/ test results and reports: Submit immediately they are available, and before installing glazing.
- Designated items: FD30 and FD60 doors.

875 GROUTING

M50 Rubber/ plastics/ cork/ lino/ carpet tiling/ sheeting

15 CARPET TILING To areas previously carpeted areas As per schedule of works
- Base: Existing concrete floor.
  - Preparation: Remove existing carpeting.
- Fabricated underlay: N/A.
- Carpet tiles to BS EN 1307: Cut pile.
  - Manufacturer: Interface.
    Product reference: Heuga 725.
  - Recycled content: 100% (minimum) to BS EN ISO 14021.
  - Size: 500 x 500 mm.
  - Colour/ pattern: Graphite.
- Method of laying: Fully adhere all tiles with release adhesive recommended by tile manufacturer..

45 EXISTING FLOOR COVERING REMOVED
- Substrate: Clear of covering and as much adhesive as possible. Skim with smoothing compound to give smooth, even surface.

60 SETTING OUT TILES
- Method: Set out from centre of area/ room so that wherever possible:
  - Tiles along opposite edges are of equal size.
  - Edge tiles are more than 50% of full tile width.

65 LAYING COVERINGS
- Base/ substrate condition: Rigid, dry, smooth, free from grease, dirt and other contaminants.
- Use a primer where recommended by adhesive manufacturer. Allow to dry thoroughly.
- Adhesive: As specified, as recommended by covering manufacturer or, as approved.
- Conditioning of materials prior to laying: As recommended by manufacturer.
- Environment: Before, during and after laying, provide adequate ventilation and maintain temperature and humidity approximately at levels which will prevail after building is occupied.
- Finished coverings: Accurately fitted, tightly jointed, securely bonded, smooth and free from air bubbles, rippling, adhesive marks, stains, trowel ridges and high spots.

85 WASTE
- Spare covering material: Retain suitable material for patching. On completion submit pieces for selection. Hand over selected pieces to Employer.

210 WORKMANSHIP GENERALLY
- Base condition after preparation: Rigid, dry, sound, smooth and free from grease, dirt and other contaminants.
- Finished coverings: Accurately fitted, tightly jointed, securely bonded, smooth and free from air bubbles, rippling, adhesive marks and stains.

330 COMMENCEMENT
- Required condition of works prior to laying materials:
  - Building is weathertight and well dried out.

- Wet trades have finished work.
- Paintwork is finished and dry.
- Conflicting overhead work is complete.
- Floor service outlets, duct covers and other fixtures around which materials are to be cut are fixed.

• Notification: Submit not less than 48 hours before commencing laying.

340 CONDITIONING

• Prior to laying: Condition materials by unpacking and separating in spaces where they are to be laid. Maintain resilient flooring rolls in an upright position. Unroll carpet and keep flat on a supporting surface.
• Conditioning time and temperature (minimum): As recommended by manufacturer with time extended by a factor of two for materials stored or transported at a temperature of less than 10°C immediately prior to laying.

350 ENVIRONMENT

• Temperature and humidity: Before, during and after laying, maintain approximately at levels which will prevail after building is occupied.
• Ventilation: Before during and after laying, maintain adequate provision.

PREPARING BASES

410 NEW BASES

• Suitability of bases and conditions within any area: Commencement of laying of coverings will be taken as acceptance of suitability.

420 EXISTING BASES

• Notification: Before commencing work, confirm that existing bases will, after preparation, be suitable to receive coverings.
• Suitability of bases and conditions within any area: Commencement of laying of coverings will be taken as acceptance of suitability.

470 BASES FROM WHICH EXISTING FLOOR COVERINGS HAVE BEEN REMOVED

• Substrate: Clear of covering and as much adhesive as possible. Skim with smoothing underlayment compound to give smooth, even surface.

M60 Painting/ clear finishing

10 EMULSION PAINT To the locations identified on the tender drawings
- Manufacturer: Dulux.
  - Product reference: Diamond Matt.
- Surfaces: All surfaces identified on the tender drawings.
  - Preparation: Tape and fill joints and Wash down all surfaces.
- Initial coats: As recommended by manufacturer.
  - Number of coats: One.
- Undercoats: N/A.
  - Number of coats: N/A.
- Finishing coats: Diamond matt.
  Number of coats: Two.

12 GLOSS PAINT To internal timber
- Manufacturer: Dulux.
  - Product reference: Gloss.
- Surfaces: Previously decorated and new timber.
  - Preparation: Degrease and provide key and Remove existing gloss paint.
- Initial coats: N/A.
  - Number of coats: 0.
- Undercoats: Dulux undercoat.
  - Number of coats: One.
- Finishing coats: Full gloss.
  - Number of coats: Two.

30 PREPARATION GENERALLY
- Standard: In accordance with BS 6150.
- Refer to any pre-existing CDM Health and Safety File and CDM Construction Phase Plan where applicable.
- Risk assessment and method statement for hazardous materials: Prepare for operations, disposal of waste, containment and reoccupation, and obtain approval before commencing work.
- Preparation materials: Types recommended by their manufacturers and the coating manufacturer for the situation and surfaces being prepared.
- Substrates: Sufficiently dry in depth to suit coating.
- Efflorescence salts, dirt, grease and oil: Remove.
- Surface irregularities: Provide smooth finish.
- Organic growths and infected coatings:
  - Remove with assistance of biocidal solution.
  - Apply residual effect biocidal solution to inhibit regrowth.
- Joints, cracks, holes and other depressions: Fill with stoppers/ fillers. Provide smooth finish.
- Dust, particles and residues from preparation: Remove and dispose of safely.
- Doors, opening windows and other moving parts:
  - Ease, if necessary, before coating.
  - Prime resulting bare areas.

32 PREVIOUSLY COATED SURFACES GENERALLY

- Preparation: In accordance with BS 6150, clause 11.5.
- Contaminated or hazardous surfaces: Give notice of:
  - Coatings suspected of containing lead.
  - Substrates suspected of containing asbestos or other hazardous materials.
  - Significant rot, corrosion or other degradation of substrates.
- Risk assessment and method statement for hazardous materials: Prepare for operations, disposal of waste, containment and reoccupation, and obtain approval before commencing work.
- Removing coatings: Do not damage substrate and adjacent surfaces or adversely affect subsequent coatings.
- Loose, flaking or otherwise defective areas: Carefully remove to a firm edge.
- Alkali affected coatings: Completely remove.
- Retained coatings:
  - Thoroughly clean.
  - Gloss coated surfaces: Provide key.
- Partly removed coatings: Apply additional preparatory coats.
- Completely stripped surfaces: Prepare as for uncoated surfaces.

37 WOOD PREPARATION

- General: Provide smooth, even finish with lightly rounded arrises.
- Degraded or weathered surface wood: Take back surface to provide suitable substrate.
- Degraded substrate wood: Repair with sound material of same species.
- Heads of fasteners: Countersink sufficient to hold stoppers/ fillers.
- Resinous areas and knots: Apply two coats of knotting.
- Defective primer: Take back to bare wood and reprime.

43 PLASTER PREPARATION

- Nibs, trowel marks and plaster splashes: Scrape off.
- Overtrowelled 'polished' areas: Provide suitable key.

61 COATING GENERALLY

- Application standard: In accordance with BS 6150, clause 9.
- Conditions: Maintain suitable temperature, humidity and air quality.
- Surfaces: Clean and dry at time of application.
- Thinning and intermixing: Not permitted unless recommended by manufacturer.
- Priming coats: Apply as soon as possible on same day as preparation is completed.
- Finish:
  - Even, smooth and of uniform colour.
  - Free from brush marks, sags, runs and other defects.
  - Cut in neatly.
- Doors, opening windows and other moving parts: Ease before coating and between coats.

N10 General fixtures/ furnishings/ equipment

EXECUTION

710 MOISTURE CONTENT OF WOOD AND WOOD BASED BOARDS
- Temperature and humidity: During delivery, storage, fixing and to handover maintain conditions to suit specified moisture contents of timber components.
- Testing: When instructed, test components with approved moisture meter to manufacturer's recommendations.

720 INSTALLATION GENERALLY
- General: As Preliminaries section A33.
- Fixing and fasteners: As section Z20.
- Services: As sections S12 and V90.

770 TRIMS
- Lengths: Wherever possible, unjointed between angles or ends of runs.
- Running joints: Where unavoidable, obtain approval of location and method of jointing.
- Angle joints: Mitred.

COMPLETION

910 GENERAL
- Doors and drawers: Accurately aligned, not binding. Adjusted to ensure smooth operation.
- Ironmongery: Checked, adjusted and lubricated to ensure correct functioning.

920 APPLIANCES
- Test: Ensure that all functions and features work correctly.
- Documentation: Submit guarantees, instruction manuals, etc.

P12 Fire stopping systems

EXECUTION

620 WORKMANSHIP GENERALLY
- Gaps: Seal gaps between building elements and services, to provide fire resistance and resist the passage of smoke.
- Adjacent surfaces: Prevent overrun of sealant or mortar on to finished surfaces.

650 INSTALLING FIRE STOP LAMINATE
- Fitting of strips: Compress strips and fit into gap so that, as they decompress, the strips wedge themselves in the void.
- Shrink wrapping: Not applicable.
- Joints:
  - Ends of strips: Fit intumescent 'end piece' at both ends of run of fire stop laminate.

  Joints between strips: Fit two intumescent 'end pieces' at each butt joint.

660 APPLYING INTUMESCENT FOAM
- New joints: Remove builder's debris, mortar droppings, grease, and other contaminants.
- Old joints: Clean and remove existing sealant from each joint.
- Priming: Lightly moisten substrate with water.
- Application: Fill joint to approximately half its depth, and allow foam to expand to face of joint.
- Trimming: Trim excess foam to give a neat, flush appearance.

745 APPLYING SEALANTS GENERALLY
- Application: As section Z22.

COMPLETION

910 CLEANING
- Masking tapes: Remove.
- Cleaning: Clean off splashes and droppings. Wipe down finishes.

P20 Unframed isolated trims/ skirtings/ sundry items

10 SOFTWOOD Skirtings

- Quality of wood and fixing: To BS 1186-3.
  - Species: European whitewood .
  - Class: 3.
- Moisture content at time of fixing: 9 -13%.
- Preservative treatment: Not required.
- Fire rating: Not applicable.
- Profile: To match existing.
  - Finished size: To match existing.
- Finish as delivered: Natural.
- Fixing: Plugged, and screwed at 450 centres.

80 INSTALLATION GENERALLY

- Joinery workmanship: As section Z10.
- Metal workmanship: As section Z11.
- Methods of fixing and fasteners: As section Z20.
- Straight runs: To be in one piece, or in long lengths with as few joints as possible.
- Running joints: Location and method of forming to be agreed where not detailed.
- Joints at angles: Mitre, unless shown otherwise.
- Position and level: To be agreed where not detailed.

P21 Door/ window ironmongery

6 SINGLE AXIS DOOR HINGES To new doors
- Standard: To BS EN 1935.
  - Hinges to doors on escape routes and fire/ smoke control doors: CE marked.
- Manufacturer: Submit proposals .
  - Product reference: Submit proposals .
- Type: Double ball bearing butt .
- Size: submit proposal .
- Material/ finish: Satin stainless steel, grade 1.4301 (304) .
- Hinge grade: Minimum 12 .
- Other requirements: N/A .

12 OVERHEAD DOOR CLOSERS To new doors
- Standard: To BS EN 1154.
  - Devices to fire/ smoke control doors: CE marked.
- Manufacturer: Submit proposals .
  - Product reference: Submit proposals .
- Power size: Adjustable 2-6 .
- Other functions: Back check .
- Casing finish: Satin Stainless Steel .
- Operational adjustment:
  - Variable power: Matched to size, weight and location of doors. Fully closing latched doors and holding unlatched doors closed.
  - Closing against smoke seals of fire doors: Positive. No gaps.

24 DOOR LOCKS To doors
- Standard: To BS EN 12209.
- Manufacturer: Submit proposals .
  - Product reference: Submit proposals
- Type: Eurocylinder .
- Backset: As required .
- Material/ finish: Satin stainless Steel .
- Keying: In master keyed suite .

38 LEVER HANDLES To New doors
- Standard: To BS EN 1906.
- Manufacturer: Submit proposals .
  - Product reference: Submit proposals .
- Style: Round pattern with return to door .
- Size: 20 mm diameter .
- Material/ finish: Satin stainless steel, grade 1.4301 (304) .
- Mounting: Sprung rose .

42 PULL HANDLES To New Circulation Doors
- Standard: To BS 8424.

- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Shape: D handle.
- Diameter: 25 mm.
- Distance between centres: 225 mm.
- Material/ finish: Satin stainless steel, grade 1.4301 (304).
- Mounting: Bolt through.

44 PUSH PLATES To New Circulation Doors

- Manufacturer: Submit proposals .
  - Product reference: Submit proposals .
- Size: 325 x 75 mm .
- Material/ finish: Satin stainless steel, grade 1.4301 (304) .
- Mounting: Face fix .

46 KICK PLATES To New Doors

- Manufacturer: Submit proposals .
  - Product reference: Submit proposals .
- Size: 900 x 150 mm .
- Material/ finish: Satin stainless steel, grade 1.4301 (304) .
- Mounting: Face fix .

48 ESCUTCHEONS To Locks

- Manufacturer: Submit proposals .
  - Product reference: Submit proposals .
- Material/ finish: Satin stainless steel, grade 1.4301 (304) .
- Keyhole type: Euro profile cylinder .

50 DOOR STOPS To all New Doors

- Manufacturer: Submit proposals .
  - Product reference: Submit proposals .
- Type: Wall mounted, face fixed, SAA finish, 75 mm projection .

S90 Hot and cold water supply systems - domestic

SYSTEM PERFORMANCE

PRODUCTS

30 DEZINCIFICATION

- Fittings, pipelines, equipment located below ground or in concealed or inaccessible locations: Resistant to dezincification, e.g. gunmetal.

50 COPPER PIPELINES FOR GENERAL USE

- Standard: To BS EN 1057, Kitemark certified.
- Temper: Half hard R250.
- Finish: Plain.
  - Colour: Natural.
- Wall thickness (nominal):
  - OD 6, 8, 10 and 12 mm: 0.6 mm.
  - OD 15 mm: 0.7 mm.
  - OD 22 and 28 mm: 0.9 mm.
  - OD 35 and 42 mm: 1.2 mm.
- Jointing:
  - Chromium plated: Type A compression fittings to BS EN 1254-2, chromium plated.
  - Plain: Integral lead free solder ring capillary fittings to BS EN 1254-1, Kitemark certified.
  - Plastics coated: Type A compression fittings to BS EN 1254-2.
- Connections to appliances and equipment: Select from:
  - Compression fittings: To BS EN 1254-2, Kitemark certified.
  - Fittings with threaded ends: To BS EN 1254-4.
- Supports: Compatible with pipe material.

55 INSULATION TO PIPELINESFOR HOT AND COLD WATER SUPPLY

- Material: Mineral fibre split tube.
- Function: Heat loss control and protection from freezing.
- Thermal conductivity: 0.035 W/m·K.
- Emissivity: Low.
- Thickness (minimum): To BS 5422, Tables 19 and 20 and in accordance with 'TIMSA guidance for achieving compliance with Part L of the Building Regulations', Table 6.1.1.
- Fire performance: Class 1 spread of flame when tested to BS 476-7.

60 VALVES GENERALLY

- Types: Approved for the purpose by local water supply undertaker and of appropriate pressure and/ or temperature ratings.
- Control of valves: Fit with handwheels for isolation and lockshields for isolation and regulation of circuits or equipment.

EXECUTION

70 INSTALLATION GENERALLY

- Installation: To BS EN 806-4.
- Performance: Free from leaks and the audible effects of expansion, vibration and water hammer.
- Fixing of equipment, components and accessories: Fix securely, parallel or perpendicular to the structure of the building.
- Preparation: Immediately before installing tanks and cisterns on a floor or platform, clear the surface completely of debris and projections.
- Corrosion resistance: In locations where moisture is present or may occur, provide corrosion resistant fittings/ fixings and avoid contact between dissimilar metals by use of suitable washers, gaskets, etc.

71 INSTALLING CISTERNS

- Outlet positions: Connect lowest outlets at least 30 mm above bottom of cistern.
- Access: Fix cistern with a minimum clear space of 350 mm above, or 225 mm if the cistern does not exceed 450 mm in any dimension.

72 INSTALLING WARNING/ OVERFLOW PIPES TO CISTERNS

- Difference (minimum) between normal water level and overflow level:
  - Cold water storage cisterns: The greater of 32 mm or the bore of warning pipe.
  - Feed and expansion cisterns: Sufficient to allow 20% increase in the volume of water in the tank, plus 25 mm.
- Vertical distance (minimum) of water supply inlet above overflow level: Bore of warning pipe.
- Fall (minimum): 1 in 10.
- Installation: Support to prevent sagging. Terminate pipes separately in prominent positions with turned down ends. Turn down within the cistern. Terminate 50 mm below normal water level.
- Insulation: Insulate within the building where the pipe is in an uninsulated space and subject to freezing.

73 INSTALLING VENT PIPES OVER CISTERNS

- Route: Install with no restrictions or valves and rising continuously from system connection to discharge over cistern.
- Internal diameter (minimum): 20 mm.

79 PIPELINES INSTALLATION

- Appearance: Install pipes straight, and parallel or perpendicular to walls, floors, ceilings, and other building elements.
- Pipelines finish: Smooth, consistent bore, clean, free from defects, e.g. external scratching, toolmarks, distortion, wrinkling, and cracks.
- Concealment: Generally conceal pipelines within floor, ceiling and/ or roof voids.
- Access: Locate runs to facilitate installation of equipment, accessories and insulation and allow access for maintenance.
- Arrangement of hot and cold pipelines: Run hot pipelines above cold where routed together horizontally. Do not run cold water pipelines near to heating pipelines or through heated spaces.
- Electrical equipment: Install pipelines clear of electrical equipment. Do not run pipelines through electrical enclosures or above switch gear distribution boards or the like.
- Insulation allowance: Provide space around pipelines to fit insulation without compression.

80 PIPELINES FIXING

- Fixing: Secure and neat.
- Joints, bends and offsets: Minimize.
- Pipeline support: Prevent strain, e.g. from the operation of taps or valves.
- Drains and vents: Fix pipelines to falls. Fit draining taps at low points and vents at high points.
- Thermal expansion and contraction: Allow for thermal movement of pipelines. Isolate from structure. Prevent noise or abrasion of pipelines caused by movement. Sleeve pipelines passing through walls, floors or other building elements.
- Dirt, insects or rodents: Prevent ingress.

82 SUPPORTS FOR PIPELINES

- Spacing for copper pipelines: Fix securely and true to line at the following maximum centres:
  - 15 and 22 mm pipe OD: 1200 mm horizontal, 1800 mm vertical.
  - 28 and 35 mm pipe OD: 1800 mm horizontal, 2400 mm vertical.
  - 42 and 54 mm pipe OD: 2400 mm horizontal, 3000 mm vertical.
- Spacing for thermoplastics pipelines: Fix securely and true to line at the following maximum centres:
  - Up to 16 mm pipe OD: 300 mm horizontal, 500 mm vertical.
  - 17-25 mm pipe OD: 500 mm horizontal, 800 mm vertical.
  - 26-32 mm pipe OD: 800 mm horizontal, 1000 mm vertical.
- Additional supports: Locate within 150 mm of connections, junctions and changes of direction.

83 PIPELINE SPACING

- Clearance (minimum) to face of wall-fixed pipes or pipe insulation:
  - From floor: 150 mm.
  - From ceiling: 50 mm.
  - From wall: 15 mm.
  - Between pipes: 25 mm.
  - From electrical conduit, cables, etc: 150 mm.

84 JOINTS IN PIPELINES

- Copper pipelines:
  - Preparation: Cut pipes square. Remove burrs.
  - Joints: Neat, clean and fully sealed. Install pipe ends into joint fittings to full depth.
  - Bends: Do not use formed bends on exposed pipework, except for small offsets. Form changes of direction with radius fittings.
  - Adaptors for connecting dissimilar materials: Purpose designed.
  - Substrate and plastics pipes and fittings: Do not damage, e.g. by heat when forming soldered joints.
  - Flux residue: Clean off.
- Capillary joints in plastics coated pipelines.
  - Plastics coating: Do not damage, e.g. by direct or indirect heat. Wrap completed joint (when cool) with PVC tape of matching colour, half lapped.
- Thermoplastics pipelines:
  - Standard: Fusion jointing in accordance with WIS 4-32-08.
  - Fittings and accessories for joints: Purpose designed.
  - Preparation: Cut pipes square. Remove burrs.
  - Joints: Neat, clean and fully sealed. Install pipe ends into joint fittings to full depth. Compression fittings: Do not overtighten.

85 PIPELINES ENTERING BUILDINGS
- Depth: Lay pipes at least 750 mm below finished ground level.
- Pipelines rising into building within 750 mm of the external face of the external wall or passing through a ventilated void below floor level: Insulate from finished floor level to 600 mm beyond external face of building.
- Ends of pipeducts: Seal both ends to a depth of at least 150 mm.

86 INSTALLING INSULATION TO PIPELINES
- Standard: In accordance with BS 5970.
- Cold water pipelines: Insulate in unheated spaces. Insulate potable cold water pipelines.
- Hot water pipelines: Insulate, except for short lengths in prominent positions next to appliances.
- External supply pipelines exposed to air or less than 750 mm below finished ground level: Insulate.
- Appearance: Fix securely and neatly. Make continuous over fittings and at supports. Leave no gaps. Locate split on 'blind' side of pipeline.
- Timing: Fit insulation after testing.

87 INSTALLING INSULATION TO CISTERNS
- Standard: In accordance with BS 5970.
- General: Fix securely to sides and top of cisterns. Leave no gaps.
- Access cover: Allow removal of cover with minimum disturbance to insulation.
- Underside of cistern: Insulate where exposed in unheated spaces.

88 INSTALLING VALVES
- Isolation and regulation valves: Provide on equipment and subcircuits.
- Access: Locate where valves can be readily operated and maintained and next to equipment which is to be isolated.
- Connection to pipework: Fit with joints to suit the pipe material.

COMPLETION

90 FLUSHING AND FILLING
- Standard: To BS EN 806-4.

91 SYSTEM DISINFECTION
- Disinfection: To BS EN 806-4.

92 TESTING
- Standard: To BS EN 806-4.
  - Notice (minimum): 3 days.
- Preparation: Secure and clean pipework and equipment. Fit cistern and tank covers.
- Leak testing: Start boiler and run the system until all parts are at normal operating temperatures and then allow to cool to cold condition for a period of 3 h.
- Pressure testing: At both hot and cold conditions joints, fittings and components must be free from leaks and signs of physical distress when tested for at least 1 h as follows:
  - Systems fed directly from the mains, and systems downstream of a booster pump: Apply a test pressure equal to 1.5 times the maximum pressure to which the installation or relevant part is designed to be subjected in operation.
  - Systems fed from storage: Apply a test pressure equal to the pressure produced when the storage cistern is filled to its normal maximum operating level.
  - Inaccessible or buried pipelines: Carry out hydraulic pressure test to twice the working pressure.

93 COMMISSIONING
- Standard: To BS EN 806-4.
- Equipment: Check and adjust operation of equipment, controls and safety devices.
- Outlets: Check operation of outlets for satisfactory rate of flow and temperature.

94 TESTING SERVICE PIPELINES
- Test method: Disconnect from the mains, fill with potable water, exclude air, and apply at least twice the working pressure for 1 h.
- Test criterion: No leakage.

95 DOCUMENTATION
- Manufacturers' operating and maintenance instructions: Submit for equipment and controls.
- System operating and maintenance instructions: Submit for the system as a whole giving optimum settings for controls.
- Record drawings: Submit drawings showing the location of circuits and operating controls.

96 OPERATING TOOLS
- Tools: Supply tools for operation, maintenance and cleaning purposes.
- Valve keys: Supply keys for valves and vents.

97 LABELS
- Valve labels: Provide labels on isolating and regulating valves on primary circuits, stating their function.

V90 Electrical systems

20 DESIGN OF LOW VOLTAGE ELECTRICAL INSTALLATION GENERALLY
- Design and detailing: Complete for the electrical installation.
- Standards: In accordance with BS 7671 and the requirements of the electricity distributor.
- Design information: Submit calculations, manufacturer's literature and drawings showing equipment positions and routes.

21 DESIGN OF LOW VOLTAGE INCOMING SUPPLY
- Design and detailing: Complete for the low voltage incoming supply.
- Capacity: Determine the anticipated maximum demand of the installation.
- Establishing the supply: Manage and liaise with the electricity distributor to establish an incoming electricity supply.
- Electricity supplier: TBC .
- Liaise with the electricity supplier, complete an application for supply of electricity and manage installation of metering equipment.
- Incoming earthing arrangement: Establish with the electricity distributor.
- Location: Coordinate the location of the incoming supply and establish the spatial requirements for the electricity distributor's equipment and metering.

23 LV DISTRIBUTION SYSTEM DESIGN

- Design: To cater for the complete working building.
- Spare capacity: 5% of connected electrical load .
- Equipment: Provide electrical supplies to equipment requiring power.

24 DESIGN OF GENERAL LIGHTING SYSTEM

- Purpose: To allow for any adaptations to the lighting system for the erection of new partition walls.
- Design and detailing: Complete for the general lighting system.
- Standard: To SLL 'Code for lighting'.
- Room: Family Rooms 1 and 2 and associated office space.
  - Maintained average illuminance: As existing.
  - Controls: Each room to be individually controlled by a rocker switch.
- Maintenance: Submit proposals for the maintenance/ relamping regime.

26 DESIGN AND LIGHTING CALCULATIONS

- Design: Complete for the following lighting systems: General.
- Proposals: Submit drawings, technical information, calculations and manufacturers' literature.
- Lighting calculations:
  - Type: Computer generated point calculations.
- Submit the following:
  - Luminaire layout drawings.
  - Luminaire photometric data including flux fraction ratios and polar intensity curves.
  - Lamp technical information.
  - Maintenance factor calculations, including proposals for luminaire maintenance and lamp replacement.
  - Isolux contour plots for the working plane.
  - Schedule of design and calculated maintained average illuminance values. Schedule of design and calculated uniformity values.

27 SMALL POWER SYSTEM DESIGN
- Purpose: For all amendments and adaptations of the small power system to enable the proposed layout of the power outlets as per Drawing 2019.00022.001 T07.
- Small power outlets: Provide to serve the building and its equipment.
- Room: Throughout the proposed work area.
  - Outlets: Twin socket outlet to each desk.
- Fixed equipment: Provide supplies.

PRODUCTS

30 PRODUCTS GENERALLY
- Standard: To BS 7671.
- CE Marking: Required.

33 CABLE TRAYS To carry any additional cable runs required to meet the proposed small power layout on Drawing 2019.00022.001 T07
- Standard: To BS EN 61537.
- Manufacturer: Contractor's choice .
  - Product reference: Contractor's choice .
- Accessories and fittings: Factory made of the same material type, pattern, finish and thickness as cable tray.

36 CABLE TRUNKING AND DUCTING To carry any additional cable runs required to meet the proposed small power layout on Drawing 2019.00022.001 T07
- Standards: To BS EN 50085-1 and BS EN 50085-2-1 for walls and ceilings.

39 CABLES
- Approval: British Approvals Service for Cables (BASEC) certified.
- Cable sizes not stated: Submit proposals and calculations.

40 PROTECTIVE CONDUCTORS
- Type: Cable conductors with yellow/ green sheath.

41 ELECTRICAL ACCESSORIES To all areas
- Standards:
  - Generally: To BS 5733.
  - Switches: To BS EN 60669-1.
- Manufacturer: Contractor's choice .
  - Product reference: Contractor's choice .
- Finish: White plastic .
- Mounting: Surface .

EXECUTION

60 GENERAL EXECUTION
- Standard: In accordance with BS 7671.

63 INSTALLING CONDUIT AND FITTINGS

- Fixing: Fix securely. Fix boxes independently of conduit.
- Drainage outlets: Locate at lowest points in conduit installed externally, and where condensation may occur.
- Location: Position vertically and horizontally in line with equipment served, and parallel with building lines. Locate where accessible.
- Jointing:
  - Number of joints: Minimize.
  - Lengths of conduit: Maximize.
  - Cut ends: Remove burrs, and plug during building works.
  - Movement joints in structure: Manufactured expansion coupling.
  - Threaded steel conduits: Tightly screw to ensure electrical continuity, with no thread showing.
  - Conduit connections to boxes and items of equipment, other than those with threaded entries: Earthing coupling/ male brass bush and protective conductor.
- Changes of direction: Site machine-formed bends, junction boxes and proprietary components. Do not use elbows or tees. Alternatively, use conduit boxes.
  - Connections to boxes, trunking, equipment and accessories: Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.

64 INSTALLING TRUNKING AND DUCTING

- Positioning: Accurate with respect to equipment served, and parallel with other services and, where relevant, floor level and other building lines.
- Access: Provide space encompassing cable trunking to permit access for installing and maintaining cables.
- Jointing:
  - Number of joints: Minimize.
  - Lengths of trunking: Maximize.
  - Steel systems: Mechanical couplings. Do not weld. Fit a copper link at each joint to ensure electrical continuity.
- Movement: Fix securely. Restrain floor mounted systems during screeding.
- Junctions and changes of direction: Proprietary jointing units.
- Cable entries: Fit grommets, bushes or liners.
- Internal fire barriers: Provide to maintain integrity of fire compartment.
- Protection: Fit temporary blanking plates. Prevent ingress of screed and other extraneous materials.
- Service outlet units: Fit when cables are installed.

66 CABLE ROUTES

- Cables generally: Conceal wherever possible.
  - Concealed cable runs to wall switches and outlets: Align vertically with the accessory.
- Exposed cable runs: Submit proposals.
  - Orientation: Straight, vertical and/ or horizontal and parallel to walls.
- Distance from other services running parallel: 150 mm minimum.
  - Heating pipes: Position cables below.

68 INSTALLING ELECTRICAL ACCESSORIES AND EQUIPMENT

- Location: As drawing Drawing 2019.00022.001 T07
- Arrangement: Coordinate with other wall or ceiling mounted equipment.
- Positioning: Accurately and square to vertical and horizontal axes.
- Alignment: Align adjacent accessories on the same vertical or horizontal axis.
- Mounting: Surface .
- Mounting heights (finished floor level to underside of equipment or accessory): Submit proposals .

70 INSTALLING FINAL CONNECTIONS

- Size: Determine.
- Cable: Heat resisting white flex.
- Length: Allow for equipment removal and maintenance.

74 EQUIPMENT LABELLING

- Electrical equipment: Install labels indicating purpose.
- Voltage warning notices:
  - Location: Apply to equipment when the voltage exceeds 230 V.
  - Format: To BS EN ISO 7010 W012, include warnings of the voltage present.
- Distribution boards: Card circuit chart within a reusable clear plastic cover. Fit to the inside of each unit. Include typed information identifying the outgoing circuit references, their device rating, cable type, size, circuit location and details. Label each outgoing way corresponding to the circuit chart.
- Sub-main cables: Label at both ends, with circuit reference using proprietary cable marker sleeves.

78 FINAL FIX

- Accessory faceplates, luminaires and other equipment: Fit after completion of building painting.

79 CLEANING

- Electrical equipment: Clean immediately before handover.
- Equipment not supplied but installed under the electrical works: Clean immediately before handover.

COMPLETION

85 INSPECTION AND TESTING GENERALLY

- Standard: In accordance with BS 7671.
- Notice before commencing tests (minimum): 24 hours.
- Labels and signs: Fix securely before system is tested.
- Certificates: Submit.
  Number of copies: 1.

Z10 Purpose made joinery

110 FABRICATION

- Standard: To BS 1186-2.
- Sections: Accurate in profile and length, and free from twist and bowing. Formed out of solid unless shown otherwise.
  - Machined surfaces: Smooth and free from tearing, wooliness, chip bruising and other machining defects.
- Joints: Tight and close fitting.
- Assembled components: Rigid. Free from distortion.
- Screws: Provide pilot holes.
  - Screws of 8 gauge (4 mm diameter) or more and screws into hardwood: Provide clearance holes.
  - Countersink screws: Heads sunk at least 2 mm below surfaces visible in completed work.
- Adhesives: Compatible with wood preservatives applied and end uses of timber.

120 CROSS SECTION DIMENSIONS OF TIMBER

- General: Dimensions on drawings are finished sizes.
- Maximum permitted deviations from finished sizes:
  - Softwood sections: To BS EN 1313-1:-
    Clause 6 for sawn sections.
  - Hardwood sections: To BS EN 1313-2:-
    Clause 6 for sawn sections.
    Clause NA.3 for further processed sections.

130 PRESERVATIVE TREATED WOOD

- Cutting and machining: Completed as far as possible before treatment.
- Extensively processed timber: Retreat timber sawn lengthways, thicknessed, planed, ploughed, etc.
- Surfaces exposed by minor cutting and/ or drilling: Treat as recommended by main treatment solution manufacturer.

140 MOISTURE CONTENT

- Wood and wood based products: Maintained within range specified for the component during manufacture and storage.

210 LAMINATED PLASTICS VENEERED BOARDS/ PANELS

- Fabrication: To British Laminated Plastics Fabricators Association Ltd (BLF) fabricating standards.
- Balancing veneer: From decorative veneer manufacturer and of similar composition. Applied to reverse side of core material.
- Finished components: Free from defects, including bow, twist, scratches, chipping, cracks, pimpling, indentations, glue marks, staining and variations in colour and pattern.
- Joints visible in completed work: Tight butted, true and flush.

220 WOOD VENEERED BOARDS/ PANELS

- Core material and veneers: Conditioned before bonding.
- Setting out: Veneer features and grain pattern aligned regularly and symmetrically unless instructed otherwise.
- Balancing veneer: Applied to reverse side of core material.
  - Moisture and temperature movement characteristics: As facing veneer.
- Veneer edges: Tight butted and flush, with no gaps.
- Tolerance of veneer thickness (maximum): ± 0.5 mm.
- Finished components: Free from defects, including bow, twist, scratches, chipping, splits, blebs, indentations, glue marks and staining.
- Surface finish: Fine, smooth, free from sanding marks.

250 FINISHING

- Surfaces: Smooth, even and suitable to receive finishes.
  - Arrises: Eased unless shown otherwise on drawings.
- End grain in external components: Sealed with primer or sealer as section M60 and allowed to dry before assembly.

Z20 Fixings and adhesives

PRODUCTS

310 FASTENERS GENERALLY
- Materials: To have:
  - Bimetallic corrosion resistance appropriate to items being fixed.
  - Atmospheric corrosion resistance appropriate to fixing location.
- Appearance: Submit samples on request.

320 PACKINGS
- Materials: Noncompressible, corrosion proof.
- Area of packings: Sufficient to transfer loads.

330 NAILED TIMBER FASTENERS
- Nails:
  - Steel: To BS 1202-1 or BS EN 10230-1.
  - Copper: To BS EN 1202-2.
  - Aluminium: To BS 1202-3.

340 MASONRY FIXINGS
- Light duty: Plugs and screws.
- Heavy duty: Expansion anchors or chemical anchors.

350 PLUGS
- Type: Proprietary types to suit substrate, loads to be supported and conditions expected in use.

360 ANCHORS
- Types:
  - Expansion: For use in substrate strong enough to resist forces generated by expansion of anchor.
  - Adhesive or chemical:
    For use in substrate where expansion of anchor would fracture substrate.
    For use in irregular substrate where expansion anchors cannot transfer load on anchor.
  - Cavity: For use where the anchor is retained by toggles of the plug locking onto the inside face of the cavity.

370 WOOD SCREWS
- Type:
  - Wood screws (traditional pattern).
    Standard: To BS 1210.
    - Wood screws.
      Pattern: Parallel, fully threaded shank or twin thread types.
- Washers and screw cups: Where required are to be of same material as screw.

380 MISCELLANEOUS SCREWS
- Type: To suit the fixing requirement of the components and substrate.
  - Pattern: Self-tapping, metallic drive screws, or power driven screws.
- Washers and screw cups: Where required to be of same material as screw.

390 ADHESIVES GENERALLY
- Standards:
  - Hot-setting phenolic and aminoplastic: To BS 1203.
  - Thermosetting wood adhesives: To BS EN 12765.
  - Thermoplastic adhesives: To BS EN 204.

410 POWDER ACTUATED FIXING SYSTEMS
- Types of fastener, accessories and consumables: As recommended by tool manufacturer.

EXECUTION

610 FIXING GENERALLY
- Integrity of supported components: Select types, sizes, quantities and spacings of fixings, fasteners and packings to retain supported components without distortion or loss of support.
- Components, substrates, fixings and fasteners of dissimilar metals: Isolate with washers/ sleeves to avoid bimetallic corrosion.
- Appearance: Fixings to be in straight lines at regular centres.

620 FIXING THROUGH FINISHES
- Penetration of fasteners and plugs into substrate: To achieve a secure fixing.

630 FIXING PACKINGS
- Function: To take up tolerances and prevent distortion of materials and components.
- Limits: Do not use packings beyond thicknesses recommended by fixings and fasteners manufacturer.
- Locations: Not within zones to be filled with sealant.

640 FIXING CRAMPS
- Cramp positions: Maximum 150 mm from each end of frame sections and at 600 mm maximum centres.
- Fasteners: Fix cramps to frames with screws of same material as cramps.
- Fixings in masonry work: Fully bed in mortar.

650 NAILED TIMBER FIXING
- Penetration: Drive fully in without splitting or crushing timber.
- Surfaces visible in completed work: Punch nail heads below wrot surfaces.
- Nailed timber joints: Two nails per joint (minimum), opposed skew driven.

660 SCREW FIXING
- Finished level of countersunk screw heads:
  - Exposed: Flush with timber surface.
  - Concealed (holes filled or stopped): Sink minimum 2 mm below surface.

670 PELLETED COUNTERSUNK SCREW FIXING
- Finished level of countersunk screw heads: Minimum 6 mm below timber surface.
- Pellets: Cut from matching timber, match grain and glue in to full depth of hole.
- Finished level of pellets: Flush with surface.

680 PLUGGED COUNTERSUNK SCREW FIXING
- Finished level of countersunk screw heads: Minimum 6 mm below timber surface.
- Plugs: Glue in to full depth of hole.
- Finished level of plugs: Projecting above surface.

690 USING POWDER ACTUATED FIXING SYSTEMS

- Powder actuated fixing tools: To BS 4078-2 and Kitemark certified.
- Operatives: Trained and certified as competent by tool manufacturer.

700 APPLYING ADHESIVES

- Surfaces: Clean. Adjust regularity and texture to suit bonding and gap filling characteristics of adhesive.
- Support and clamping during setting: Provide as necessary. Do not mark surfaces of or distort components being fixed.
- Finished adhesive joints: Fully bonded. Free of surplus adhesive.

Z22 Sealants

EXECUTION

610 SUITABILITY OF JOINTS

- Presealing checks:
  - Joint dimensions: Within limits specified for the sealant.
  - Substrate quality: Surfaces regular, undamaged and stable.
- Joints not fit to receive sealant: Submit proposals for rectification.

620 PREPARING JOINTS

- Surfaces to which sealant must adhere:
  - Remove temporary coatings, tapes, loosely adhering material, dust, oil, grease, surface water and contaminants that may affect bond.
  - Clean using materials and methods recommended by sealant manufacturer.
- Vulnerable surfaces adjacent to joints: Mask to prevent staining or smearing with primer or sealant.
- Backing strip and/ or bond breaker installation: Insert into joint to correct depth, without stretching or twisting, leaving no gaps.
- Protection: Keep joints clean and protect from damage until sealant is applied.

630 APPLYING SEALANTS

- Substrate: Dry (unless recommended otherwise) and unaffected by frost, ice or snow.
- Environmental conditions: Do not dry or raise temperature of joints by heating.
- Sealant application: Fill joints completely and neatly, ensuring firm adhesion to substrates.
- Sealant profiles:
  - Butt and lap joints: Slightly concave.
  - Fillet joints: Flat or slightly convex.
- Protection: Protect finished joints from contamination or damage until sealant has cured.

Section 3

Schedule of Works

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
1.00	**GENERALLY**				
1.01	The Contractor is to include and price all works shown on the drawings and enclosed within the specification noted below. No additional costs will be accepted for any omissions.				
1.02	**The works are to be carried out in strict accordance with the specification documents and the Contractor's attention is drawn to this and the relevant clauses in the general Works Information including Preambles section.**				
1.03	The Contractor shall carry out the works specified without inconvenience, nuisance and without danger to the occupants of the building.				
1.04	Disruption to the building and its staff must be kept to an absolute minimum. The rest of the building contains offices for The Olive School staff.				
1.05	The Contractor must programme all works to achieve completion within the designated Contract Period. The contractor must provide the CA with a contract programme at tender return.				
1.07	The Employer will not accept any claim from the Contractor for working outside the hours defined in order to complete the whole of the works within the Contract Period.				
1.08	Where materials are specified by Manufacturer's name, a full set of the Manufacturer's instructions are to be retained on site and it is the Main Contractor's responsibility to ensure that these are strictly observed at all times. Bring to the attention of the CA any discrepancy between the specification, and any instructions that are contrary to the Manufacturer's recommendations.				
1.09	The Contractor must also bring to the attention of the Manufacturer/material supplier immediately, any discrepancy between the materials supplied, the manufacture's literature or site conditions.				
1.10	The Contractor shall include for giving all formal notices including for scaffolds/ works to public highways etc as may be required from time to time and for obtaining the necessary consents from the Enforcing Authority, Statutory Undertakers, Public Bodies and Owners of adjacent properties and land.				
1.11	The Contractor shall alone be responsible for the serving of such notices and obtaining consents as no claim arising from a delay in either of giving notice or receiving consent will be accepted.				
1.12	The Contractor shall indemnify the Employer against all third party claims emanating from the work.				
1.13	The Employer and CA reserves the right to amend or omit the final scope of any items of the works by instruction. No claims for loss, expense or delay shall be allowed in connection with the issue of any such instructions.				
1.14	The contractor should allow for the carrying out a Photographic schedule of condition of the existing welfare available on site this should be provided to the CA before works start on site. The Contractor is to ensure that once works are completed all areas are left clean and any damage to these areas are made good at the cost of the contractor, any repairs carried out must be to the CA satisfaction				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
1.15	The contractor should make allowances for there being no parking available at the site.				
1.16	The playing of music/ radios is not permitted in any areas of the buildings and mobile telephones should be used for business purposes only. The contractors staff and visitors should maintain a smart appearance and the name of the company should be displayed at all times.				
1.17	Smoking is only permitted in designated areas and is not permitted in the contractors vans etc.				
1.18	The contractor shall ensure that all requirements to control the noise, vibration and dust levels and other potential nuisances produced by his operations on site required under or by virtue of any enactment or regulation, or the working rules of any industry, are strictly complied with.				
2.00	**SUPERVISION**				
2.01	Allow for maintaining the same full time WORKING Foreman / Site Manager on site for the FULL duration of the works to effectively programme labour and resources and receive instructions from the Employers delegate.				
2.02	The site foreman is to remain the same throughout the duration of the works, be experienced in this type of work, be responsible for supervision and control of these works and able to programme resources accurately and to effectively monitor and co-ordinate sub-contractors and suppliers. The contractor's supervisory foreman on site may be a working foreman if sufficiently proficient to perform the role and suitably qualified, experienced and fully briefed on the whole project and its specific health and safety requirements.				
2.03	Prior to starting on site, the main contractor must provide **'out of hours' (24 hours a day, 7 days a week) emergency contact numbers - mobile telephones with answer machine service,** for the contracts manager and site foreman and these personnel must be in a position to attend site within a reasonable period of time to deal with any event which poses a threat to the office buildings as a result of the works.				
2.04	The Site Foreman is to be suitably qualified in first aid appropriate for the type of work being undertaken and should be carried out in accordance with First Aid at Work: The Health & Safety (First Aid) Regulations 1981.				
2.05	Ensure all site operatives have an appropriate current and validated CSCS card.				
3.00	**SAFETY**				
	CDM Regulations				
3.01	The Contractor is to allow for acting as 'Principal Contractor' as defined by the CDM Regulations 2015 and must include for all specific requirements detailed in the preliminary clauses of this specification and the Pre-Construction Information Pack (PIP) issued as part of these tender documents.				
3.02	It is to be noted that the Certificate of Practical Completion will not be issued by the CA until the Principal Designer has confirmed receipt of a satisfactorily completed Health & Safety file from the 'Principal Contractor' to include but not limited to:				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
	— Record drawings and Schedule of Equipment — Operation and Maintenance manuals for specific items of equipment; — Blank maintenance logs, where appropriate				
	Site Compound				
3.03	All materials and equipment are to be stored on site during the course of the contract. Any additional areas will be agreed during the pre-start meeting but will generally be within close proximity of the works.				
4.00	**PHASING/SECURITY**				
4.01	All work, including setting up and dismantling access equipment, must be undertaken within specified times to suit the occupier's movement. No equipment, plant and material are to be left within the surrounding areas where they may cause obstruction at any time.				
4.02	It will be the Contractor's responsibility to ensure that the site remains secure during the course of the project when work is not being undertaken.				
4.03	All operatives on site must be provided with, and display at all times, an identification badge which is to include a current photograph of the operative, the operative's name, signature and company name within a sealed waterproof casing. **Failure by individuals to comply will result in expulsion from site.**				
4.04	The Contractor is to ensure that the buildings and sites are left secure at the end of each working day. The foreman for the work should be in attendance at the end of each working day and must ensure that agreed security measures have been carried out.				
4.05	It should be noted that works are to be undertaken **During normal working hours**. This is deemed to be Monday to Friday from 8.30 until 17.30. The contractor can work these hours to suit in line with the programme. Noisy works restrictions (although there will be some flexibility offered). •Before 9am •After 4pm				
5.00	**CHECK DIMENSIONS**				
5.01	All dimensions given in the descriptions and drawings are approximate and the Contractor, his Sub-Contractors and suppliers must examine the existing buildings on site to ascertain the full extent of the works and take all necessary dimensions before preparing a tender.				
6.00	**SPECIFICATION AND DRAWINGS**				
6.01	**The contract drawings and all sections of the specification are to be read as a whole. Any areas of work shown or described on the drawings but omitted in the specification, and vice versa are to be included by the Contractor in his tender.**				
6.02	**No claim shall be allowed in respect of misinterpretation of any item, neither shall lack of knowledge or ignorance of standards or conditions be accepted as justification for such a claim. All queries must be directed to the Employers delegate at Tender stage.**				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
7.00	**INSPECT THE SITE**				
7.01	The Contractor must visit each of the sites and fully acquaint himself with all aspects of the work whether explicitly referred to in the specification or not. He must also satisfy himself as to the facilities for access and storage of materials, plant, etc., and other site conditions. No claims will be entertained as a result of his failure to do so.				
7.02	A mid tender site visit will take place during the tender period at a time arranged by the Employer / CA. All contractors must ensure they are available to attend.				
8.00	**STANDARDS**				
8.01	Where reference is made to the British Standards Specification and the British Standards Code of Practice, the latest revision will apply. Where no particular standards are available, the materials are to be to the best of their respective kinds and to the approval of the Contract Administrator.				
9.00	**PROTECTION**				
	The works				
9.01	Allow for protecting, taking off, temporarily supporting and fixing upon completion, any cables or services running adjacent to areas of work.				
9.02	The Contractor is to allow for providing adequate protection to all surfaces, finishes and equipment at all times, including all access circulation, stairwells and lifts that may be used to deliver plant and materials to the works area.				
9.03	Materials noted to be taken down or otherwise removed for “reuse” should be carefully stored on site, protected from damage or theft and re-fixed as described. Any damage caused to materials removed for “reuse” shall be made good entirely at the expense of the Contractor. Unless otherwise specifically permitted and described, no materials arising from these works shall be used in the finished works.				
9.04	All materials stored on site shall be adequately protected from the elements during the course of the works. At no time will the Contractor leave stored materials unprotected overnight.				
9.05	At no time will the Contractor leave any exposed works unprotected overnight. Any damage to internal finishes, furnishing, fittings or coverings shall be the sole responsibility of the Contractor and will be required to be made good to the satisfaction of the CA.				
9.06	The Contractor must make good, at his own expense, any damage to the property of the Employer, caused as a result of the works, which damage could have been reasonably foreseen and prevented.				
9.07	The Contractor is to allow for maintaining the security of all the buildings during the course of the works.				
9.08	All descriptions are to include for making good to walls, adjacent areas and other disturbed surfaces where appropriate.				
10.00	**Welfare Facilities**				
10.01	The Employer will provide welfare facilities for personnel which will comprise of the following:- i) Toilet facilities for operatives with washing facilities ii) An area within the site for a site office iii) Canteen facilities				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
	iii) Storage areas are to be agreed at the pre-contract meeting				
10.02	The contractor should allow for undertaking a clean of all communal office areas at the end of each shift. These are to be used by other tenants during working hours and therefore should be used and respected as such.				
11.00	**SITE SET UP**				
11.01	The contractor will be responsible for the security of all plant, equipment and materials within the site compound and building, and should take all steps and actions necessary to safeguard and prevent theft from these areas.				
11.02	Due to the location of the property, there will be no space available for a skip. The contractor is therefore to make an allowance for wait and load.				
11.03	Supply and install the signage as necessary and dictated by the CA or H&S executive on the perimeter fencing and other areas as required around the main building; which includes: 1) 'CONSTRUCTION SITE - KEEP OUT' Ref:21475 RG MR 2) 'HARD HATS MUST BE WORK ON THIS SITE AT ALL TIMES' Ref: 21540 RG MR 3) 'CHILDREN MUST NOT PLAY ON THIS SITE' Ref:21478 RG MR 4) ALL OTHER SIGNAGE AS NECESSARY, DICTATED BY Employers delegate OR HEALTH & SAFETY EXECUTIVE				
11.04	All signage should be fixed on solid backing boards and secured to prevent removal, or accidental mis-positioning.				
11.05	The Contractor will be responsible for the security of all plant, equipment and materials within the site compound, the property and should take all steps and actions necessary to safeguard and prevent that from these areas.				
12.00	**RECYCLING OF STRIP OUT, CAVATED AND WASTE MATERIALS**				
12.01	The contractor and all sub contractors and suppliers should make all reasonable efforts and attempts to effectively recycle strip out and waste materials arising from this project.				
12.02	As a minimum, the Employers and CA would expect to see the following materials, created as strip out or waste materials, recycled to either a Local Authority or Private local recycling centre located within the district or Authority where the project is being carried out: Plastics Wood Plasterboard Glass Bricks, blocks and tiles Waste packaging materials Concrete, demolition rubble and soils Metals				
12.03	To assist you in planning your approach to recycling construction materials on this project we have enclosed, a series of 'How to?' guides published by WRAP (Waste and Resources Action Programme).				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
	These are: Guide 1 – Introduction to Recycling and Waste Management Guide 2 – How to segregate, re-use and recycle plastics Guide 3 – How to segregate, re-use and recycle wood Guide 4 – How to segregate and recycle plasterboard Guide 5 – How to segregate and recycle glass Guide 6 – How to segregate, re-use and recycle bricks and tiles Guide 7 – How to segregate and recycle waste packaging materials Guide 8 – How to segregate, re-use and recycle concrete, demolition rubble and soils How to re-use, reclaim and recycle construction materials on site – A guide for site Engineers, Agents and Foremen				
12.04	In order to assist in encouraging site operatives in actively embracing site recycling, will ensure a Site Poster, as produced by WRAP, will be displayed on site.				
12.05	A series of site labourers prompt cards, as produced by WRAP, are to be provided to assist in the education of site operatives and their understanding of what materials can be recycled.				
12.06	Contractors should assess at tender stage the potential proportion of materials which can be recycled from this project and plan accordingly for materials recycling, allowing provision within the tender return for segregation of materials and waste and the necessary skipping processes to allow this.				
12.07	The contractor is to indicate below the potential percentage of recyclable materials, from overall strip out materials and site waste on this project:				

Materials	**Potential Recyclable %**
Plastics	
Wood	
Plasterboard	
Glass	
Bricks, blocks and tiles	
Waste packaging materials	
Concrete, demolition rubble and soils	
Metals	

12.08	The contactor should provide details of the Local Authority or Private recycling centre he intends to use for this project: Proposed Site: Contact Details:				
12.09	The contractor is to provide at PC to the CA, certification from the above recycling centre of what materials and volumes were recycled on this project.				
	Further general information on Materials and Waste recycling can be obtained from: **WRAP** Waste & Resources Action Programme The Old Academy 21 Horse Fair Banbury Oxon OX16 0AH **Helpline:** 0808 100 2040 **Switchboard:** 01295 819 900				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £

Fax: 01295 819 911
Email: info@wrap.org.uk

13.00 USE OF SUSTAINABLE AND RECYCLED MATERIALS

13.01 Wherever possible the designer has considered the use and specification of sustainable materials and recycled materials in this project.

13.02 Where specific materials have not been specified and have been left to 'Contractors Choice', the contractor and all sub contractors should make all reasonable efforts and attempts to procure and utilise materials from sustainable sources and also products made from recycled materials.

13.03 The contractor should schedule below these materials and manufacturer to allow the Employers delegate to verify acceptance of their use in this project.

Material	Manufacturer

14.00 DISCLOSURE & BARRING SERVICE (CRB) CHECKS

Contractor Responsibilities

14.01 The Contractors must comply with the principles set out in:

- The Department for Education guidance: 'Keeping Children Safe in Education' (April 2014).
- Disclosure and Barring Service (DBS & former CRB): Policy and Guidance, and
- The Independent Safeguarding Authority: The Vetting and Barring Scheme Guidance, October 2009

Contractor Responsibilities – Before the contractor starts work

14.02 The contractor **'must'** provide the Contract Administrator with a **'Method Statement in Respect of Enhanced DBS (CRB) Checks When Working Adjacent to an Occupied School'** at least 14 days before works commence on site.

14.03 The contractor **'must'** supply the Contract Administrator with confirmation that all key contractor representatives on site are in receipt of a satisfactory Enhanced DBS (CRB) check. As a minimum this should include but not limited to:

- All Senior Staff Likely to Visit Site,
- Contract Manager(s),
- Quantity Surveyor(s),
- Site Manager(s),
- Principle Representatives from Key Sub-contractor(s),

14.04 The contractor **'must'** provide the Contract Administrator with a **'Central Register' and 'Letter of Assurance'** for all contractor staff who have undertaken an Enhanced CRB Check at least 14 days before works commence on site.

Name and Role
Anticipated Start Date

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
	Enhanced DBS (CRB) Clearance Received				
14.05	The contractor **'must'** throughout the contract period keep the Contract Administrator informed of key staff changes at least 14 days before works commence.				
14.06	In exceptional circumstances, where 14 days notice has not been given, the contractor may subject to CA Approval commence work on site, however, when requested the contractor would need to be able to provide that all reasonable efforts have been taken to provide the CA with the required notice.				
	Contractor Responsibilities – Non DBS (CRB) Checked Staff.				
14.07	Where a DBS (CRB) check is required, if the contractor is unable to provide an employee who has received the results of their disclosure (e.g. in cases of sickness absence or emergency repairs), then the contractor must notify the CA in advance of assigning a DBS (CRB) non-vetted individual to site. The contractor must receive approval from the CA before committing such an employee to work and the client made aware that the individual does not have a DBS (CRB) check so that the required safeguards can be put in place.				
	N.B. To safeguard themselves, contractor staff should 'not' agree to be unsupervised if they have not been DBS (CRB) checked.				
	Contractor Responsibilities – Positive DBS (CRB) Disclosures				
14.08	If a contractor wishes to assign an employee who has received a positive enhanced DBS (CRB) check that discloses a criminal background or history, then they must refer the matter to the CA for consideration and sign off at least 14 days before works commence on site.				
	Contractor Responsibilities – Identity Cards				
14.09	The Contractor must supply all contract staff with a company identity card which should, as a minimum, contain the following information: • Full Name (except in cases with special dispensation). • A statement confirming whether the individual has been DBS (CRB) checked. • Photo (where the card does not have a photo, the individual must have photo identification with them to enable verification of their identity).				
14.10	**All** contract staff must clearly display their identity card at all times. Failure to display an identity card when requested or presenting to work will result in contract staff not being permitted site access.				
14.11	In all instances where an ID card does not confirm whether the individual has been enhanced DBS (CRB) checked, contract staff must have written confirmation from the contractor organisation, on contractor headed paper, that an enhanced DBS (CRB) check has been undertaken. Without this information, the CA/ Client will assume that a check has not been completed and the contract staff will be asked to leave site.				
14.12	The contractor is to note that no resulting claims for loss of time will be accepted by the CA where non-compliance with any of the clause(s) detailed above or for the cost and time entailed in obtaining such approvals.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
14.13	When agreeing a potential start on site date the contractor shall programme and include critical dates in respect to the submission and receipt of all contractor and sub-contractor enhanced DBS (CRB) checks prior to work commencing on site. No claims for loss or damages arising for the non-execution of this element will be accepted under the contract.				
15.00	**MAKING GOOD**				
15.01	All descriptions are to include for making good to surface finishes, adjacent areas and other disturbed surfaces whether specific references are made or not and making good to all disturbed surfaces in every instance is to match the existing finishes.				
16.01	**THE WORKS**				
16.02	The works comprise of the internal refurbishment of the ground floor of 32 St John's Church Road (Admin House) as shown on ***AHR Drawing T003-Proposed Plan*.** The refurbishment works include but are not limited to the remodel of the ground floor office/ reception area. Works will include the strip out of existing partition walls, erection of new walls to create a new layout, new doors installed, and M&E layout adapted to suit. A new bespoke reception hatch will be built with workstation/desks and shelving to be installed. Externally, a new main entrance door set will be relocated on the inside face of the wall. A new wider door to match the existing is to be installed. First floor timber sash windows are to be replaced with new like for like windows with double glazed safety glazing. A new pathway is to be installed into the main entrance of Admin House to improve wheelchair access. New signage is to be installed on to the front elevation of both Admin House and 2-4 Clapton Road. Adjustments will also be made to an area of paving outside Admin house.				
16.03	The works are to be carried out in strict accordance with the preliminaries and preambles sections of the specification and the Contractors attention is drawn to these sections.				
16.04	Materials are to be used in strict accordance with the manufacturer's printed instructions and recommendations.				
17.00	**ASBESTOS**				
17.01	A 'Demolition and Refurbishment' survey is to be arranged by the contractor prior to works commencing on site and a copy of the report issued to the Contract Administrator.				
17.02	Where asbestos containing materials are subsequently discovered/disturbed during the course of the works, all works within that area are to be stopped immediately and the CA informed. The removal of asbestos containing materials are to be undertaken by a competent and licensed asbestos removal contractor as necessary and disposed of as licensed waste in accordance with 'Work with Asbestos Insulation, Asbestos Coatings and Asbestos Insulating Board' (Fourth Edition), ' Approved Code of Practice and Guidance' L28. HSE Books.				
17.03	Asbestos containing materials should not be disturbed / damaged / fixed into during the course of the works.				
17.04	The Contractor is to ensure that appropriate Asbestos Awareness training is provided to all site operatives as part of the site induction.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
18.00	**TEMPORARY WORKS**				
18.01	The Contractor is to allow for all protection of existing floor finishes whilst undertaking the work. Protective sheeting can be supplied by Florprotec (T-Board), or similar and approved. The contractor will be responsible for taking up and disposing of all temporary protection on completion of the works.				
18.02	The Contractor is to allow for the segregation of the work space from the other areas of the building whilst undertaking the work. Protective sheeting can be supplied by Protec Zip-Wall, or similar and approved. The contractor will be responsible for taking up and disposing of all temporary protection on completion of the works.				
19.00	**STRIP OUT WORKS**				
19.01	Strip out works to be completed in line with ***AHR Drawing T002 - Strip Out Works.***				
19.02	Existing trunking denoted in ***AHR Drawing T002 - Strip Out Works*** is to be removed and disposed of. The remainder is to be kept for reuse. Where electrical sockets, communication or similar devices exist in a wall to be removed, remove associated existing wire back to its source.				
19.03	3No. existing radiators to be removed and set aside for reuse and relocation. 1no radiators to be retained.				
19.04	3No. Pin Boards to be removed and set aside for reuse and relocation.				
19.05	Existing whiteboard to be removed and set aside for reuse and relocation.				
19.06	Existing door D0.01 (As per ***AHR Drawing T002 - Strip Out Works***) to be removed and disposed of. Hardware to be retained for reuse on new door.				
19.07	2No. doors to existing interview/meeting room to be removed and disposed of (D1.02 & D1.03 - As per ***AHR Drawing T002 - Strip Out Works)***. Hardware to be set aside and retained for reuse on new doors.				
19.08	Existing wall partitions to Interview/ Meeting Room to be demolished. In addition to indicated partitions, remove attached millwork, wall base and reception fitted desk. Patch existing partitions, flooring and ceiling as needed. Prep for new finishes.				
19.09	Reception desk to be removed and disposed of.				
19.10	5No. suspended light fittings to be removed and set aside for reuse. 1 No suspended light fitting to removed and disposed of. 3 No recessed downlights to be retained.				
19.11	Main Entrance door and associated hardware to be removed and disposed of (D0.04 - As per ***AHR Drawing T001 - Strip Out Works***)				
19.12	Main Entrance door frame and fanlight to be removed and disposed of.				
19.12	Existing carpet tiles to be carefully lifted and stored ready to be re-laid to suit new layout.				
19.13	The existing main entrance pathway between gateway and front door is to be carefully broken out and removed from site.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
20.00	**NEW WALL PARTITIONS**				
20.01	Allow for the erection of new partitioning as shown on ***AHR Drawing T003 - Proposed Plan.*** Allow to construct new partitions from Gypframe 72 FEC 50 Folded Edge Standard Floor and Ceiling Channel and Gypframe 70 S 50 'C' Studs at 600mm centres. Floor channel to be installed into the solid floor and ceiling channel to be appropriately fixed into the existing bulkheads. All partitions to be installed in line with the manufacturers recommendations and Preambles Clause K10.				
20.02	Linings to be 1 x Layer 18mm Plywood (inner) and 1 x Layer 12.5mm Plasterboard (Outer). Boards should be staggered in accordance with Gyproc's current installation guidance. Joints should be treated in accordance with the Gyproc paper joint tape method. Plasterboard to be fixed back to metal framing with Gyproc Drywall Screws at 300mm centres (200mm centres at external corners) and screws must maintain a 10mm penetration through metal framework all in accordance with the manufacturers recommendations and Preambles Clause K10.				
20.03	Allow for filling and taping all internal angles, joints and gaps with jointing compound and cover with continuous lengths of tape, fully bedded as per Preambles Clause K10. Feather out jointing compound to give a flush, smooth, seamless surface.				
20.04	Allow for one coat of Gyproc Drywall Primer in accordance with manufacturers recommendations and leave ready for decoration.				
20.05	Allow for sealing the perimeter to both sides of the newly erected partition with Gyproc Sealant, applied in accordance with the manufacturers recommendations and Preambles Clause K10.				
21.00	**NEW DOORS - Contractor's Designed Portion**				
	The contractor must note that all dimensions provided are indicative and the contractor must measure the required door sizes prior to procurement. The CA will not entertain additional costs as a result of the contractor not undertaking the required measures.				
21.01	**D0.01** ***(As per AHR Drawing T003 - Proposed Plan)*** New single door to match existing. Including: door vision panel, door stop, door frame and architrave. Fitted with retained hardware. Fitted within existing structural opening. Access control required: Fob access both sides of door and to be interfaced with fire alarm. Doors to be Equality Act compliant. Door to be finished in veneer to match existing and are to be approved by the CA prior to works commencing. Doors to incorporate a Vision Panel Standard FD30S. All works to be in accordance with the manufacturers recommendations and Preambles Clause L20.				
21.02	**D0.02 - Reception/ Office (As per AHR Drawing T003 - Proposed Plan)** New single door to match existing including door vision panel, door stop, door frame and architrave. Fitted with existing hardware. Access control required: to be key access, thumb turn on the inside. Doors to be Equality Act compliant. Door to be finished in veneer to match existing and are to be approved by the CA prior to works commencing.. All works to be in accordance with the manufacturers recommendations and Preambles Clause L20.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
21.03	**D0.03** (***As per AHR Drawing T003 - Proposed Plan)*** New single door to match existing including: door vision panel, door stop, door frame and architrave. Fitted with retained hardware. Access control required: Fob access both sides of door and to be interfaced with fire alarm. Doors to be Equality Act compliant. Door to be finished in veneer to match existing and are to be approved by the CA prior to works commencing. All works to be in accordance with the manufacturers recommendations and Preambles Clause L20.				
21.04	**D0.04** ***(As per AHR Drawing T003 - Proposed Plan)*** - Details provided below under Item **32.00: NEW MAIN ENTRANCE DOOR.**				
21.05	All glazing to comply with Part M of Building Regulations for disabled visibility. Glazed vision panels as shown on drawing, and as defined in Approved Document M2 of the current edition of the Building Regulations to be toughened glass. Toughened glazing to BS 6206.				
22.00	**VISITOR'S RECEPTION DESK - Contractor's Designed Portion** **The contractor must note that all dimensions provided are indicative and the contractor must measure the required sizes prior to procurement. The CA will not entertain additional costs as a result of the contractor not undertaking the required measures.**				
22.01	The contractor is to complete the design of, supply and install the visitor's reception desk. The contractor is to use the employer's requirements listed below and as shown on ***AHR Drawing T004 - Visitor Reception Hatch*** to finalise the design and provide full construction/ design details following being appointed for the works. The contractor is to allow for their required programme at tender stage to incorporate time periods for providing their design proposal, client sign off and lead in times for materials.				
22.02	**Employer's Requirements for Reception Hatch:**				
22.03	Aluminium 2 panel sliding configuration hatch with toughened safety glass and secure latch. To be DDA compliant. Latch to be barrier hatch glass sliding door kit or equivalent other. Fixed glazing panel to installed to the right of sliding panels.				
22.04	Timber reveal around perimeter of reception area.				
22.05	Raised desk area below fixed glazing panel to provide a writing area for visitors. Timber to match reveal. Area below desk to sit proud of other wall finishes and be painted in Star Dark Grey 26BB 10/088.				
22.06	DDA compliant timber shelf fixed below sliding hatches to provide a writing area for visitors. To be the same timber as above.				
22.07	Sign in screen to be provided by the school and set into timber reveal. Reveal to be painted STAR Dark Grey 26BB 10/088				
22.08	Linings to partitions to be 1 x Layer 18mm Plywood (inner) and 1 x Layer 12.5mm Plasterboard (Outer).				
22.09	Plywood lining be installed to reception desk underneath timber reveal. Wall to be STAR Dark Grey 26BB 10/088 behind.				
23.00	**NEW JOINERY**				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
23.01	**Workstation Desk - CONTRACTORS DESIGNED PORTION**				
23.02	The contractor is to complete the design of, supply and install 2No. Office desks as shown on ***AHR drawing T003 - Proposed Plan.*** The contractor is to use the employers requirements listed below and as shown on ***AHR drawing T003 - Proposed Plan*** to finalise the design and provide full construction/ design details following appointment. The contractor is to allow for their programme to incorporate time periods for providing their design proposal, client sign off and lead in times for materials.				
23.03	Workstations are to be 600mm deep and incorporate sufficient grommets for office equipment.				
23.04	Workstations are to be fully supported by a timber bearer fixed to the wall and sufficient support along the front edge. Works to be in accordance with Preambles Clause G20, Z10 and Z20.				
23.05	Workstations to be finished in timber veneer, to match visitor's reception				
23.06	**Shelving - CONTRACTOR's DESIGN PORTION**				
23.07	The contractor is to complete the design of, supply and install 4No. 300mm deep floating shelves as shown on ***AHR drawing T003 - Proposed Plan*** . The contractor is to finalise the design and provide full construction/ design details following appointment. The contractor is to allow for their programme to incorporate time periods for providing their design proposal, client sign off and lead in times for materials. Shelves to match timber of visitor's reception desk. Allow for appropriate fixings into the substrates. Client to provide details of intended uses of shelves and max load capacity. Works to be in accordance with Preambles Clause G20, Z10 and Z20.				
23.08	**Main Entrance Doorframe - CONTRACTOR's DESIGN PORTION**				
23.09	The contractor is to complete the design of, supply and install a new bespoke door frame as shown on ***AHR drawing T003 - Proposed Plan*** . The new door frame is to be installed on the inside face of the wall as shown on ***AHR Drawing T005 - External Works*** . The new frame is be constructed wider than the original (Internal dimension to be equal to the existing structural opening). The new frame is to incorporate a Fanlight to replicate the existing to reduce the visual impact of the new frame from the street. The new door frame is to incorporate a structural steel angle around the head and side jambs of the door, to strengthen the door frame and allow fixing into the wall, floor and ceiling. The contractor is to finalise the design and provide full construction/ design details following appointment. The contractor is to allow for their programme to incorporate time periods for providing their design proposal, client sign off and lead in times for materials.				
23.10	**Skirting and Architraves**				
23.11	Allow for installing new timber skirting to the internal and external aspect of the newly constructed stud partitions, as shown on ***AHR Drawing T003 - Proposed Plan.*** Timber skirting to match the existing skirting to the accommodation in terms of size and profile. Allow for plugging and screwing at 450mm centres, all joints to be mitred and suitably filled using a proprietary timber filler, sanded down ready for decoration. Works to be in accordance with Preambles Clause P20 and Z10.				
23.12	Allow for installing new timber architraves around the door frames of the internal and external aspect of the newly constructed stud partitions, shown on ***AHR Drawing T003 - Proposed Plan*** . Timber architrave to match the existing architraves to the accommodation in terms of size and profile. Allow for plugging and screwing at 450mm centres, all joints to be mitred and suitably filled using a proprietary timber filler, sanded down ready for decoration. Works to be in accordance with Preambles Clause P20 and Z10.				

SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
23.13	**Boxing In**				
23.14	Include for new boxing to all new and existing exposed services. Boxing to comprise 12mm MDF boarding over sw framing at required centres. Boxing sizes vary according to concealed pipework diameters. Provide screwed access panels above all rodding access points. Allow for decoration comprising 1 coat primer, 1 undercoat and 2 full gloss paint finish coats.				
24.00	**FLOOR FINISHES**				
24.01	Existing stored carpet tiles to be re-laid to suit new layout with any additional matching tiles to be changed. The tiles are to laid in accordance with the manufacturers recommendations and Preambles Clause M50.				
25.00	**DECORATION**				
	Previously Decorated Walls and Ceilings				
25.01	To all previously decorated ceilings and walls allow for redecoration. Allow to clean down, de-grease and fill any surface defects with a proprietary brand of filler, finished level with the surrounding surfaces. Allow to decorate in two coats of Dulux Diamond Matt emulsion, in colour to match base build in accordance with Preambles Clause M60.				
25.02	**Newly Constructed Plasterboard Partitions and Ceilings**				
25.03	To all bare plasterboard walls allow to redecorate in one mist coat and two final coats of Dulux Diamond Matt emulsion, in colour to match base build in accordance with Preambles Clause M60.				
25.04	**Joinery**				
25.05	Allow for the decoration of all previously decorated and new bare joinery in accordance with Preambles Clause M60. Existing doors to be included.				
25.06	Ensure all timber to be painted is sufficiently dry, clean and free of surface contaminants and in a suitable condition to accept the paint coating. The moisture content of the timber should not exceed 18%.				
25.07	Ensure surfaces should be clean, dry and free from grease. Remove any crazed or flaking material. Rub down glossy surfaces with fine waterproof abrasive paper and rinse thoroughly to provide key.				
25.08	Prime rubbed down glossy surfaces with a coat of Water based Primer Undercoat, applied by brush, roller or paint pad.				
25.09	Overall apply one full coat of Undercoat in accordance with Preambles section M60, applied with brush, roller or paint pad. Allow 6 hours between coats.				
25.10	Overall apply two full coats of Dulux Gloss in accordance with Preambles section M60, applied with brush, roller or paint pad. Allow 6 hours between coats. Colour to match the existing decorated timberwork.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
26.00	**Furniture, Fixings and Equipment**				
	Pin boards				
26.01	The contractor is to allow to re-fix pin boards in locations shown on ***AHR Drawing T003 - Proposed Plan.*** Works to be in accordance with the appropriate substrate within Preambles Claus Z20.				
27.00	**MECHANICAL AND ELECTRICAL WORKS**				
27.02	**Enabling Works** - Allow for all enabling works to be undertaken in line with ***CPW Drawing 220466-CPW-XX-00-DR-N-301001*** MEP Services Enabling Works Layout and ***CPW MEP Specification (Appendix B).***				
27.03	Allow for existing dado trunking and associated electrical accessories to be retained.				
27.04	Allow for existing 2no. light fitting to be isolated, stripped out, securely stored and relocated.				
27.05	Allow for 5no. existing fire alarm detectors to be retained.				
27.06	Allow for existing radiators to be stripped out, securely stored and relocated.				
27.07	Allow for 3no. existing light fittings to be retained.				
27.08	Allow for existing radiator to be stripped out, securely stored and relocated.				
27.09	Allow for existing dado trunking and associated electrical accessories to be isolated and stripped out.				
27.10	Allow for existing 3no. light fittings to be retained.				
27.12	Allow for existing intruder alarm detector to be retained.				
27.13	Allow for existing dado trunking, electrical accessories, fire alarm panel and manual call point to be retained.				
27.14	Allow for existing 2no. radiator to be retained.				
27.15	Allow for existing intruder alarm detector to be isolated, stripped out, securely stored and relocated.				
27.16	Allow for existing over door emergency light fitting to be retained.				
27.17	**Lighting and Fire Alarm** - Allow for all lighting and fire alarm works to be undertaken in line with ***CPW Drawing 220466-CPW-XX-00-DR-E-220001*** Proposed Lighting & Fire Alarm Layout and ***CPW MEP Specification (Appendix B)***				
27.18	Allow for existing light fittings c/w with 3hr emergency battery back up to be swapped with the light fitting within the corridor to allow for emergency lighting within the corridor.				
27.19	Allow for existing fire alarm detectors to be retained.				
27.20	Allow for lighting control to existing light fittings to be rewired to allow for a connection to the new local light switch.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
27.21	Allow for existing light fittings retained.				
27.22	Allow for new 3no. light fittings to match existing. contractor to confirm the existing light fittings manufacturer, cow has not obtained this information prior to tender submission.				
27.23	Allow for existing 3no. light fittings c/w existing 3hr battery back-ups retained.				
27.24	Allow for existing fire alarm panel and manual call point retained.				
27.25	Allow for new fire alarm interfaces for accessed controlled door to be mounted at high level.				
27.26	Allow for lighting control to existing light fittings to be rewired to allow for a connection to the new local light switch.				
27.27	Allow for existing light fittings assumed not to be emergency. existing light fittings within the reception c/w with 3hr emergency battery back up to be swapped with the light fitting within the corridor to allow for emergency lighting within the corridor.				
27.28	**Power, Data & Security:** Allow for all power, data and security works to be undertaken in line with ***CPW Drawing 220466-CPW-XX-00-DR-E-230001 Proposed Power, Data & Security Layout*** and ***CPW MEP Specification.***				
27.29	Allow for existing intruder alarm detector to be relocated from the corridor.				
27.30	Allow for new 7no. double switched socket outlets and double data point.				
27.31	Allow for new switched fuse connection unit for the induction loop.				
27.32	Allow for remote release button for main entrance intercom.				
27.33	Allow for new dado trunking to match existing.				
27.34	Allow for new double switched socket outlet and double data point for the sign-in screen.				
27.35	Allow for existing intruder alarm detector retained.				
27.36	Allow for existing electrical accessories and panels retained.				
27.37	Allow for existing distribution boards retained.				
27.38	Allow for new access control fobs provided on both sides of the door. to be linked to the existing access control system.				
27.39	Allow for existing electrical accessories retained.				
27.40	Allow for new access control fobs provided on both sides of the door. to be linked to the existing access control system.				
27.41	Allow for new double switched socket outlet and double data point for the screen to be mounted at high level.				
27.42	Allow for new intercom provided, linked to the reception desk.				
27.43	Allow for new access control fobs provided on both sides of the main entrance door. to be linked to the existing access control system.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
27.44	**Mechanical Services**: Allow for all mechanical services works to be undertaken in line with ***CPW Drawing 220466-CPW-XX-00-DR-M-121001 Proposed Mechanical Services Layout*** and **CPW MEP Specification.**				
27.45	Allow for 3no. existing radiator relocated ***As per AHR drawing T003 - Proposed Plan.*** Existing pipework shall be amended to suit radiator location. contractor shall provide new lsv's and trv's to each relocated radiator.				
27.46	Allow for 1no. existing radiator retained.				
27.47	Ventilation: **CONTRACTOR's DESIGN PORTION**				
27.48	The contractor is to complete the design of, supply and install a new extractor fan as shown on ***AHR drawing T003 - Proposed Plan.*** The contractor is to allow for the manufacturer of the extractor fan to be Xpelaire or equivalent equal. The contractor is to finalise the design and provide full construction/ design details following appointment. The work shall include for all the builders work element of the construction (forming holes, chases, remedial work as a result of the builders work) and to include all necessary fire stopping of the services in accordance with the Building Regulations and British Standards. The contractor is to allow for making any necessary structural alterations, that may arise from their design.				
	EXTERNAL WORKS				
28.00	**Pavement Repair**				
28.01	The contractor is to allow to level the paved area shown on ***AHR Drawing T005 - External Works.***				
28.02	The contractor is to leave the new surface course level with the existing access and therefore should allow for any excavation or levelling off to achieve this.				
28.03	The contractor is to allow for removing the end kerb stone and undertake the sufficient works to drop the level of the top of the curb stone in line with the adjacent stones and pavement. The foundation for the stone should be 100mm thick, of well compacted semi-dry 1:2:4 (cement:sand:aggregate) concrete with not less than one third of the kerb fully bedded into the mortar mix.				
28.04	The contractor is to cut out highlighted section of existing concrete pathway on ***AHR Drawing T005 - External Works.*** The contractor shall excavate the area by 200mm. The contractor is to allow for compacting 100mm of MOT Type 1 subbase into the hole and pouring a 100mm deep concrete course to finish level with the adjacent ground level.				
28.05	The contractor is to allow for any necessary shuttering.				
28.06	The contractor is to allow to texture the surface of the new concrete to suit existing.				
28.07	The contractor is to allow for cat scanning the area of works to determine the location of any existing services, prior to undertaking any excavation works.				
28.08	The contractor is to ensure surrounding areas are protected during the works and all debris and dust created during the works is cleaned upon finishing.				
29.00	**Main Entrance Pathway**				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
29.01	The contractor is to allow to install a new concrete pathway as shown on ***AHR Drawing T005 - External Works.***				
29.03	The contractor is to allow for excavating a sufficient area of 1500mm wide, 2000mm long and to a depth of 200mm from the existing ground level.				
29.04	The contractor is to allow for compacting 100mm of MOT Type 1 subbase into the hole and pouring a 100mm deep concrete slab as per drawing.				
29.05	The contractor is to allow for any necessary shuttering.				
29.06	The contractor is to allow to edge the concrete with an edging trowel and texture the remaining surface with a broomed finish.				
29.08	The contractor is to allow for cat scanning the area of works to determine the location of any existing services, prior to undertaking any excavation works.				
29.09	The contractor is to ensure surrounding areas are protected during the works and all debris and dust created during the works is cleaned upon finishing.				
30.00	**SIGNAGE - Artwork to be provided by School**				
30.01	**Admin House -** The contractor is to allow to supply and install signage as shown on ***AHR Drawing T007 - Signage*** and detailed below:				
30.02	Olive School logo located above main entrance door: Flat cut brushed steel Star/ Letters mounted with stand- off fixings. Overall Dimensions: Width 700mm, Height 230mm.				
30.03	Sign with the name of school and contact details located between ground floor window and main entrance door: 3mm aluminium panel with radius corners. Digital print to face and anti-graffiti laminate. Screw fixed to wall with screw caps. Dimensions: Width 800mm, Height 400mm.				
30.04	Sign located to left of ground floor window - Directional Sign: Arrow pointing left – Pupil Entrance, Arrow pointing right – Visitor Entrance & Deliveries: 3mm aluminium panel with radius corners. Digital print to face and anti-graffiti laminate. Screw fixed to wall with screw caps. Dimensions: Width 800mm, Height 400mm.				
30.05	Sign located to left of main entrance door: Registered Office Sign 5mm clear acrylic panel with reverse applied digital print complete with 2 off security style 12mm dia screw cap covers in satin chrome, Size: 210mm(w) x 115mm(h)				
30.06	**2 - 4 Lower Clapton Road -** The contractor is to allow to supply and install signage as shown on ***AHR Drawing T006 - Signage*** and detailed below:				
30.07	Larger sign to replace the two existing signs at this entrance Detail: School name/logo, Main Entrance on St. John's Church Road				
30.08	Dimensions: Width 1000mm x Height 450mm				
30.09	Specification: 3mm aluminium panel with radius corners. Digital print to face and anti-graffiti laminate. Screw fixed to wall with screw caps.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
30.10	**Inner Courtyard -** The contractor is to allow to supply and install 6 No. Year Group signs outside classrooms entrance doors.				
30.11	6 x Year Group signs. Specification =: 3mm aluminium panel with radius corners. Digital print to face and anti-graffiti laminate. Screw fixed to wall with screw caps. Size: 300mm(w) x 150mm(h)				
31.00	**FIRST FLOOR REPLACEMENT WINDOWS - Contractor's Design Portion**				
31.01	The contractor is to complete the design of, supply and install of the 2No. sliding sash timber windows on the front elevation of Admin House, as shown on ***AHR Drawing T005 - External Works.*** The contractor is to finalise the design and provide full construction/ design details following appointment. The contractor is to allow for their programme to incorporate time periods for providing their design proposal, client sign off and lead in times for materials. Due to being located in the Clapton Square Conservation Area, the contractor is to replace with windows that match the existing in regard to material and style as closely as possible, albeit with slimline double glazed safety glass (12mm width max). Hackney Borough Council have confirmed that glazing bars are to be integral with a putty finish. No trickle vents or metallic/ perforated spacer bars should be used.				
31.02	Contractors must be registered with FENSA as an approved installer. The FENSA installer must ensure the windows fully comply with the latest Building Regulation requirements and will supply confirmation of FENSA certification for each installation on completion of the works to the CA.				
31.03	Generally, site work shall consist of the following:				
31.04	▪ Safe removal and disposal of existing window and door units ▪ Supply of new timber windows and doors as scheduled ▪ Installation of new timber windows and doors as scheduled ▪ Making good all affected surfaces				
31.05	The Contractor is deemed to have visited the site prior to tendering in order to satisfy themselves with statements made within the document in regard the following:				
31.06	▪ Quantity of windows and doors to be replaced ▪ Dimensions of each window and door type to be replaced ▪ Configuration of existing openers ▪ Current ironmongery types ▪ Finish of existing windows and doors ▪ Necessary access equipment				
31.07	No additional costs will be payable due to Contractors lack of knowledge of the site or existing system.				
31.08	The contractor is to include for all necessary access equipment to complete the works in a safe manner in accordance with current HSE guidelines. The contractor is to confirm the type of access equipment included for within their tender submission.				
31.09	The contractor is to include for appropriate health and safety signage to be displayed around the scheme whilst works are being undertaken i.e. 'operatives working at height' and 'no access' signage.				
31.10	The contractor must allow for closing off access to the areas in which they are undertaking works. They must also ensure that:				
31.11	• All scaffoldings and access equipment complies with HSE Guidelines.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
	• Ladders used to access scaffolds are to be removed at the end of the day and adequately secured • Scaffolds are to be fenced off to prevent unauthorised access. • A safe system of working is to be adopted when working over conservatories and glazed roofs, etc. Adequate protection to both operatives and residents is required • Check the site to determine the whereabouts of all overhead cables and ensure a safe method of working is adopted to prevent an accidents from this risk • Ensure access and egress to the building is maintained at all times • All tools and materials are cleared away when work is not being undertaken • Tools are not left scattered on the ground • Trailing leads are avoided at all times • Ladders and steps are not left unattended at any time • Whilst working from ladders, the immediate vicinity is cordoned off • Special care is taken whilst working in the vicinity of the front entrance and emergency door exits • All barriers, materials and signage to be removed at the end of each working day, and on completion of the works The contractor is to submit fabrication drawings detailing the frame, section, opening, ironmongery and glazing details for comment by the CA prior to manufacture. The contractor is to allow for the production of a maximum of 2no sample windows (reduced scale) for approval and sign off by the CA and residents prior to manufacture. These samples should be presented in the contractor's proposed frame design and sizes, including the proposed glazing and ironmongery and be a true representation of what will be installed on site. The sample(s) will be left with the residents for review and comment.				
31.12	**WINDOW PERFORMANCE REQUIREMENTS**				
31.13	The following performance requirements are to be read in conjunction with the preambles (section 2) and preliminaries (section 1).				
31.14	**Certification**				
31.15	The contractor is to provide independently certified evidence that all incorporated components comply with specified performance requirements.				
31.16	**Timber Procurement**				
31.17	All timbers are to be obtained from well managed forests and / or plantations in accordance with:				
31.18	• The laws governing forest management in the producer country or countries. • International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES). The contractor is to allow for providing documentary evidence as follows: • Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied. • Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood based products.				
31.19	**Components Generally**				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
31.20	Timber cills and cill nosings shall have a throat formed in their under surface adjacent to the front face to prevent water running back across the underside of the cill.				
31.21	Timber cill members shall finish flush with the other main frame components. When installed, cill nosings shall be designed to shed water away from the window and over the construction below the window.				
31.22	The exposed top surfaces of horizontal members of frames, casements, sashes, cill nosings and glazing beads shall be profiled or angled, with a slope of not less than one in eight (7°), to shed water from external surfaces.				
31.23	The top surfaces of internal horizontal members of windows shall, where practicable, be profiled or angled to shed any water from condensation or cleaning away from the internal face of the glass and the glazing rebate.				
31.24	Glazing beads to be appearance class J2 (BS EN 942). Drip mouldings and the like J40 (BS EN 942) or better for all other members. Finger jointing and knots on arrises not permitted where exposed to view.				
31.25	The glazing rebate sizes and design shall be appropriate for the glazing and the glazing method. For drained and vented glazing systems, the profile shall be designed such that water is prevented from accumulating anywhere within the rebate. Any drainage channels shall be kept clear. Unless otherwise agreed, exposed arrises shall be replaced with a radius of not less than 3 mm to avoid thinning of the proposed coating system.				
31.26	**Thermal Insulation**				
31.27	The replacement windows will need to meet the thermal insulation requirements of the Building Regulations Approved Document L1B. The whole unit U-value needs to achieve a minimum of 1.6W/m²K in accordance with section 4 of the Approved Document.				
31.28	**Glazing**				
31.29	All glazing to be double glazed sealed units and comply with all current Building Regulations. All glazing to be FENSA and BSI Kitemark certified to BS EN 1279.				
31.30	Glazing in critical locations between finished floor level and 800mm above that level must contain safety glass (toughened or laminated) and must include the relevant safety mark clearly visibly to comply with Building Regulations Approved Document K. All safety glass is to meet requirements of BS 6206 & BS EN 12600.				
31.31	Glazing blocks and packers must be used to properly support and locate the glass.				
31.35	**Acoustics**				
31.36	Acoustic requirements for all windows to comply with BS 6375-3 section 5.5 and BS 6262-2 section 6.0.				
31.37	**Finish**				
31.38	The finish of the proposed timber windows is to match that of the existing windows being replaced in accordance with Preambles section M60.				
32.00	**NEW MAIN ENTRANCE TIMBER DOOR (D1.04)**				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
32.01	The contractor is to complete the design of, supply and install of a new timber door to the main entrance of Admin house, to suit the new, wider door frame, as shown on **AHR Drawing T005 - External Works**. The contractor is to finalise the design and provide full construction/ design details following appointment. The contractor is to allow for their programme to incorporate time periods for providing their design proposal, client sign off and lead in times for materials. Due to being located in the Clapton Square Conservation Area, the contractor is to replace with a door that match the existing in regard to material and style as closely as possible.				
32.02	The contractor is to provide independently certified evidence that all incorporated components comply with specified performance requirements.				
32.03	**Timber Procurement**				
32.04	All timbers are to be obtained from well managed forests and / or plantations in accordance with:				
32.05	• The laws governing forest management in the producer country or countries. • International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).				
33.06	The contractor is to allow for providing documentary evidence as follows: • Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied. • Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood based products.				
33.07	**Components Generally**				
33.08	Timber cills and cill nosings shall have a throat formed in their under surface adjacent to the front face to prevent water running back across the underside of the cill.				
33.09	Timber cill members shall finish flush with the other main frame components. When installed, cill nosings shall be designed to shed water away from the door frame and over the construction below the door, unless the design of the doors requires no projecting cill.				
33.10	The exposed top surfaces of horizontal members of frames, doors, cill nosings and glazing beads shall be profiled or angled, with a slope of not less than one in eight (7°), to shed water from external surfaces.				
33.11	The top surfaces of internal horizontal members of doors shall, where practicable, be profiled or angled to shed any water from condensation or cleaning away from the internal face of the glass and the glazing rebate.				
33.12	Glazing beads to be appearance class J2 (BS EN 942). Drip mouldings and the like J40 (BS EN 942) or better for all other members. Finger jointing and knots on arrises not permitted where exposed to view.				
33.13	The glazing rebate sizes and design shall be appropriate for the glazing and the glazing method. For drained and vented glazing systems, the profile shall be designed such that water is prevented from accumulating anywhere within the rebate. Any drainage channels shall be kept clear. Unless otherwise agreed, exposed arrises shall be replaced with a radius of not less than 3 mm to avoid thinning of the proposed coating system.				
33.14	**Ironmongery**				
33.15	Door ironmongery shall be to match existing as closely as possible.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
33.16	**Thermal Insulation**				
33.17	The replacement windows will need to meet the thermal insulation requirements of the Building Regulations Approved Document L1B. The whole unit U-value needs to achieve a minimum of 1.8W/m²K in accordance with section 4 of the Approved Document.				
33.18	**Glazing**				
33.14	All glazing to be double glazed sealed units and comply with all current Building Regulations. All glazing to be FENSA and BSI Kitemark certified to BS EN 1279.				
33.15	Glazing in critical locations between finished floor level and 800mm above that level must contain safety glass (toughened or laminated) and must include the relevant safety mark clearly visibly to comply with Building Regulations Approved Document K. All safety glass is to meet requirements of BS 6206 & BS EN 12600.				
33.16	Glazing blocks and packers must be used to properly support and locate the glass.				
33.17	**Acoustics**				
33.18	Acoustic requirements for all windows to comply with BS 6375-3 section 5.5 and BS 6262-2 section 6.0.				
33.19	**Finish**				
33.20	The finish of the proposed timber windows is to match that of the existing windows being replaced in accordance with Preambles section M60.				
34.00	**Window and Door Removal**				
34.01	Care must be taken to ensure the safe removal of the existing windows and that damp proof courses, reveals, lintels and cills are not damaged during such works. The contractor should include for all making good works to all reveals, floor coverings, ceilings and the aforementioned to match and finish flush with adjacent surfaces.				
34.02	The contractor is to allow for making good all affected surfaces following the removal of the existing windows. All making good works undertaken by the contractor are match and finish flush with adjacent surfaces.				
34.03	**WINDOW AND DOOR REPLACEMENT - SPECIFIC DETAILS**				
34.05	All windows and doors will be fixed into existing openings using stainless steel wood screws to BS 1210. When not predrilled or specified otherwise, fasteners are to be positioned not more than 150 mm from the ends of each jamb, adjacent to each hanging point of opening lights, and at maximum 450 mm centres.				
34.06	All gaps between the back of fire resisting frames and the window reveals to be completely filled with intumescent mastic or tape.				
34.07	Care must be taken not to damage vertical or horizontal DPCs or trays during the fixing process. If any DPCs are damaged, the contractor shall allow for making good as necessary, with new section of suitable DPC.				
34.08	Mastic is not to be used to fill incorrectly sited windows. Excessive use of mastic is not permitted. Inaccuracies or errors in the windows which would cause excessive gaps when the windows are fitted must be rectified to ensure the correct tolerances are achieved.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
34.09	The contractor shall, in the event of a greater than 10mm gap between the new frame and structural opening (and up to the maximum permissible gap), fill that gap using a proprietary expanding foam product. Allow for trimming all excess as necessary to ensure the sealant installation is in line with the manufacturer's recommendations.				
34.10	All windows are to be glazed in accordance with BS 8000-0:2014.				
34.11	The contractor shall provide a 10 year, insurance backed guarantee				
35.00	**CLEANING**				
35.01	Allow for thoroughly cleaning all areas of the building affected by the works, include for removing all builders dust and debris to the satisfaction of the Contract Administrator. This work is to be undertaken as work proceeds but a final cleaning is to include all new and existing surfaces and finishes, include for all materials fixtures and fittings as required.				

	SCHEDULE OF WORKS	Unit	Quantity	Rate £	Total £
36.00	**COMPLETION/CLEAR SITE**				
36.01	On completion of the works, allow for making good to all disturbed surfaces, allow for thoroughly cleaning down all surfaces and remove all debris arising from site to the approval of the Contract Administrator, and leaving all appliances in a good working order. This work is to be undertaken as work proceeds but a final cleaning is to include all new and existing surfaces and finishes, include for all materials fixtures and fittings as required.				
36.02	Allow for clearing site and carting away all debris to the complete satisfaction of the CA.				
36.03	Allow for thoroughly cleaning all adjacent areas of the building, which have been affected by any dust/debris created by the works, to the complete satisfaction of the CA.				
36.04	Allow 2 days for operative to install various signage, pictures, graphics panels to new office areas exact locations to be confirmed by Employer.				
36.05	**OVERHEADS AND PROFITS**				
	Contractor to state percentage of overheads and profit on any subcontractors for any variations which may be instructed here _____%.				

Section 4

Included Sums

4.00	**INCLUDED SUMS**	
	General Contingency	
4.01	The contractor is to include the contingency sum of **10% of the cost of the works** for unforeseen building works to be expended in whole or part only with prior approval of the Contract Administrator.	£
	TOTAL CARRIED TO SUMMARY	

Section 4

Summary

1.00	**SUMMARY**	
	Building Works	
1.01	Section 1.0 - Preliminaries	£
1.02	Section 2.0 - Preambles (NBS Specification)	£
1.03	Section 3.0 - Schedule of Works	£
1.04	Section 4.0 - Included Sums	£
	TOTAL COST OF WORKS (carried to form of tender)	**£**

Tender Breakdown

1.00	General	£
2.00	Supervision	£
3.00	Safety	£
4.00	Phasing/security	£
5.00	Check dimensions	£
6.00	Specification and drawings	£
7.00	Inspect the site	£
8.00	Standards	£
9.00	Protection	£
10.00	Welfare Facilities	£
11.00	Sire Set Up	£
12.00	Recycling	£
13.00	Use of Sustainable Recycled Materials	£
14.00	Disclosure & Barring Service (CRB) Checks	£
15.00	Making Good	£
16.00	The Works	£
17.00	Asbestos	£
18.00	Temporary Works	£
19.00	Strip Out Works	£
20.00	New Wall Partitions	£
21.00	New Doors	£
22.00	Visitors Reception Desk	£
23.00	New Joinery	£
24.00	Floor Finishes	£
25.00	Decoration	£
26 .00	Furniture, Fixings and Equipment	£
27.00	M&E	£
28.00	External Works	£
29.00	Main Entrance Pathway	£
30.00	Signage	£
31.00	Replacement Windows	£
32.00	Main Entrance Door	£

34.00	Window and Door Replacement	£
35.00	Cleaning	£
36.00	Completion/ Clear Site	£

PLEASE NOTE YOUR TENDER WILL NOT BE ACCEPTED UNLESS THIS PAGE IS FULLY COMPLETED AND RETURNED

Section 6

Form of Tender

FORM OF TENDER FOR USE WITH SPECIFICATION **PL2**

TENDER FOR: **The Olive School, Hackney**
Office Remodel

NAME OF TENDERER:

To: AHR Building Consultancy Ltd
31-35 Kirby Street
London
EC1N 8TE

Dear Sirs,

I / We the undersigned hereby tender and agree to execute and complete all the work described in the specification and tender drawings dated

I / We undertake in the event of the acceptance of this tender to execute with the Employer a form of contract embodying all the terms and conditions contained in this offer.

I / We agree that should obvious errors in pricing or errors in arithmetic be discovered in the submitted priced specification before acceptance of this offer, these errors will be corrected in accordance with the Alternative 2 contained in section 6 of the current Code of Procedure for Single Stage Selective Tendering.

For the sum of £.....……

(in words).....

Which includes £…….. for Contingencies and Provisional Sums.

I / We undertake to commence work on site within …… days of your instruction to proceed, and to complete the work within ….. weeks of commencement.

Dated this .....Day of .....…….2021

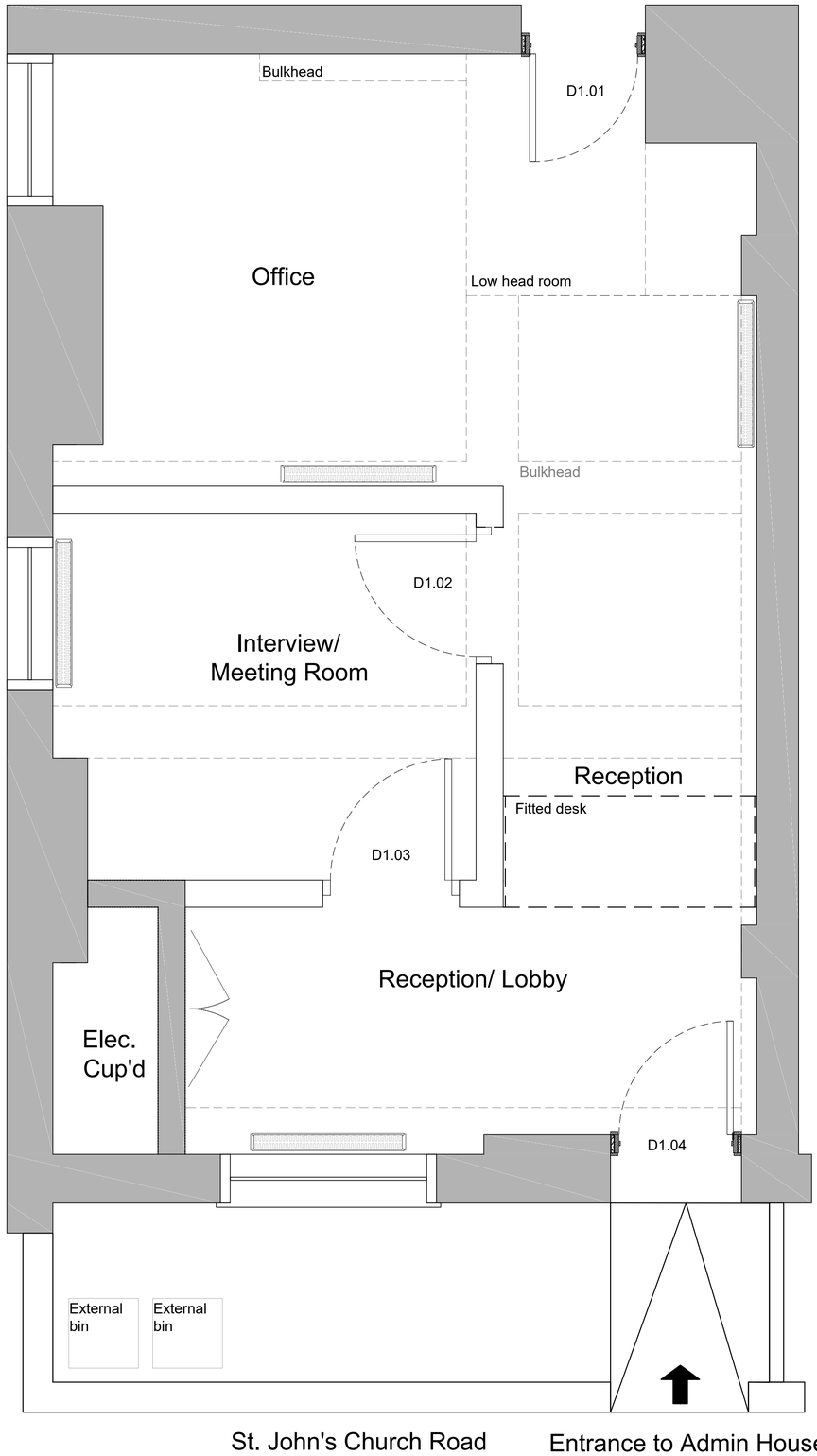
Signature .....
Address .....
.....
.....
.....

The tender is to remain open for consideration for a period of 90 days

The Employer is not bound to accept the lowest or any other tender, nor to reimburse any costs or expenses incurred in tendering.

Appendix A

AHR Drawings



Existing Floor Plan

Scale 1:20 @ A1

0 0.5m 1m 2m

1:20

Notes

THIS DRAWING READ IN CONJUNCTION WITH :

Rev	Description	Date	Dr by	App by
-	-	-	-	-

original by	date created	Approved by
IB	03/11/2021	

Choose Office
Address

client
Star Academies

project
Olive School, Hackney
Admin House Remodel

drawing
Existing Floor Plan

project number	scale	
2022.00255.001	1:20	@A1
drawing number	rev	issue status
T001	-	Tender

DEMOLITION NOTES

1. Partitions indicated for demolition to coordinate with final space plan.
2. In addition to indicated partitions, remove attached millwork, wall base and reception fitted desk.
3. Where electrical sockets, communication or similar devices exist in a wall to be removed, remove associated existing wire back to its source.
4. Patch existing partitions, flooring and ceiling as needed. Prep for new finishes.
5. Remove noted doors and keep associated hardware to be reused.
6. Remove existing light fixtures to be retained and save for reuse.
7. Existing carpet tiles to be carefully lifted and stored and re-laid to suit new layout with any additional matching tiles.

Strip Out Works

Scale 1:20 @ A1

0 0.5m 1m 2m

1:20

Notes

THIS DRAWING READ IN CONJUNCTION WITH :

Rev	Description	Date	Dr by	App by
-	-	-	-	-

original by	date created	Approved by
IB	03/11/2021	

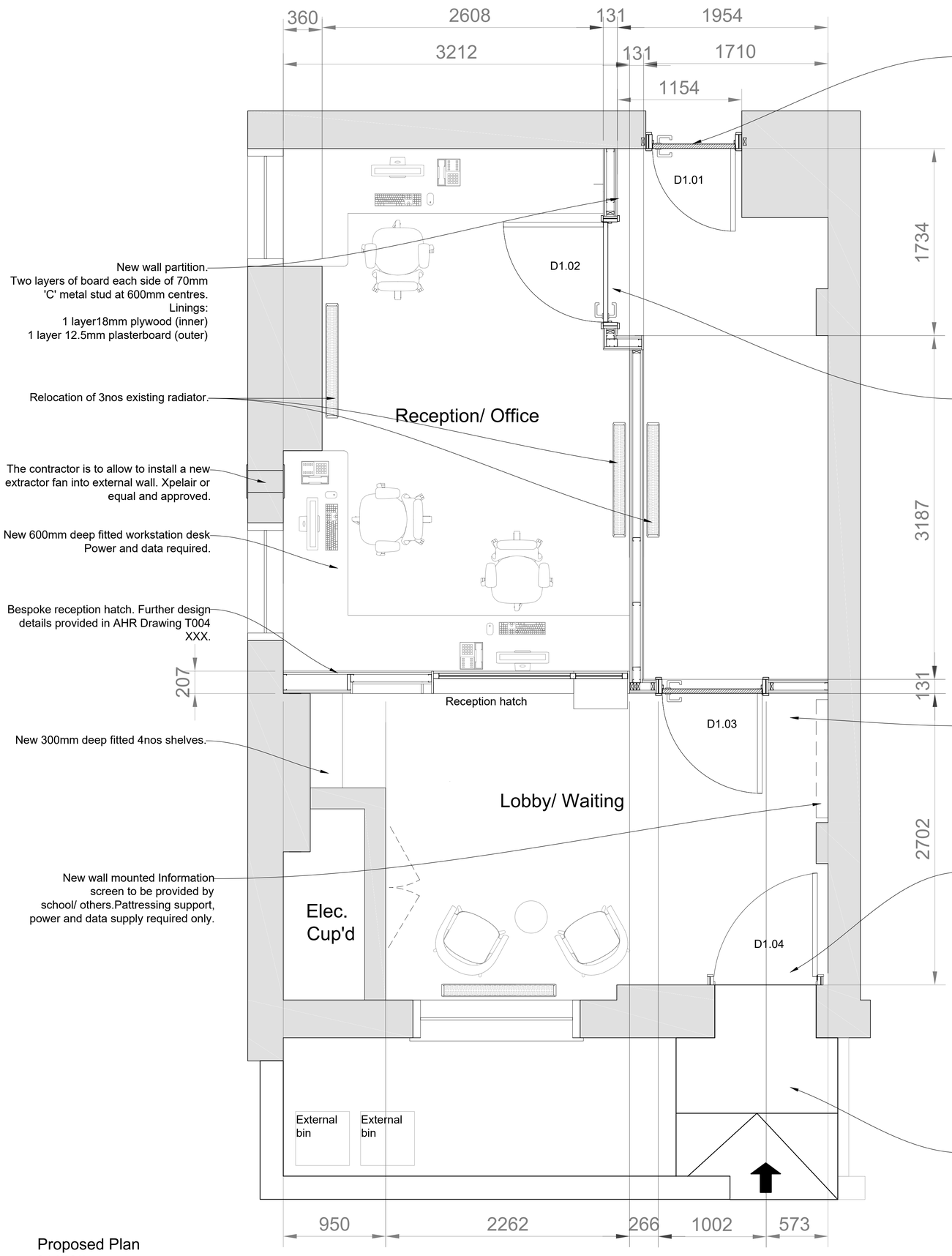
Choose Office
Address

client
Star Academies

project
Olive School, Hackney
Admin House Remodel

drawing
Strip Out Works

project number	scale	
2022.00255.001	1:20	@A1
drawing number	rev	issue status
T001	-	Tender



Proposed Plan

Scale 1:20 @ A1

St. John's Church Road

PARTITION NOTES

1. Maintain alignments shown on plan. Connection shall be flush and smooth, unless otherwise noted.
2. All new construction to meet applicable UK standards and regulation.
3. New partitions are to be:

A
D2.1.D2
0HR

PARTITION LEGEND

HEAD CONDITION

A Full height drywall to underside of structure

SURFACE CODE

D2 Two layer drywall

SUPPORT CODE

1 70mm METAL STUD

FIRE RATING
(INDICATED RATING IN HOURS)

0HR NOT RATED

A
D2.1.D2
0HR

4. Pattress required for heavy duty fixtures.
5. All setting out dimensions to be checked on site prior to fabrication.

POWER AND COMMUNICATION NOTES

1. Where communication or other cabling devices have been abandoned or are obsolete, remove any associated wires back to source. Patch and repair to eliminate any evidence of disruption.
2. Utilize existing power sources where applicable.
3. Power and data to be provided to the Reception hatch area for the sign in screen panel.
4. Power and data to be provided for the information screen in reception.

FINISH NOTES

1. Existing carpet tiles to be carefully lifted and stored and re-laid to suit new layout with any additional matching tiles.
2. Existing wall and ceiling surfaces shall be patched, sanded smooth, skim coated and prepared to receive new finishes.
3. New hardwood skirting to match existing and finish.

DOOR NOTES

1. New doors, door stops, door frames and architrave type and finish to match existing.
2. New hardware sets to match existing.
3. Existing hardware sets retained from demolished doors are to be reused on new doors.

0 0.5m 1m 2m

1:20

Notes

THIS DRAWING READ IN CONJUNCTION WITH :

NOTE TO CONTRACTOR:
These are indicative details provided only, the contractor is to undergo a measured survey before undertaking any of the refurbishment works.

Rev	Description	Date	Dr by	App by
-	-	-	-	-

original by	date created	Approved by
IB	03/11/2021	

Choose Office
Address

client
Star Academies

project
Olive School, Hackney
Admin House Remodel

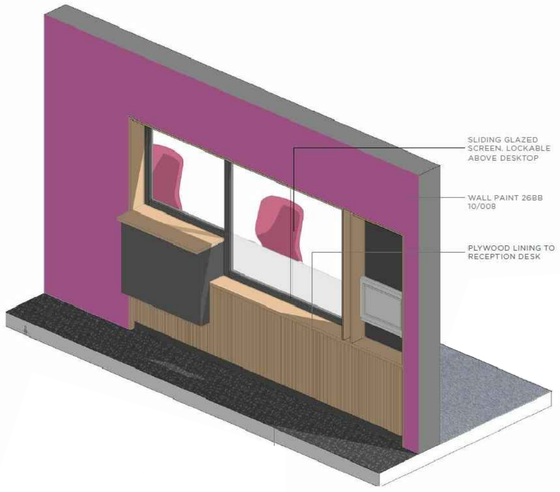
drawing
Proposed Plan

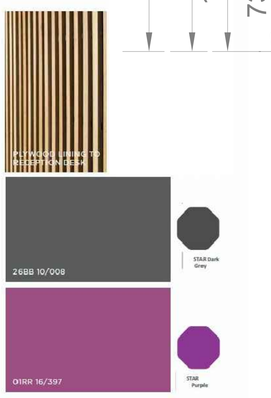
project number	scale	
2022.00255.001	1:20	@A1
drawing number	rev	issue status
T001	-	Tender

Visual Representation of Indicative Reception Design

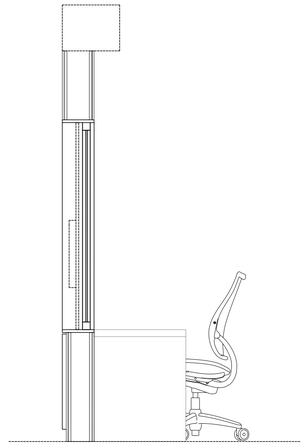
EDEN BOYS LEADERSHIP ACADEMY

RECEPTION DESK

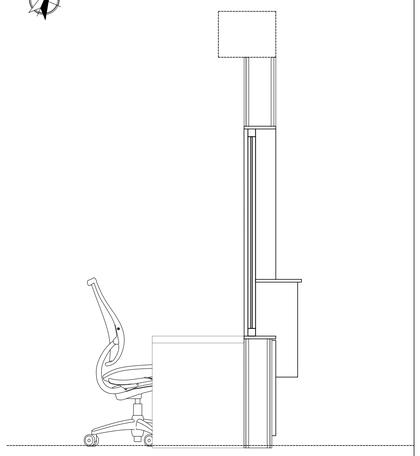




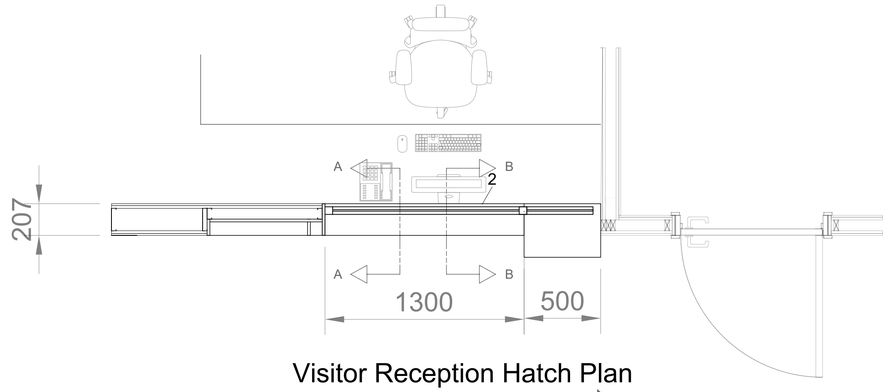
Visitor Reception Hatch Elevation A



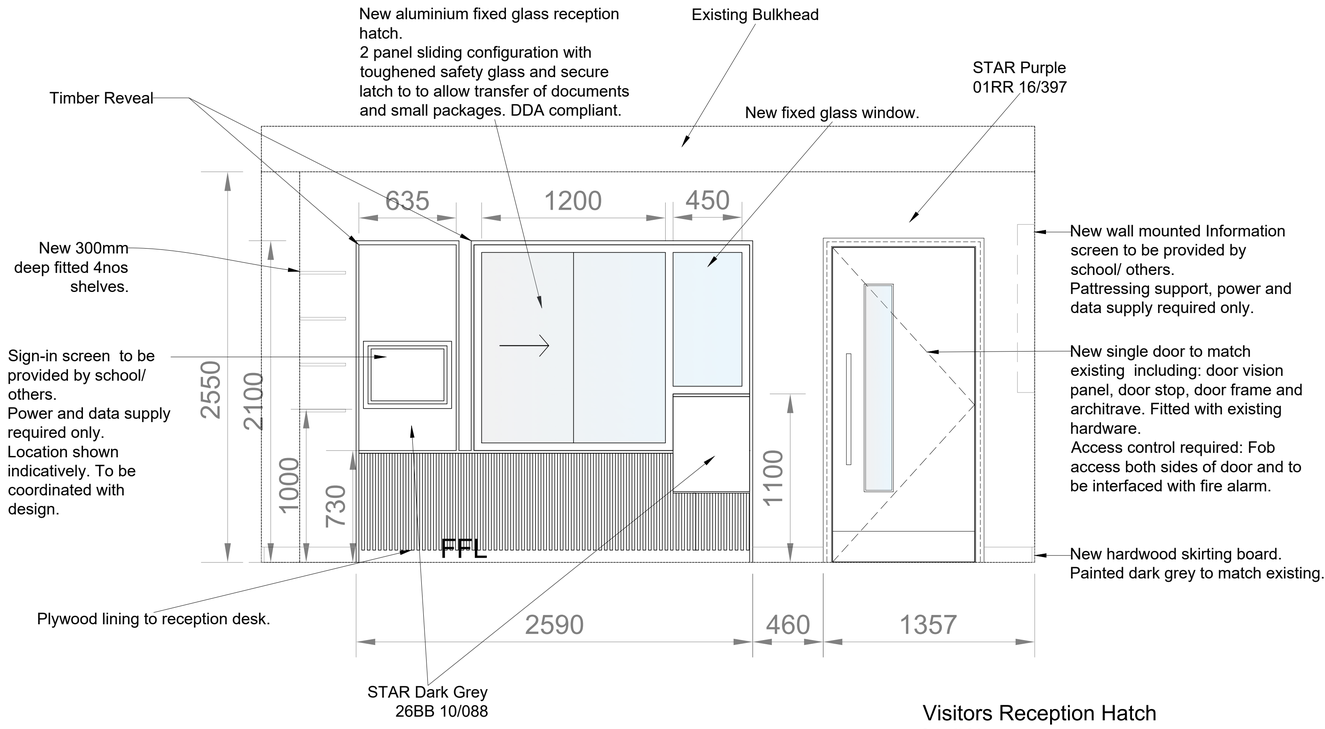
Section A-A
Visitor Reception Hatch



Section B-B
Visitor Reception Hatch



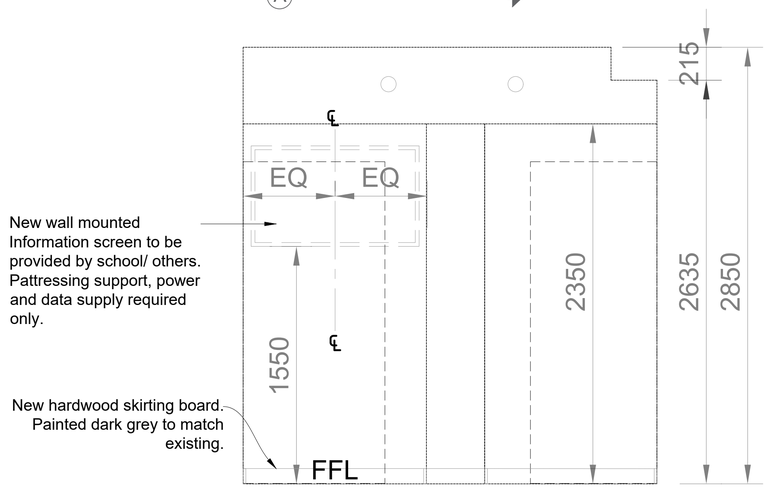
Visitor Reception Hatch Plan



Visitors Reception Hatch

Scale 1:20 @ A1

A B



Information Screen Location - Elevation B

0 0.5m 1m 2m

1:20

Notes

THIS DRAWING READ IN CONJUNCTION WITH :

NOTE TO CONTRACTOR:
These are indicative details provided only, the contractor is to undergo a measured survey before undertaking any of the refurbishment works.

Rev	Description	Date	Dr by	App by
original by: IB		date created: 03/11/2021		Approved by

Choose Office
Address

client: Star Academies

project: Olive School, Hackney
Admin House Remodel

drawing: Visitor Reception Hatch

project number	scale	
2022.00255.001	1:20	@A1
drawing number: T004	rev: -	issue status: Tender

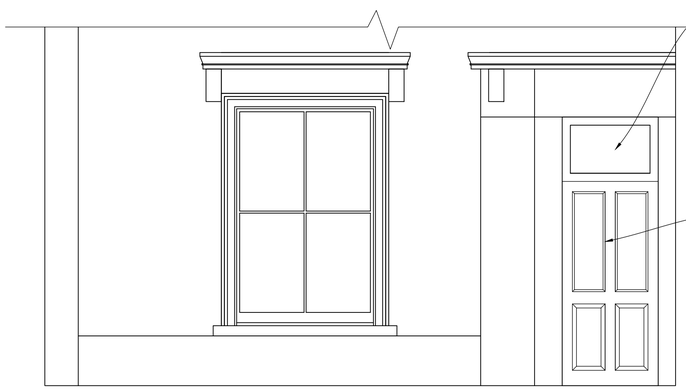
Notes

THIS DRAWING READ IN CONJUNCTION WITH :

The contractor is to complete the design of, supply and install of the 2No. sliding sash timber windows on the front elevation of Admin House. The contractor is to finalize the design and provide full construction/ design details following appointment. Due to being located in the Clapton Square Conservation Area, the contractor is to replace with windows that match the existing in regard to material and style as closely as possible, albeit with double glazed safety glass, in replacement of the existing single glazed panes.

Existing Door and door frame to be removed

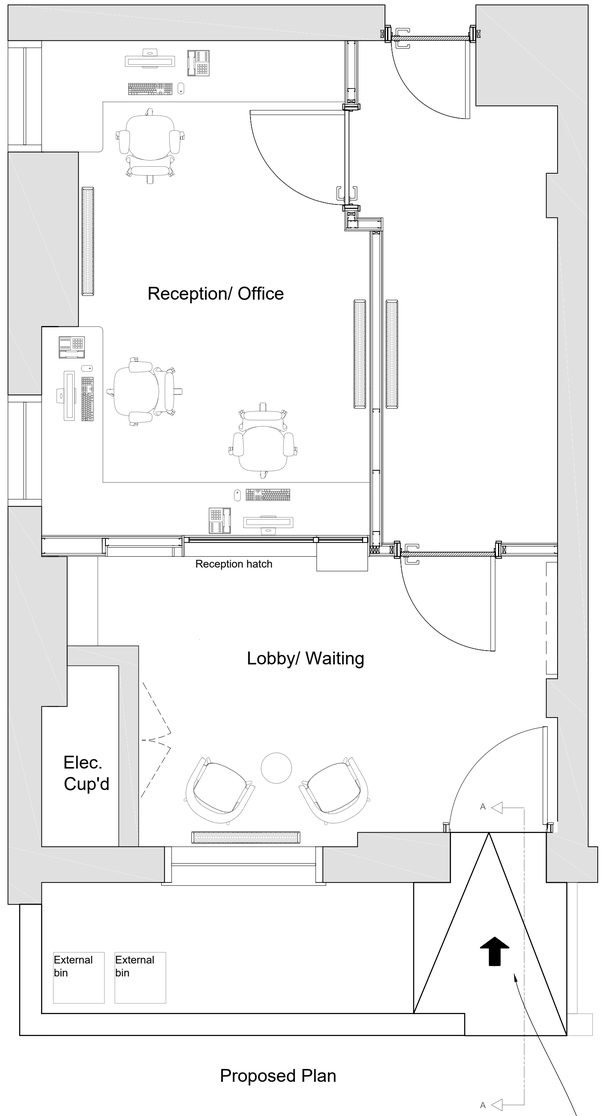
Existing Elevation



The contractor is to complete the design of, supply and install a new bespoke door frame. The new door frame is to be installed on the inside face of the wall as shown in Proposed Plan. The new frame is be constructed wider than the original (Internal dimension to be equal to the existing structural opening). The new frame is to incorporate a Fanlight to replicate the existing to reduce the visual impact of the new frame from the street. The contractor is to finalize the design and provide full construction/ design details following appointment.
Door Reveal to be made good and decorated.

The contractor is to complete the design of, supply and install of a new timber door to the main entrance of Admin house, to suit the new, wider door frame. The contractor is to finalize the design and provide full construction/ design details following appointment. Due to being located in the Clapton Square Conservation Area, the contractor is to replace with a door that match the existing in regard to material and style as closely as possible.

Proposed Front Door Arrangement



Proposed Plan

The contractor is to install a new concrete pathway, creating a gradient from existing pavement level to the internal finished floor level.

The contractor is to allow for compacting 100mm of MOT Type 1 Subbase and pouring a minimum of a concrete slab.

The contractor is to leave a broomed finish on the concrete with a toweled edge..

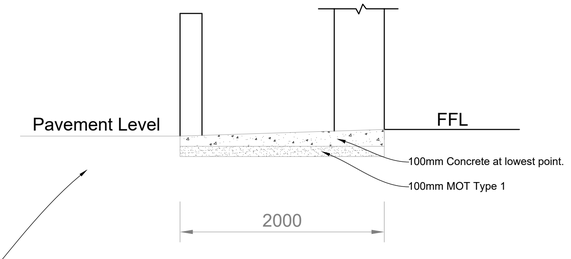
Hard Landscaping

Section of pavement to be cut out and disposed of. New concrete section to be poured to suit new level of curbstone.

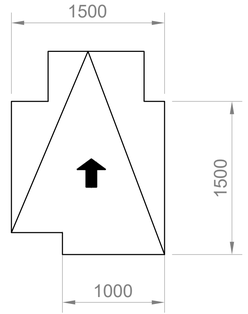
1 No Curb stone to be removed and to be re-bed flush with adjacent surfaces to remove trip hazard.

Admin House

Location of works



Section A-A
Entrance pathway



Entrance Path

NOTE TO CONTRACTOR:
These are indicative details provided only, the contractor is to undergo a measured survey before undertaking any of the refurbishment works.

Rev	Description	Date	Dr by	App by
original by		date created		Approved by
IB		03/11/2021		

Choose Office
Address

client
Star Academies

project
Olive School, Hackney
Admin House Remodel

drawing
External Works

project number	scale	
2022.00255.001	1:30	@A1
drawing number	rev	issue status
T005	-	Tender

External Works

Scale 1:30 @ A1

Site Plan

Scale 1:1250 @ A1

North Elevation to 2 - 4 Lower Clapton Road

Scale 1:50 @ A1

0 0.5m 1m 2m 5m

1:50

School Name and Directional Signage

1. Signage Dimensions Width 1000mm x Height 450mm
2. Specification:
   3mm aluminium panel with radius corners.
   Digital print to face and anti-graffiti laminate.
   Screw Fixed to wall with screw caps.

Notes

THIS DRAWING READ IN CONJUNCTION WITH :

NOTE TO CONTRACTOR:
These are indicative details provided only, the contractor is to undergo a measured survey before undertaking any of the refurbishment works.

Rev	Description	Date	Dr by	App by
-	-	-	-	-

original by	date created	Approved by
IB	15.12.2022	RR

Choose Office

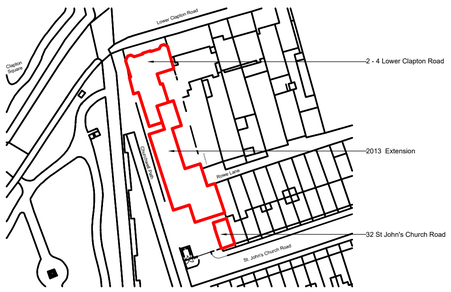
Address

client
Star Academies

project
Olive School, Hackney
Admin House Remodel

drawing
Signage Works - 2 - 4 Lower Clapton Road

project number	scale	
2022.00255.001	As Shown	@A1
drawing number	rev	issue status
T006	-	Tender



Site Plan

Scale 1:1250 @ A1

South Elevation to 32 St John's Church Road.

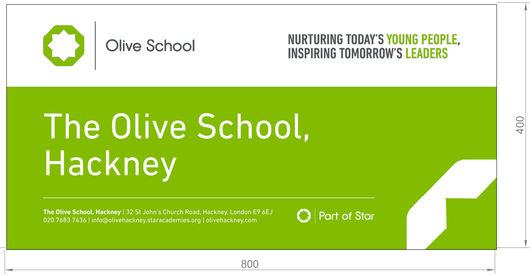
Scale 1:20 @ A1

0 0.5m 1m 2m

1:20

New Direction Signage

1. Signage Dimensions Width 800mm x Height 400mm
2. Specification:
   3mm aluminium panel with radius corners.
   Digital print to face and anti-graffiti laminate.
   Screw Fixed to wall with screw caps.

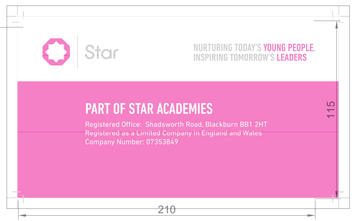


School Name and Contact Details

1. Signage Dimensions Width 800mm x Height 400mm
2. Specification:
   3mm aluminium panel with radius corners.
   Digital print to face and anti-graffiti laminate.
   Screw Fixed to wall with screw caps.

Star Academies and Olive Logo

1. Signage Dimensions Width 700mm x Height to suit width.
2. Specification:
   Flat cut brushed Stainless Steel on stand-off fixings.



Registered Office Signage

1. Signage Dimensions: Width 210mm x 115mm.
2. Specification:
   5mm Clear Acrylic Panel applied digital print.
   2 No security style 12mmm diameter screw caps in satin chrome.

Notes

THIS DRAWING READ IN CONJUNCTION WITH :

NOTE TO CONTRACTOR:
These are indicative details provided only, the contractor is to undergo a measured survey before undertaking any of the refurbishment works.

Rev	Description	Date	Dr by	App by
-	-	-	-	-

original by	date created	Approved by
IB	15.12.22	RR

Choose Office

Address

client
Star Academies

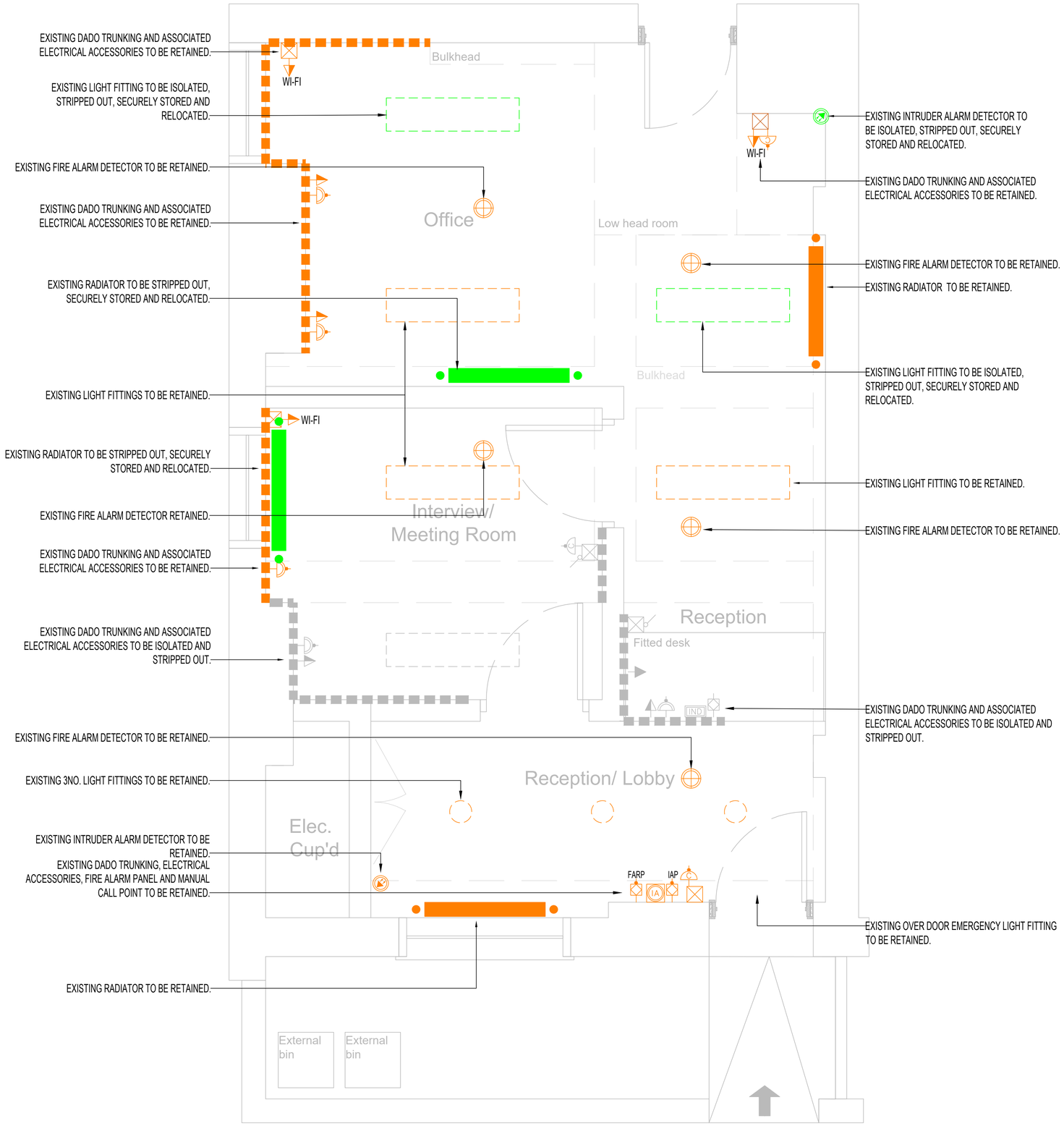
project
Olive School, Hackney
Admin House Remodel

drawing
Signage Works - 32 St John's Church Road

project number	scale	
2022.00255.001	As Shown	@A1
drawing number	rev	issue status
T007	-	Tender

Appendix B

CPW MEP Drawings



GENERAL NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CPW SPECIFICATION AND ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING.
3. REMOVE ASSOCIATED EXISTING WIRE BACK TO ITS SOURCE WHERE ELECTRICAL SOCKETS, COMMUNICATION OR SIMILAR DEVICES EXIST IN A WALL TO BE REMOVED.
4. CONTRACTOR SHALL OBTAIN THE EXISTING MEP DOCUMENTATION AND REFER TO AS-BUILT DRAWINGS.

COLOUR CODED LEGEND:

SERVICES TO BE RETAINED

SERVICES TO BE ISOLATED, STRIPPED OUT, SECURELY STORED AND RELOCATED

SERVICES TO BE ISOLATED AND STRIPPED OUT

LEGEND:

- 13A SWITCHED DOUBLE SOCKET OUTLET
- 13A SWITCHED SINGLE CLEANER'S SOCKET OUTLET
- 13A SWITCHED FUSED CONNECTION UNIT
- 13A UNSWITCHED FUSED CONNECTION UNIT
- DADO TRUNKING
- DOUBLE DATA OUTLET
- AUDIO INTERCOM
- INTRUDER ALARM PANEL
- INDUCTION LOOP
- RADIATOR
- HL — DENOTES AN OUTLET MOUNTED AT HIGH LEVEL
- SC — DENOTES AN OUTLET MOUNTED FOR SCREEN
- IAP — DENOTES AN OUTLET MOUNTED FOR INTRUDER ALARM PANEL
- FARP — DENOTES AN OUTLET MOUNTED FOR FIRE ALARM REPEATER PANEL

REV	DATE	DESCRIPTION	BY	VE
T01	05/12/2022	TENDER ISSUE	HD	KW

www.cpwp.com
Address: Bolsover House, 5-6 Clipstone Street, London W1W 6BB
Phone: + 44(0) 203 870 4790
Email: london@cpwp.com

RIBA Stage: STAGE 4

Status: TENDER

Client: AHR

Project: OLIVE SCHOOL, HACKNEY
ADMIN HOUSE REMODEL

Drawing Title: ENABLING WORKS LAYOUT

Scale (A1): 1:20 | Date: DEC '22 | By: HD | Ve: KW

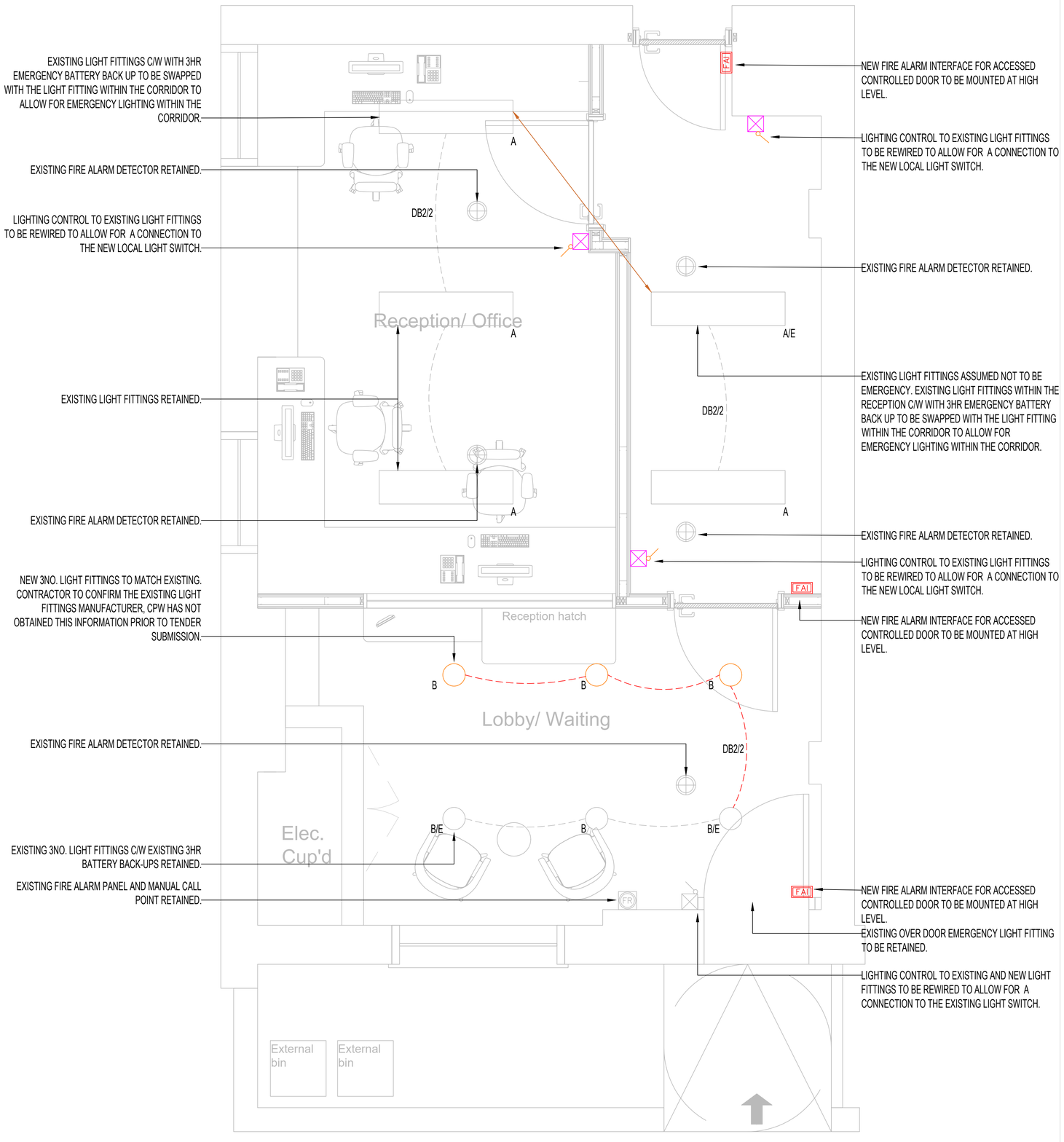
Proj ID	Originator	Volume	Level	Type	Role	Number	Suitability	Revision
220466	CPW	XX	00	DR	N	301001	S3	T01

220466-CPW-XX-00-DR-N-301001 S3 T01

CPW Project No. 220466

Linked Files: Olive_Xref

EXISTING SERVICES SHOWN IN GREY



GENERAL NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CPW SPECIFICATION AND ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRODUCING FULLY DIMENSIONED WORKING/FABRICATION DRAWINGS FOR THESE WORKS. ALL WORKING DRAWINGS SHALL BE FULLY CO-ORDINATED WITH OTHER TRADES AND BUILDING DETAILS, INCLUDING CEILING/STEEL DETAILS.
4. THE FINAL POSITIONS OF ALL ELECTRICAL ACCESSORIES SHALL BE CAREFULLY CO-ORDINATED AGAINST THE LATEST ARCHITECTURE AND FURNITURE LAYOUTS AND SHALL BE AGREED ON SITE PRIOR TO INSTALLATION OF ALL SERVICES TO ENSURE FULL CO-ORDINATION.
5. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL 'AS FITTED' DRAWINGS AND O&M INFORMATION FOR THE COMPLETE INSTALLATION, INCLUDING ALL RELEVANT INFORMATION FROM THE SPECIALIST SUB-CONTRACTORS.
6. THE ELECTRICAL INSTALLATIONS MUST COMPLY IN FULL WITH THE REQUIREMENTS OF BS7671 18TH EDITION WIRING REGULATIONS.
7. THE FIRE DETECTION INSTALLATIONS MUST COMPLY IN FULL WITH THE REQUIREMENTS OF BS5839-1.

CIRCUITRY:

DB2/2
WIRING TYPE - Cu LS0H MULTI FLAT
CIRCUIT CONDUCTOR CSA, LIVE 1.5mm², CPC 1.0mm²
BS(EN) 60898, MCB - YES, RCD - NO, AFDD - NO
TYPE C, RATING 10A, SHORT CIRCUIT CAPACITY 10kA

LEGEND:

- A — SUSPENDED LED LUMINAIRE
- B — RECESSED CIRCULAR LED LUMINAIRE
- 1-WAY LIGHT SWITCH
- /E — 3 HOUR EMERGENCY BATTERY BACK-UP
- SMOKE DETECTOR
- FAI — FIRE ALARM INTERFACE
- FR — FIRE ALARM REPEATER PANEL
- TRUNKING - RISES TO CEILING

REV	DATE	DESCRIPTION	BY	VE
T01	05/12/2022	TENDER ISSUE	HD	KW

www.cpwp.com
Address
Bolsover House
5-6 Clipstone Street, London
W1W 6BB
Phone
+ 44(0) 203 870 4790
Email
london@cpwp.com

RIBA Stage
STAGE 4

Status
TENDER

Client
AHR

Project
OLIVE SCHOOL, HACKNEY
ADMIN HOUSE REMODEL

Drawing Title
PROPOSED LIGHTING & FIRE ALARM LAYOUT

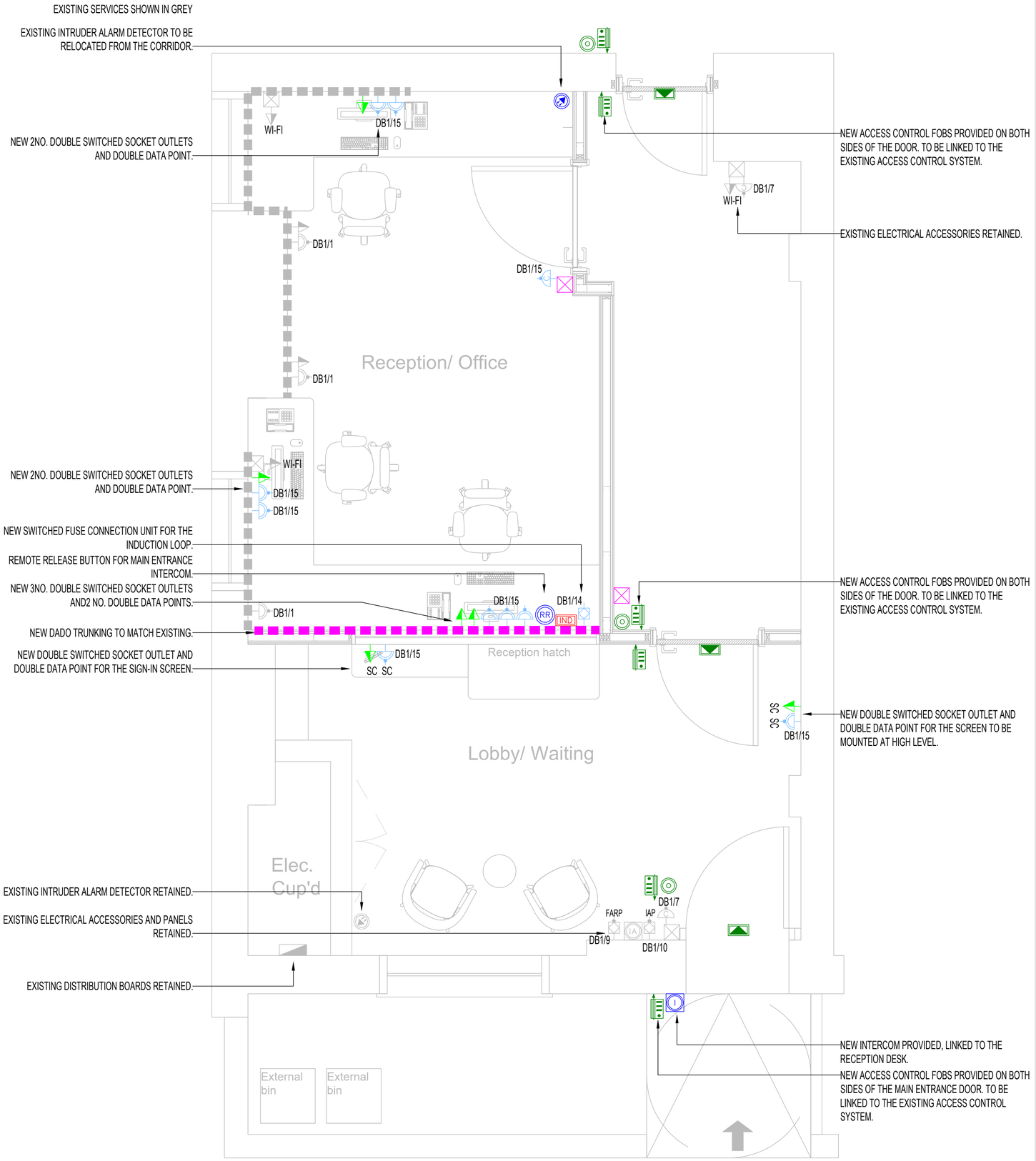
Scale (A1)	Date	By	Ve
1:20	DEC '22	HD	KW

Doc ID	Originator	Volume	Level	Type	Role	Number	Suitability	Revision
220466	CPW	XX	00	DR	E	220001	S3	T01

220466-CPW-XX-00-DR-E-220001 S3 T01

CPW Project No. 220466

Linked Files
Olive_Xref



GENERAL NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CPW SPECIFICATION AND ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRODUCING FULLY DIMENSIONED WORKING/FABRICATION DRAWINGS FOR THESE WORKS. ALL WORKING DRAWINGS SHALL BE FULLY CO-ORDINATED WITH OTHER TRADES AND BUILDING DETAILS, INCLUDING CEILING/STEEL DETAILS.
4. THE FINAL POSITIONS OF ALL ELECTRICAL ACCESSORIES SHALL BE CAREFULLY CO-ORDINATED AGAINST THE LATEST ARCHITECTURE AND FURNITURE LAYOUTS AND SHALL BE AGREED ON SITE PRIOR TO INSTALLATION OF ALL SERVICES TO ENSURE FULL CO-ORDINATION.
5. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL 'AS FITTED' DRAWINGS AND O&M INFORMATION FOR THE COMPLETE INSTALLATION, INCLUDING ALL RELEVANT INFORMATION FROM THE SPECIALIST SUB-CONTRACTORS.
6. THE ELECTRICAL INSTALLATIONS MUST COMPLY IN FULL WITH THE REQUIREMENTS OF BS7671 18TH EDITION WIRING REGULATIONS.
7. WHERE COMMUNICATION OR OTHER CABLING DEVICES HAVE BEEN ABANDONED OR ARE OBSOLETE, REMOVE ANY ASSOCIATED WIRES BACK TO SOURCE. PATCH AND REPAIR TO ELIMINATE ANY EVIDENCE OF DISRUPTION.
8. UTILIZE EXISTING POWER SOURCES WHERE APPLICABLE.
9. ALL NEW UTILITY POWER CIRCUITS SHALL BE INSTALLED WITHIN NEW GALVANISED STEEL CABLE TRUNKING AND NEW STEEL CONDUIT.

CIRCUITRY:

DB1/14
AS EXISTING
DB1/15
WIRING TYPE - Cu LS0H MULTI FLAT
CIRCUIT CONDUCTOR CSA, LIVE 2.5mm², CPC 1.5mm²
BS(EN) 60898, MCB - YES, RCD - YES, **AFDD - YES**
TYPE B, RATING 32A, SHORT CIRCUIT CAPACITY 10kA, 30mA

LEGEND:

- PROPOSED NEW POWER & DATA
- RETAINED & REUSED POWER & DATA
- 13A SWITCHED DOUBLE SOCKET OUTLET
- 13A SWITCHED SINGLE CLEANER'S SOCKET OUTLET
- 13A SWITCHED FUSED CONNECTION UNIT
- 13A UNSWITCHED FUSED CONNECTION UNIT
- DADO TRUNKING
- DOUBLE DATA OUTLET
- ACCESS CONTROL MAGNETIC LOCK
- ACCESS CONTROL FOB/CARD READER
- ACCESS CONTROL GREEN BREAK-GLASS UNIT
- INTERCOM REMOTE RELEASE BUTTON
- AUDIO INTERCOM
- INTRUDER ALARM PANEL
- INTRUDER ALARM MOVEMENT DETECTOR
- INDUCTION LOOP
- HL — DENOTES AN OUTLET MOUNTED AT HIGH LEVEL
- SC — DENOTES AN OUTLET MOUNTED FOR SCREEN
- IAP — DENOTES AN OUTLET MOUNTED FOR INTRUDER ALARM PANEL

REV	DATE	DESCRIPTION	BY	VE
T01	05/12/2022	TENDER ISSUE	HD	KW

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london@cpwp.com

RIBA Stage
STAGE 4

Status
TENDER

Client
AHR

Project
OLIVE SCHOOL, HACKNEY
ADMIN HOUSE REMODEL

Drawing Title
PROPOSED POWER, DATA & SECURITY LAYOUT

Scale (A1)	Date	By	Ve
1:20	DEC '22	HD	KW

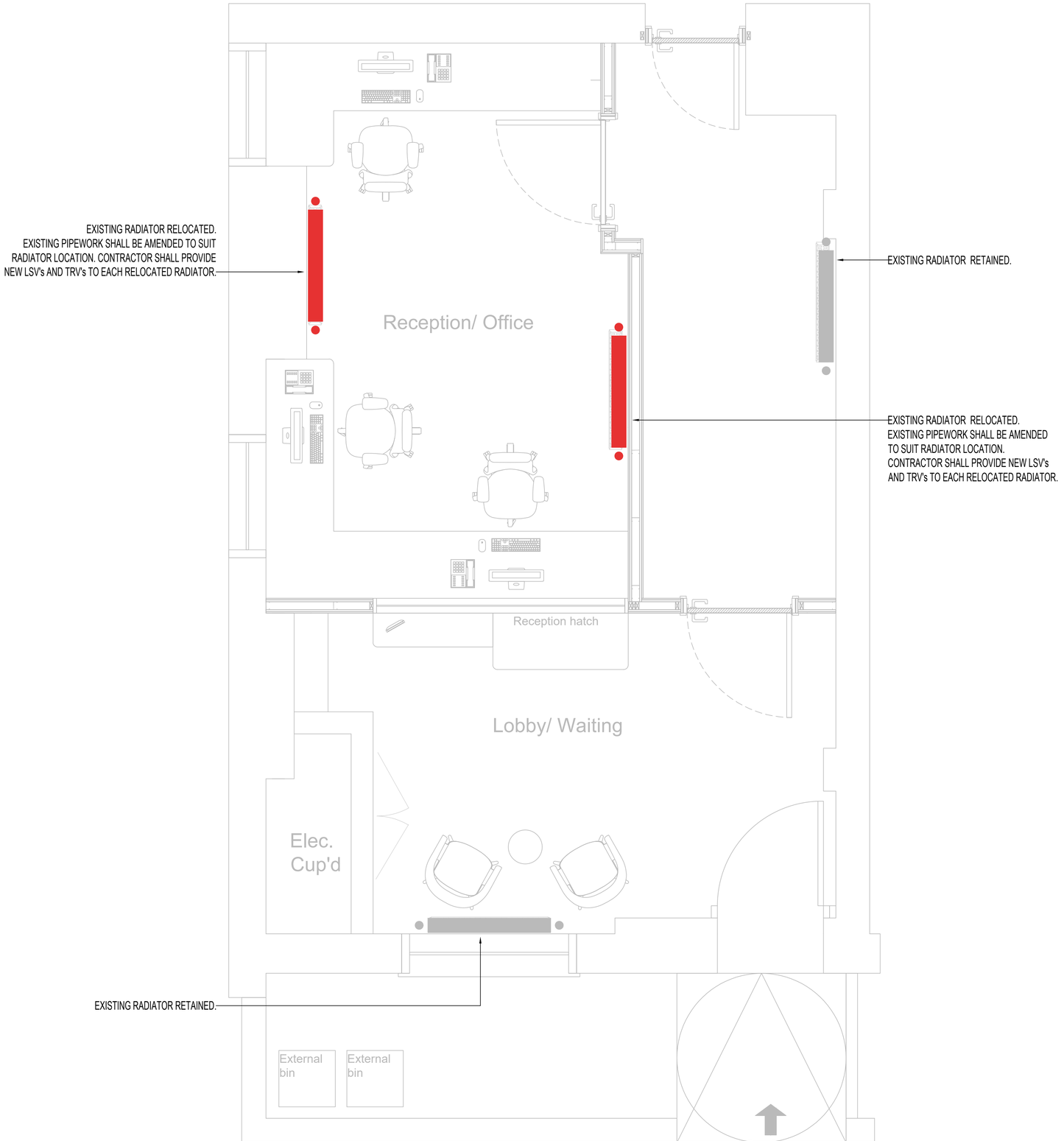
Proj ID	Originator	Volume	Level	Type	Role	Number	Suitability	Revision
220466	CPW	XX	00	DR	E	230001	S3	T01

220466-CPW-XX-00-DR-E-230001 S3 T01

CPW Project No. 220466

Linked Files
Olive_Xref

EXISTING SERVICES SHOWN IN GREY



GENERAL NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CPW SPECIFICATION AND ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRODUCING FULLY DIMENSIONED WORKING/FABRICATION DRAWINGS FOR THESE WORKS. ALL WORKING DRAWINGS SHALL BE FULLY CO-ORDINATED WITH OTHER TRADES AND BUILDING DETAILS, INCLUDING CEILING/STEEL DETAILS.
4. THE FINAL POSITIONS OF ALL MECHANICAL ACCESSORIES SHALL BE CAREFULLY CO-ORDINATED AGAINST THE LATEST ARCHITECTURE AND FURNITURE LAYOUTS AND SHALL BE AGREED ON SITE PRIOR TO INSTALLATION OF ALL SERVICES TO ENSURE FULL CO-ORDINATION.
5. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL 'AS FITTED' DRAWINGS AND O&M INFORMATION FOR THE COMPLETE INSTALLATION, INCLUDING ALL RELEVANT INFORMATION FROM THE SPECIALIST SUB-CONTRACTORS.

REV	DATE	DESCRIPTION	BY	VE
T01	05/12/2022	TENDER ISSUE	HD	AK

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RIBA Stage
STAGE 4

Status
TENDER

Client
AHR

Project
OLIVE SCHOOL, HACKNEY
ADMIN HOUSE REMODEL

Drawing Title
PROPOSED MECHANICAL SERVICES LAYOUT

Scale (A1)	Date	By	Ve
1:20	DEC '22	HD	KW

Proj ID	Originator	Volume	Level	Type	Role	Number	Suitability	Revision
220466	CPW	XX	00	DR	M	121001	S3	T01

220466-CPW-XX-00-DR-M-121001 S3 T01

CPW Project No. 220466

Linked Files
Olive_Xref

Appendix B

CPW MEP Specification

Where buildings come alive

AHR

Olive School Admin House Remodel

220466

MEP Specification

Birmingham | Nottingham | Huntingdon | Leeds | Bristol | Leicester | London | Manchester | Derby | Oxford | Poland | India

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Sustainability at our core.

Document Revision History			Ref	220466	
Rev	**Author**	**Verification By**	**Date**	**Suitability**	**Comments / Status**
T01	K. WIATR	A. KOUYIALIS	05/12/2022	S3	TENDER ISSUE

Contents

Section One (A)

Preliminaries

Refer to Main Contract Documentation for Preliminary Clauses.

The Building Services Sub-Contractor shall obtain a copy of the Main Contract Preliminary Clauses and include all costs necessary associated with the Main Contract Preliminary Clauses within their tender submission – no further monies shall be forthcoming for any errors or omissions due to the failure of the contractor to not have included for any costs associated with these clauses.

Section

1B

Preliminaries, M&E Requirements

Contents

1B-1 INTRODUCTION AND INTERPRETATION

The Mechanical and Electrical Contractors shall complete the installations as detailed within this specification and associated documentation i.e. drawings, reports etc., employing skilled personnel and Specialist Contractors as necessary to achieve the standards described.

1B-1-1 DEFINITIONS

Authority having jurisdiction (AHJ) - Refers to organization, office, or individual responsible for enforcing the requirements of legislation or standards, or for approving equipment, materials, an installation, or a procedure

Contract Administrator – Refers to a representative of the company administering the project as defined in the Contract preliminaries.

Building Contractor – Where this term is used within the specification, it shall be taken as the Contractor mainly responsible for completing the building works as detailed herein.

Building Services Contractor – Where this term is used within the specification, it shall be taken as the Contractor mainly responsible for completing the combined mechanical and electrical installation works as detailed herein.

Contractor – Where this term is used within the specification, it shall refer to the Contractor completing the Works detailed herein and shall refer equally to Mechanical Main Contractor or Building Sub-contractor or any of the other "contractor" terms defined within this clause.

Electrical Contractor – Where this term is used within the specification, it shall be taken as the Contractor mainly responsible for completing the electrical installation works as detailed herein.

Engineer – Refers to a representative of Couch Perry Wilkes.

Fire Advisor –Refers to organization, office, or persons responsible for approving the fire safety design, equipment, materials, installation and procedures such as Authority Having Jurisdiction (AHJ), Fire Officer, Fire Brigade, Building Control, Fire Consultant etc.

Main Contractor (or Principal Contractor) – Where this term is used within the specification, it shall be taken as the Contractor with overall responsibility for the completion of the Works on behalf of the Employer.

Mechanical Contractor – Where this term is used within the specification, it shall be taken as the Contractor mainly responsible for completing the mechanical installation works as detailed herein.

Specialist – Refers to a specialist company employed by any of the above to complete a part of the Works on their behalf. The employing Contractor shall remain fully responsible for all works undertaken by the Specialist.

Note: None of the above terms imply a contractual relationship this will depend on the contract arrangements.

DEFINITIONS			
BESA	Building Engineering Service Association	CDP	Contractor's Design Portion
BREEAM	Building Research Establishment Environmental Assessment Method	CDM	Construction Design Management (Regulation)
BS	British Standard	CIBSE	Chartered Institution of Building Services Engineers
BS EN	British Standard European Norm	IET	Institution of Engineering and Technology
BS EN ISO	British Standard European Norm International Standard	NICEIC	National Inspection Council for Electrical Installation contracting
BSRIA	Building Services Research and Information Association	TN-S	Separate protective earth and neutral conductors
CCTV	Closed Circuit Television	TN-C-S	Combined Earth and Neutral conductor separate protective earth and neutral downstream

1B-1-2 REFERENCE TO OTHER SECTIONS OF THIS SPECIFICATION

This section of the specification shall not be used in isolation and must be read in conjunction with the particular sections, commissioning and standard clauses, all of which further define the requirements for the works.

1B-1-3 STANDARDS APPLICABLE

Works shall be completed in accordance with all applicable industry standards. Some of the most relevant standards associated with this section are scheduled below:

STANDARDS	
BSRIA BG 6 Design Framework for Building Services	Electricity at Work Regulations
BSRIA BG 28 Soft Landing BREEAM	F Gas Regulations
BSRIA BG 38 Soft landing Core Principles	Gas Safety Regulations
BSRIA BG 54 Soft Landing Framework,	Health and Safety at Work Act
BSRIA BG 61 Soft landings and Government Soft landings	Health and Safety Executive ACOP and HS Guides
Building Regulations	IET Wiring Regulations (BS7671)
COSHH Regulations	Insurance Company Requirements
Clean Air Act	Pressure Systems Safety Regulations
Clean Air Strategy	(The) Public Health (Infectious Diseases) Regulations
Construction (Design and Management) Regulations	Liquid Petroleum Regulations
Control of Asbestos Regulation	Local Authority Building Control (LABC)
Control of Pollution Act	London Building Act and / or Building (Inner London) Regulations where applicable.
Dangerous Substances and Explosive Atmosphere Regulations	Management of Health and Safety at Work Regulations
Electricity Safety, Quality and Continuity Regulation	National Joint Utilities Group Publications
(The) Health & Safety (Miscellaneous Amendments) Regulations	Water Supply Regulations
Health & Safety at Work Act	
Requirements of the Environmental Health Officer (EHO), Fire Officer and Building Control Officer	

Any EU legislation cited within this specification will continue to be required for the specific services described and forms part of the “retained EU legislation” detailed within the European Union (Withdrawal) Act 2018.

Where the above standards refer to supporting documentation and standards these shall be fully complied with in all respects.

Where discrepancy is found between this specification and the relevant standards, the Contractor shall obtain written clarification from the Engineer prior to submission of the tender. Where a discrepancy has not been clarified prior to tender submission, the Contractor shall include the most onerous requirements.

1B-1-4 CURRENCY OF INDUSTRY STANDARDS

In general, all works shall be completed in accordance with the latest versions of the relevant standards that are applicable at the time of contract commencement.

These standards may be updated, or new standards issued, during the execution of the works and if so the Contractor shall:

1) Comply with all new or updated statutory requirements that come into force during the contract period. Where notice of a change to these is in place during the tender period then compliance is deemed to be included in the tender price.
2) Advise the Engineer of all other relevant new or updated standards when these become known.
3) Obtain confirmation, from the Engineer, as to whether the works shall comply with these new or updated standards with respect to:
    - Subsequent phases.
    - Variations.

1B-2 GENERAL REQUIREMENTS

This Section of the Specification identifies general requirements which are applicable to all services and all sections of this specification.

1B-2-1 CONTRACT CONDITIONS

The contract conditions shall be as detailed in the main contract preliminaries set out for the Contract conditions.

1B-2-2 PROJECT DESCRIPTION

The project involves the design, supply*, (modification of existing installation)* installation, testing and commissioning of the Mechanical and Electrical Services. Scheduled below is a brief list of the services - this list is not exhaustive and is provided to give a general understanding of the works only:

- Isolation and draining down ready for demolition of all MEP services as indicated on Enabling Works layout.
- LTHW heating system
- LV electrical distribution system
- General and Emergency Lighting systems
- Telecommunication systems
- Security detection and alarms
- Fire detection and alarms
- Earthing and bonding systems

Please refer to Main Contract Documentation for a full description of the overall works.

1B-2-3 PHASING OF THE PROJECT

The project shall be phased to ensure minimum disruption is caused on site.

Refer to Contract preliminaries for further details.

1B-3 SITE VISIT

A site visit shall be undertaken during the tender period to obtain satisfactory knowledge of the following:

1) Local conditions
2) Nature and accessibility of the site
3) The nature and extent of the operations
4) The supply of and conditions affecting labour
5) Storage space for materials

6) Position of underground services and drains
7) Space available for the execution of the works generally
8) Site Permit schemes and any restrictive site practices
9) Access and site restrictions

The tenderer shall include for all costs necessary to take account of the above. Arrangements for the delivery of materials to site shall be such that no congestion occurs and shall include for all additional handling and transporting due to site conditions.

No additional cost/claim shall be considered due to the failure to undertake a visit site and obtain the necessary knowledge.

1B-4 CONTRACT INCLUSION

The specific contract details are laid out in the Contract preliminaries. The Mechanical and Electrical Contractors shall include for all items necessary for the due and proper completion of the works according to the true intent and meaning of the Tender documentation and this shall include, but not be limited to, all:

1) Materials
2) Labour
3) Carriage
4) Offloading and positioning
5) Tools
6) Minor items such as screws, fixings etc.
7) Items shown on Tender drawings but not detailed in specification
8) Items detailed in specification but not shown on Tender drawings

All materials shall be new unless otherwise specified and of a type and rating matched to the duty for which they are intended. Samples of proposed fittings, materials and construction quality, where required by the Engineer, shall be submitted without delay and in good time to suit the project programme. All systems shall be complete and operational unless otherwise specified.

All test requirements at manufacturer's works, as listed in relevant British Standards or elsewhere in this specification, shall be met prior to dispatch of equipment.

All items of plant and equipment shall arrive on Site in good condition and be suitably protected from all hazards once there and all prime movers etc. shall be in working order. If items of plant are found not to function correctly after installation and this causes a delay to the Contract, the Mechanical and/or Electrical Contractor shall be charged for any costs incurred.

Care shall be taken to maintain services to areas that need to remain operational during the works. The Mechanical and/or Electrical Contractors shall not disconnect any services until they have established, in writing and through survey, the extent of these areas, and agreed an exact timing and methodology for the necessary isolation and diversion of services.

Where a client/site permit to work scheme (or similar) exists this shall be complied with in full together with necessary notice periods etc.

Should any of the tender information be found to be incompatible or ambiguous with other information, then this shall be raised as a query during the tender period and if no response is provided prior to the tender return date, the tender return shall include for the most onerous option available.

1B-5 SPECIFIED EQUIPMENT

Where materials are specified in this document they shall be included in the tender without adjustment or alteration. The Engineer may consider alternatives (as a below line tender sum option), at their discretion. Any alternatives must be provided with all supporting information to prove that it is at least equivalent to the specified product particularly regarding the following:

1) Performance
2) Physical size

3) Appearance
4) Longevity (robustness)
5) Energy efficiency
6) Certification
7) Product support and Warranty.

Where the specified product satisfies the criteria for enhanced capital allowances and hence is published within the energy technology product list, the alternative product must do likewise.

1B-5-1 CONSTRUCTION PRODUCT MARKING – (DECLARATION OF CONFORMITY)

Following on from Great Britain leaving the European Union changes in product marking now apply. Products shall comply with the Construction Product Regulation as detailed below:

Timeline	GB Market. (England, Scotland & Wales)	Northern Ireland Market	European Market (EEA)
Until 31/12/2024	**CE** or **UKCA** or **CE&UK(NI)**	**CE** or **CE&UK(NI)**	**CE**
01/01/2025 onwards	**UKCA**	**CE** or **CE&UK(NI)**	**CE**

1B-6 PRE-TENDER ENQUIRIES

Prior to issue of this tender package, enquiries to the marketplace may have been undertaken by Couch Perry Wilkes to obtain quotations from suppliers, manufacturers and specialist installers etc. These may have been requested at varying times through the design development and therefore may not reflect the final design requirements of the project as tendered and may be out of date.

The Contractor shall not rely on the accuracy of pre-tender quotations and shall be responsible for obtaining new quotations based on the final design information contained within the tender specification, drawings, schedules and accompanying tender documentation. Where the specification package is issued as Performance information only, the Contractor shall obtain new quotations based on their final design requirements.

No additional cost/claims shall be considered due to the failure to obtain quotations against the final design information.

1B-7 SUPERVISION

Site supervision for the services work is required and shall be by a dedicated Services Site Manager or equivalent permanently based on site throughout the project.

It may be acceptable for a working Charge hand to provide this service, but only with prior permission/acceptance by the client.

The supervisor shall be:

1) Present on site whenever work is in progress by or on behalf of the Mechanical or Electrical Contractor.
2) Appropriately qualified and have previous experience for the class of work specified.
3) Approved by the Engineer
4) A responsible representative to whom site working instructions shall be transmitted.

The site supervisor may be changed only after permission to do so has been granted by the Engineer and in exceptional circumstances only.

1B-8 ELECTRICAL SUPPLY

The characteristics of the available electric supply have been determined as follows:

1) Voltage – 400/230 volts
2) Frequency – 50Hz
3) Fault level – TBC by supply authority or measured by Contractor.
4) Earthing arrangements – TN-S or TN-C-S (PME)

The above shall be assumed for Tender purposes only - actual supply details shall be verified on site prior to commencing working drawings / placing orders.

All equipment, including motors and starters shall be provided to suit the voltages and phases as detailed in the particular clauses and shall be verified before final orders for materials are placed.

As part of their co-ordination duties, the Electrical and Mechanical Contractors shall exchange relevant information from their specifications that relate to equipment being procured prior to placing any orders. Thus, for instance, the plant control panels procured by the Mechanical Contractor shall accommodate the incoming cables being procured by the Electrical Contractor.

1B-9 WATER AND ELECTRICITY

Water and electricity consumed during the construction of the works shall be chargeable. For details of any variance refer to Main Contract.

1B-10 DESIGN RESPONSIBILITIES

1B-10-1 CONTRACTOR DESIGN PORTION

The Contractor/Specialist shall assume design responsibility for part(s) of the works as detailed in this clause.

This shall include the following in relation to all systems:

1) Provide details of all builder's work requirements associated with the services installation.
2) Provide fully co-ordinated fabrication drawings.
3) Provide and design all necessary services supports/fixings, including guides and anchors, but excluding any primary steelwork. All such systems shall be appropriately fire rated for the service supported.
4) Provide and design all necessary means for expansion and contraction for the Mechanical Services.
5) Routing and sizing of electrical conduits, cable trunking and cable trays other than principal runs, to facilitate the complete installation and make due allowance for 25% spare capacity within all cable management systems.
6) Undertake co-ordination of all services installations with all other trades on site and the building structure and fabric.
7) Check all attenuation and anti-vibration requirements following completion of fabrication / installation drawings and final plant selection. Provide and design final attenuators and anti-vibration equipment to meet the performance criteria detailed in the specification.
8) Include for "workshop" meetings associated with the ongoing development of each service provided. The number of meetings per service will depend on the complexity of design and the Contractor/Specialist should allow suitable time within the design programme to accommodate these. The Client's design team shall be invited to all such meetings as appropriate (e.g. the Architect should be invited where design has implications on the building aesthetics)

In addition, the following systems require the Contractor/Specialists to assume design responsibility for the works which shall be developed from the tender package information (as far as these systems are provided within the scope of the Contract):

1) Fire Alarm and detection systems
2) Intruder/Access Control alarm systems
3) Hearing Enhancement Systems
4) Voice/data systems

Refer to appendix for CDP responsibility schedules.

1B-11 DESIGN SUBMISSIONS

The Contractor shall provide design submissions for all systems and equipment for which they have design responsibility. This shall include, where relevant to the system, the following:

1) Detailed design philosophy statements along with any assumptions made.
2) Detailed calculations to determine size of plant/equipment/distribution, etc.

3) Audibility calculations e.g. fire alarm sounders
4) Visibility calculations e.g. fire alarm beacons
5) Calculations for the category of the lightning protection and surge suppression system.
6) Detailed and complete schematic drawings.
7) Detailed design layout drawings.
8) Detailed distribution systems design drawings to include design values, e.g. peak loading, fault levels, fire stopping, flow rate, velocity, resistance and reference for each section/leg.
9) Detailed schedules of all equipment with duties, sizes, redundancy and any other pertinent information.
10) Commissioning engineer's report on commissionability of the concepts and solutions proposed.
11) Detailed controls (BMS) descriptions in plain, clear and concise English.
12) The proprietary names of all significant products to be included in the Works but not covered by the above items.
13) Any other written or drawn information the Contractor considers necessary to submit to further explain their proposals.
14) Identification of any ambiguities, inconsistencies or errors found by the Contractor in the documents provided by the Employer and a statement of how these issues have been dealt with.
15) Identification of any items or work not included in the tender sum but which are necessary for the completion of the Project.
16) A schedule of all comments received along with details of agreed actions taken or clarification to resolve any issues raised. The schedule shall be a "live" document updated on a regular basis as the design develops and the commenting procedure progresses.

Any work that commences without the submission of the relevant calculations, schedules and drawings being submitted shall be deemed to have been undertaken at the Contractor's risk and any installations subsequently found to be non-compliant with the design parameters shall be rectified at the tendering Contractor's own expense with no detriment to the programme.

A statement shall be provided as to whether or not, in each case, products specified by proprietary name, (either stated as specifically required or specified as examples meeting the requirements) are included in the Contractor's Proposals and, if not, the alternative being offered. Any departure from design intent shall be highlighted to be easily identified.

1B-12 TECHNICAL SUBMISSIONS

In addition to the design submissions, the Contractor shall provide full detailed technical submissions to demonstrate that they have understood the requirements of the criteria outlined in the tender documents and have provided a fully compliant solution.

The Contractor shall provide Technical Submissions for all items as listed below:

1) The chosen equipment from the list of manufacturers identified within the specification
2) Where manufacturers provide working drawings (equipment or system)
3) Any alternative item offered that differs from that specified (manufacturer, material, range etc.)
4) Any bespoke manufactured equipment.
5) Equipment with project/user specific programming, labelling or controls

Each Technical Submission shall be complete with the following information:

- A completed schedule for each item to show capacity/ duty, efficiencies, redundancy and design parameters used for the selection. (Use schedules within the specific sections of this specification where given.)
- Clear identification of the component/equipment/system being submitted with catalogue information, e.g. number or reference or title.
- Specific data sheets for equipment which shall include maintenance and any commissioning requirements.
- Working drawings as appropriate.
- All relevant information required to evaluate the proposal.

1B-13 COORDINATION

The tender drawings show design intent. They are not construction or working drawings and therefore do not show all bends, tees, sets etc. that are necessary to locate services correctly to avoid clashes and ensure good maintenance access. The Contractor shall:

1) Include for all materials etc. as required to provide a complete, fully co-ordinated installation for their services.
2) Complete co-ordination in conjunction with the Main Contractor, the Electrical/Mechanical Contractor and the Contract Administrator, both individually and jointly.
3) Be responsible for co-ordination of their Sub-Contractors and/or Specialists' installation
4) Ensure that all services are co-ordinated with the building itself and any other services present and agree the sequence and timing of each element of the installation in a manner that maintains the agreed co-ordinated arrangements and programme.
5) Where services are exposed to view or of architectural merit, mark out on site the positions of all equipment and services routes, including trunking, conduit and pipework etc. prior to their fixing and agree the same with the Architect/Engineer/ Contract Administrator.
6) Review architect's room layouts and elevations where available to determine exact locations.
7) Pay particular attention to ensure that accessories are positioned to suit door openings, fitted furniture, etc.
8) At all "pinch points", heavily serviced areas, congested service routes or corridors and as otherwise specified elsewhere in this specification, produce drawings/sketches/details/REVIT models allocating space for all mechanical and electrical services and demonstrate that crossover points etc. have been agreed in a manner that allows sufficient access to all maintainable items. These drawings/sketches/details shall be produced by the Mechanical Contractor who shall also lead the associated co-ordination process.
9) Produce co-ordinated Mechanical and Electrical ceiling drawings at 1:50 scale, based on Architect's ceiling layouts, showing all ceiling mounted mechanical and electrical equipment. All necessary mechanical information shall be provided by the Mechanical Contractor. The Electrical Contractor shall take the lead to produce these drawings.
10) Submit all drawings etc. following the requirements for working drawings detailed in this specification.
11) Liaise with the Contract Administrator and CDM Principal Designer with regard to the assessment and reduction of hazard and risk in accordance with the current CDM regulations.
12) Include for all necessary aspect ratio changes of ductwork where needed to achieve a fully co-ordinated layout or to allow the systems to fit within available voids / under structural steels. These shall be deemed to have been included within the Tender Sum.
13) Take particular care to obtain uniform and tidy arrangements of pumps, valves, switchgear, outlets and ceiling mounted equipment. The precise position of a piece of equipment shall normally be determined as follows: -
    a) Single items of equipment which are visually remote from other electrical or mechanical equipment shall be erected at the mounting heights stated in the Specification or shown on the drawings.
    b) Two or more items of equipment, whether electrical or mechanical or both, which are to be erected on the same wall or ceiling, or which will otherwise be visually close to each other, shall be arranged in a neat and symmetrical group. Symmetry of arrangement shall be obtained by horizontal and vertical alignment through the centre lines and not the edges of equipment; for this purpose the stated mounting heights may, with the Contract Administrator's approval, be varied slightly.
14) Not install any services in an uncoordinated manner. Any services installed that have not been co-ordinated or as shown on the co-ordinated drawings shall be re-positioned at the Contractor's own expense as necessary.

Any disputes shall be referred to the Main Contractor, who has overall responsibility for co-ordinating the construction activities.

1B-14 BUILDER'S WORK

Allowances are included in the tender for the provision of builder's work for the works such as:

1) Formation of brick or concrete bases for engineering plant.
2) Formation/excavation of trenches.
3) Provision of anchor thrust blocks.
4) Formation of horizontal and vertical service ducts, covers and access panels as appropriate.
5) Cutting/forming of holes and chases, etc., and making good.
6) Cable tiles, marker tapes and cable markers, which shall be provided by the Contractor, shall be installed by the Building Contractor.

The Contractor shall provide

1) Detailed information to the Building Contractor for all builders work required for the Contract works based on working drawings produced by the Contractor and manufacturers' drawings, etc.
2) Dimensioned drawings showing the sizes and positions of all builders work requirements.

Where it is not practical to indicate on the drawing the positions of small (<100mm dia) holes and chases, they shall be marked out on site by the Contractor; this does not apply to holes through structural concrete or beams, which shall be shown on the drawings.

The Contractor shall be responsible for the preparation of builder's work details of all their Sub Contractors / specialists.

The above shall be provided in good time to enable provision to be made for the same during the construction process. The Contractor shall provide builder's work drawings that are:

1) Based upon the installation drawings.
2) Fully co-ordinated as detailed elsewhere in this specification.
3) Provided in electronic format and:
    a) The Contractor shall agree the number of paper copies to be issued for comment by the Engineer,, for tender purposes assume 3 (three).
    b) The Contractor shall agree the number of paper copies to be issued for construction, for tender purposes assume 6 (six).

1B-15 INSTALLATION (WORKING) DRAWINGS

The Tender drawings issued are provided to show primary routes, design intent, component order etc. They shall not be used as working or fabrication drawings. The Contractor shall develop the tender drawings in order to provide a complete set of co-ordinated working and fabrication drawings for the installation works. The drawings and installed systems shall:

1) Include all fittings etc. required to comply with this specification.
2) Be based upon measured site dimensions - under no circumstances shall scaled dimensions from drawings be accepted.
3) Include minimum spacing as specified.
4) Be fully co-ordinated as detailed elsewhere in this specification.
5) Be provided to the following scales:

DESCRIPTION	SCALE
Plant rooms, external compounds and the like, risers, electrical switch rooms and cupboards and meter rooms	1:20
Internal wall elevations for positioning of outlets, components etc.	1:20
Site distribution, incoming services etc. 1:100 as long as sufficient detail can be shown	1:100
Site distribution where insufficient detail can be shown	1:50

DESCRIPTION	SCALE
Details of brackets, supports and any special fixings	1:10
Manufacturers detail drawings of items of equipment	1:20
Any drawing not listed above	1:50

1) Be provided in electronic format and:
   a) The Contractor shall agree the number of paper copies to be issued for comment with the Engineer - for tender purposes assume 3 (three).
   b) The Contractor shall agree the number of paper copies to be issued for construction with the Engineer - for tender purposes assume 6 (six).
   c) Manufacture / installation works shall not commence until the drawing has been returned without any outstanding comments from the engineer, all comments shall be addressed prior to final copy being issued for manufacture / installation.

1B-16 FURTHER DOCUMENTATION TO BE PROVIDED BY CONTRACTOR

In addition to those items discussed in the preceding clauses, the Contractor shall provide all required documentation detailed within this specification, which shall include the following:

1B-16-1 PROGRESS DRAWINGS

The Contractor shall keep on site, available for reference by the Contract Administrator or other authorised persons, a full set of installation drawings on which the contractor shall record the work as installed.

1B-16-2 RECORD DRAWINGS

The Contractor shall provide record drawings that are:

1) Based upon the installation drawings.
2) An accurate record of the actual installation including any deviations from the working drawings that have occurred on site.
3) Fully co-ordinated as detailed elsewhere in this specification.
4) Indicative of the layout identity, size and position of all services installed.
5) Provided in electronic format.

The Contractor shall agree the number of paper copies to be issued for comment with the engineer - for tender purposes assume 2 (two).

The Contractor shall provide one full set of record drawings for each maintenance manual to include:

1) Reduced A3 colour copy inserted unfolded in A3 clear plastic wallets, all drawings to be visible without removing from wallets.
2) Full size copy folded and inserted into clear plastic wallets.
3) USB drive containing electronic copy in formats described elsewhere in this specification.

1B-16-3 OPERATING AND MAINTENANCE MANUALS

The Contractor shall produce all information necessary for inclusion in the building Health and Safety file, referred to as Operating and Maintenance (O&M) manuals below.

Program for production of O&M manual.

1) 2 (two) hard copies of the manuals are required, to include record drawings as outlined elsewhere.
2) Manuals and record drawings shall be compiled during the contract and an initial draft copy shall be available for the first commissioning of the engineering services. (Minimum 21 days before contract completion.)
3) Practical completion shall not be given until final copies (without unresolved comments from the Engineer) are provided.
4) Allow a minimum of seven days for the Engineer to comment.

5) Incorporate all comments, re-issue for comment if substantial change required.
6) Prior to Practical Completion supply final copies.

The O&M manuals shall be presented as a complete and coordinated package and shall include:

1) Bound in covers capable of withstanding continual heavy use.
2) An Index.
3) Helpful telephone numbers.
4) Instructions for dealing with emergency conditions for each plant.
5) All information to enable operational staff to comprehend fully the extent, purpose and method of operation of the plant(s) including a full description of operation.
6) Detailed schedules of all plant and equipment installed, including model numbers, serial numbers and capacities and with reference numbers which agree with the detailed labelling strategy agreed with the engineer.
7) Schedule of manufacturers' names, addresses and telephone numbers.
8) Detailed instructions on the starting up, running and shut-down of all systems
9) Description of operational routines, together with diagrams showing the functions of all controls.
10) Clearly set out schedules showing the extent and frequency for which maintenance is required, in detail, and how it should be carried out
11) Maintenance and lubrication schedules listed in order of frequency.
12) Information to facilitate the ordering of spares and replacements
13) Common fault finding measures and remedial actions.
14) Any precautionary measures necessary to prevent corrosion or freezing etc.
15) Care required of plant which is or may be subject to seasonal or occasional use
16) A final copy of the report(s) prepared during testing and commissioning, including all test certificates.
17) Maintenance instructions provided by the suppliers of equipment and/or plant to support (not replace) the maintenance information
18) A full set of Record or 'As Fixed' Drawings.
19) Circuit and Test charts for each distribution board.
20) NICIEC/IET Test and Completion Certificates
21) Emergency lighting test certificates and record sheets.
22) Fire alarm test certificates.
23) Valve charts referenced to coincide with the marking of valve labels etc. called for in this Specification.
24) The size, type and length of each LV cable (to the nearest metre) together with the measured earth fault loop impedance
25) Interconnections between items of equipment, including those provided by others and terminal numbering and cables core identification for all alarm and control circuits
26) Drawings that include the work of Sub-Contractors, e.g. laboratory / medical gases and ventilation ductwork etc.
27) Schematic diagrams of the application of automatic controls and instruments etc. including a "Description of Operation".
28) The location and depth of buried services including those installed by Gas, Water and Electricity Authorities etc.
29) Schedules and/or diagrammatic presentations to amplify the drawings where necessary for clarification.
30) Building Regulations Part L Log Book.
31) Pressure Regulations documentation.
32) Building users guide.

Each manual to contain a DVD or USB memory device to contain the following:

1) CAD drawings (Latest AutoCAD version) and PDF copies of all Record and 'As Fitted' drawings.
2) Microsoft Word (Latest version) and PDF of all of Mechanical and Electrical Contractors' written instructions.
3) PDF copies of all manufacturers O&M manuals (in separate directory, named and cross referenced to match O&M manual descriptions).
4) PDF Copies of all certificates, commissioning results, test certificates etc.
5) Electronic copy of control strategies as final commissioned state.
6) Electronic copies of models, Building Regulation Part L assessments and log book etc. where prepared by the Mechanical and Electrical Contractors.
7) Pressure Regulations documentation.

1B-16-4 BUILDING LOG BOOK

The Building Logbook shall be completed in accordance with Part L of the Building Regulations.

1) In contracts where the Electrical contractor is employed as the Main contractor the log book shall be complied and issued by the Electrical contractor.
2) In contracts where both Electrical and Mechanical contractors are employed, or where Mechanical contractor is employed as Main contractor, the log book shall be compiled and issued by the Mechanical Contractor

The relevant electrical or mechanical information shall be provided to the contractor compiling the Log book as follows:

1) Information to be provided by the Contractor compiling Logbook (Mechanical and/or Electrical Contractor)
    a) The location of relevant plant and equipment, including simplified schematic diagrams.
    b) The installed capacities (input power and output rating) of the services plant.
    c) A report confirming that the building services equipment has been satisfactorily commissioned.
    d) Simplified Operating and Maintenance instructions that include provisions enabling the specified performance of equipment to be sustained during operation (this may be cross-referenced to O&M manual documentation).
    e) The locations, identifications and descriptions, including instructions of use of all building energy supply meters and sub-meters.
    f) A statement regarding air tests and air permeability carried out on the building. (Information may be required from other parties, such as the Main Contractor or Architect).
    g) A simple description of the operation and control strategies of the energy consuming services in the building. (Control Specialist to develop from Engineers statements included in Specification).
    h) A statement regarding how energy performance of the building (or each separate tenancy in the building) can be calculated from the individual metered energy readings. (Control Specialist to develop from Engineers statements included in Specification).
    i) A schedule of floor areas of each of the building zones categorised by environmental servicing type (e.g. air conditioned, naturally ventilated, etc.).
    j) Microsoft Excel spreadsheets set up for this particular project to allow recording all meter readings and energy consumption.
2) Information provided by the Engineer or Mechanical Contractor where they are the designer:
    a) A description of the whole building, its intended use and design philosophy and the intended purpose of the individual building services systems.
    b) Final Part L model output report and energy certificate / display energy certificate as appropriate to the building.

The contractor compiling the information shall be responsible for providing the Building Logbook as part of the O&M documentation. The format of any necessary input to the above items shall be agreed with the contractor

compiling the Building Logbook. It shall be the responsibility of either the Electrical or Mechanical Contractor to provide the information in the agreed format.

The contractor compiling the Building Logbook shall be responsible for obtaining the relevant information from the Engineer and other parties in a timely manner to allow the Building Logbook to be provided with the other O&M documentation for comment and final handover.

In the event of this clause not being complied with to the Engineer's satisfaction, the Engineer reserves the right to recommend to the Contract Administrator that the Certificate of Practical Completion to the contractor compiling the documentation be delayed until such time that these items are approved and/or commission independently a Specialist in this field to provide the information, and to deduct the Specialist's cost from the contractor's final account.

The contractor compiling the Building Logbook shall be responsible to ensure the sign off of this takes place prior to Practical Completion.

1B-17 FORMAT OF DOCUMENTATION TO BE PROVIDED BY CONTRACTOR

The Contractor shall include for all information issued to the client and design team to be provided in the following electronic formats:

REQUIRED FORMATS	
DESCRIPTION OF DOCUMENT	**FORMAT REQUIRED FOR ISSUE**
Drawings, to be issued in both of these formats concurrently:	AutoCAD, issued in .dwg format with any xrefs bound to the drawing. PDF, without any restrictions on printing, copying, searching etc. (applies to all PDF's described below.)
Document issue sheets, Technical submittals etc.	PDF
Request For Information (RFI)	Word or Excel Document to enable responses to be added to document.
Output from calculation, modelling or part L software. To be issued in both of these formats concurrently:	ZIP compressed file of calculation input files with all information necessary to allow others to run the same calculations. PDF of any output / summary reports with sufficient information to allow results to be viewed and commented on by all parties.
Manufacturer's instructions, certificates, warranties etc.	PDF, original from manufacturer where available, else colour scanned in version by Mechanical and Electrical Contractors
Commissioning Results	PDF generally until final versions agreed then issue in PDF and editable version such as Excel spread sheet.
Certificates etc.	Original signed copy, along with PDF of the same.
H&S O&M manual	Bound printed copies and electronic copy of the same.

REQUIRED FORMATS	
DESCRIPTION OF DOCUMENT	**FORMAT REQUIRED FOR ISSUE**
Any information / document not already detailed above.	PDF, original from manufacturer / supplier where available, else colour scanned in version by Mechanical and Electrical Contractors
All format versions shall be the latest version generally available at time of issue.	

The above is in addition to the issue of official / hard copies as required by the contract documents.

1B-18 CONTRACTOR SUBMISSION REVIEW PROCEDURE

All information submitted by the Contractor shall be subject to a review process, with the submission being graded as follows:

- Status A – Proceed with design/installation in accordance with the submission
- Status B – Proceed with the design/installation in accordance with the submission incorporating the comments provided in the process.
- Status C – Do not proceed. Re-submit for further evaluation.

Only works graded A or B shall be progressed. No certification or payment shall be given for works undertaken at Status C.

Any drawings or documents prepared by the Contractor shall be prepared in good time to allow for the inspection procedure outlined above and having due regard to site progress and deliveries of materials.

The time allowed for comment by the Contract Administrator / Engineer shall be at least 10 days, subject to an agreed information release schedule. This period shall be allowed for within the program for preparing the above documents.

The above process does not apply to final documentation produced for completion, e.g. as fitted drawings, Building Log book etc. In this case the information shall be updated as required until free of comments, after which the Contractor shall submit final versions in the agreed format.

1B-19 SITE CLEANLINESS

The Contractor shall allow for cleaning up and removal from site of any rubbish as it accumulates during the progress of the works, including that of their Sub-Contractors/specialists. On completion of work the Contractor shall clear up and remove from site all superfluous materials, clean down external faces of buildings affected by the works, scrub paving and floors, clean out gullies and gutters etc., clean glass inside and out, remove all spots, splashes and stains and leave the works and all parts of the premises affected by them clean and in good order to the entire satisfaction of the Contract Administrator.

The Contractor shall ensure that all rubbish, waste and offcuts etc. are cleared away in accordance with the Main Contractor's waste management plan.

1B-20 DAMAGE DUE TO FROST OR RAIN BEFORE PRACTICAL COMPLETION OF THE WORKS

The Contractor shall make good at their own expense damage caused by frost or rain ingress due to building fabric leaking or equipment being inadequately protected. It is the contractual responsibility of the construction team not to store or install services and equipment in a building that is not sufficiently weather proof or water tight to avoid this damage. Any damaged services and equipment shall be either replaced or repaired to the satisfaction of the contract administrator and all costs for the remedial works shall be borne by the contractor.

1B-21 ARTIFICIAL LIGHTING AND POWER

All artificial lighting and power required for the whole of the works including Mechanical or Electrical Contractor's works shall be the responsibility of the Main Contractor who shall arrange for temporary supplies as necessary, temporary metering and for payment of cost involved.

Temporary metered electrical supplies to Mechanical and Electrical Contractor's site accommodation for heating and lighting purposes shall be provided by the Main Contractor. Special electrical supplies for use by the Mechanical and/or Electrical Contractors, e.g. workshop facilities, shall be provided by the Mechanical or Electrical Contractors.

Mechanical and Electrical Contractors shall allow for picking up from the temporary services provided by the Main Contractor with temporary leads to service their own requirements and they are to allow for reimbursing the Main Contractor the cost of electricity used in the Mechanical and/or Electrical Contractor's site huts.

All temporary electric wiring is to be to the satisfaction of the Contract Administrator.

1B-22 WINTER WORKING - ARTIFICIAL LIGHTING

The Mechanical and/or Electrical Contractors shall at their own expense provide adequate artificial lighting to ensure that normal weekly working hours may be worked on site despite the loss of natural light.

1B-23 TEMPORARY WORKS

1B-23-1 PLANT, TOOLS AND SCAFFOLDING

Allow for providing everything necessary for the proper execution of the work, including all requisite vehicles, plant, scaffolding, gantries, chutes, stages, fans, ladders, trestles, tarpaulins, tools, rods, moulds, templates, levels, tackle and other implements required for expeditious carrying out of the work in proper sequence, together with the carriage and cartage thereof, maintenance, adapting, shifting and removal of same when no longer required.

The Contractor shall provide and remove on completion, temporary screen and tarpaulins required to give adequate protection against wind, weather and prevent the spreading of dirt, dust and rubbish.

1B-23-2 DELIVERY AND OFF-LOADING

The Contractor shall carry out and shall provide all the necessary equipment for the off-loading, site transport and hoisting to the required level of all materials and equipment supplied under this Contract.

1B-24 OVERTIME OR NIGHT WORK

Overtime and Night work shall only take place as detailed within the Contract Preliminaries.

Where applicable the Contractor shall provide and allow for any overtime as stated within the Specification. The Contract Administrator shall receive not less than 24 hours' notice specifying times and locations of the work to be done. Any concealed work executed during overtime for which notice has not been given may be required to be opened up for inspection and reinstated at the Contractor's expense.

Should the Contract Administrator issue specific instructions, in writing, for overtime working other than that specified within the Tender Documentation, then the net difference between normal time and overtime rates shall be added in the final account; provided that accurate and detailed returns are submitted each week to the Contract Administrator.

1B-25 FIRE PRECAUTIONS

The Contractor shall take all reasonable precautions to avoid the outbreak of fire, particularly in work involving the use of naked flames. The Contractor shall set in place and rigorously enforce procedures to minimise the risk of an outbreak of fire, which shall address the following general issues as well as any site-specific issue:

1) Disposal of flammable materials
2) Accumulation of rubbish on site
3) Hot works procedures including:
    a) Use of fire resisting mats, to prevent scorching or fire.
    b) Provision of firefighting equipment during the work.
    c) Fire watch during and after hot works.
    d) Hot works to stop at least two hours before leaving site.
4) Obtaining and clearing any required work permit from the client and following any additional requirements in their safety procedures.
5) Fire escapes being maintained clear and usable at all times.

6) Safe storage of highly flammable materials and gas cylinders.

The above procedure shall be detailed in a method statement issued to all parties for comment, and any comments incorporated, prior to commencing works.

1B-26 TESTING AND COMMISSIONING OF ENGINEERING SERVICES

Detailed Requirements for testing and commissioned are laid out later in this specification. In general:

1) All testing shall be carried out as recommended by the current edition of the IET wiring regulations (BS7671), relevant British and European Standards and Codes of Practice and current legislation.
2) The Contractor shall draw up a detailed testing and commissioning programme indicating critical dates of external influences.
3) The Contractor shall allow for their Commissioning Engineers being in attendance whilst the Engineer verifies the results and ascertains that the various elements of each system are in full working order. A minimum period of 1 week per month of the contract period (Minimum 2 weeks) shall be allowed for this procedure.
4) The Contractor shall allow for their Commissioning Specialist to demonstrate to the Employer that the design intent of the systems has been achieved.

1B-27 SOAK TEST PERIOD

Upon completion of the setting to work and commissioning of the services the Contractor shall perform a soak test of the systems installed. The soak test shall:

1) Be included in the programme for the works.
2) Continue until seven continuous days of plant operation have occurred without fault or failure of any component / function.

   During the soak test period the Contractor shall:

   a) Monitor all functions (pressures/temperatures/starts per hour etc.) which shall be trend logged using the microprocessor controls equipment where installed.
   b) Monitor each type of space served by the plant and equipment using digital data recorders (supplied by the Mechanical or Electrical Contractor) to verify the performance.
   c) Carry out any specified heat load and noise performance surveys
   d) Download/convert all data to Excel spreadsheet format (disc and hard copy).
   e) Send all data and monitoring results to the Engineer for acceptance by both the Employer and the professional parties

Should the soak test fail for any reason, then the results shall be null and void and the test period shall re-commence upon rectification of the problem/failure.

All costs associated with the soak test such as test equipment, attendance and supervision shall be included by the Contractor.

Any costs incurred as a result of or a consequence of having to restart the soak test shall be at the Contractor's expense.

A successful soak test as described shall be carried out prior to practical completion being granted by the Contract Administrator.

1B-28 USE OF BUILDING SERVICES

The Contractor is reminded that they are responsible for the permanent engineering installation provided as part of this Contract until such time as the Certificate of Practical Completion is issued.

These installations shall not be used either directly for, or in connection with carrying out Contract works without the written consent of the Contract Administrator and appropriate Contractors and Manufacturers.

Should any systems be used in this way, the following applies:

1) The Employer does not undertake that it will be available.

2) It shall not be used until the plant has been tested to the satisfaction of the Contract Administrator and Engineer.
3) The Contractor shall take responsibility for operation, maintenance (and remedial work) and arrange supervision by and the indemnification of the appropriate Sub-Contractor and pay all costs arising including extending all associated warranties accordingly.
4) The Contractor shall effect any additional insurances required and pay all additional costs associated.
5) The Contractor shall pay costs of fuel or water used.
6) The Defects Liability Period shall commence from the date of Practical Completion of the works, and not from the date when parts of the installation(s) are brought into use for the above reasons.
7) The Contractor shall indemnify the Employer against the reduction in manufacturer's guarantee resulting from use before practical completion.
8) If it has been agreed that the Contractor may use the permanent lighting then the following shall apply:
    a) Diffusers shall be replaced with new just before Practical Completion.
    b) Exposed parts of the luminaire shall be protected against paint splashes and other marks.
    c) Any separate (e.g. fluorescent) lamps that are used during this period shall be removed and replaced by new, permanent lamps immediately prior to Practical Completion.
    d) Where LED fittings with integral lamps are used, the Contractor shall provide financial compensation for the proportion of the fitting life that has been lost due to this usage. This shall be based on the total cost of the fitting and an expected lifespan of 60,000 hours. The running hours shall be logged by the Contractor and certified by the Contract Administrator.
    e) Use of the permanent lighting installation and temporary / replacement lamps shall not incur any additional cost to the contract.

1B-29 SCHEDULE OF RATES

The Contractor shall provide a full quantified schedule of rates which shall:

1) Be provided with 14 days of being appointed
2) Shall be a Bill of Quantities with a total that matches the contract price.
3) List all materials, equipment and quantities applicable to the works.
4) Be broken down into 1st fix, 2nd fix and fit out for each service element as defined in the Tender Analysis.

1B-30 CDM REGULATIONS

CDM regulations documentation, specific risk assessments etc. shall be provided as follows:

1) In electronic format
2) Mechanical and Electrical Contractors shall agree number of paper copies to be issued for comment with the Principal Contractor/Principal Designer and Engineer, for tender purposes assume 2 (two).
3) Manufacture / installation works shall not commence until the documentation has been returned without any outstanding comments from the Principal Contractor/Principal Designer and Engineer, all comments shall be addressed prior to final copy being issued for inclusion in the Health and Safety File.

1B-31 LABELLING OF EQUIPMENT

Each item of plant and equipment shall bear a metal nameplate giving the maker's name, serial number and relevant performance data. In addition all items of plant and equipment shall be provided with site specific reference labelling, for details refer to Section 3 of this specification.

1B-32 EXISTING ASBESTOS INSTALLATION

Reference to the Contract preliminaries shall be undertaken to ascertain any work associated with removal of existing asbestos. The Contractor shall also review the Client's Asbestos Register to become cognisant with all known locations of asbestos and any risks associated with the presence of asbestos

1B-33 PRESSURE REGULATION DOCUMENTATION AND COMPLIANCE

All certification/documentation in compliance with the Pressure Equipment Directive (97/23/EC) and all latest amendments shall be provided.

All equipment installed under this contract and subject to this regulation must be certified and all documentation included within the O & M Manuals.

Failure to provide necessary certification shall render the equipment/system non-functional.

The Mechanical Contractor and Main Contractor shall be liable for any subsequent costs associated with the non-compliance.

The entire installation shall comply in full with the pressure regulations and shall include:

1) Provision of all safety pressure, combined temperature & pressure relief valves and the like.
2) Provision of individual pressure test certificate for all components covered by the regulations. Type testing is not acceptable.
3) Provide, or update an existing when modifying a system, a written scheme of examination in accordance with the regulations, employ a competent person to complete this on the Mechanical Contractor's behalf if this cannot be completed in house.

All necessary attendances shall be included by the Mechanical Contractor and for compiling all necessary paperwork required to enable the written scheme of examination to be compiled.

1B-34 CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS

For the purposes of the Construction (Design and Management) Regulations, the Main Contractor shall be nominated as and assume the duties of Principal Contractor as defined and set out in those Regulations.

Notwithstanding the requirements of the above clause, the Contractor shall be bound to abide by and implement all regulations, byelaws or other legislation relevant to the health, safety and welfare of all persons on or about the works or likely to be affected by the execution of the works.

1B-35 HEALTH AND SAFETY PLAN

The Contractor shall, in conjunction with the CDM Principal Designer, where necessary, amend, adapt, and expand the Health and Safety information provided contained within the tender documents to produce a coherent Construction Phase plan for the project. The plan shall be implemented and monitored and where necessary, adapted, amended or expanded to reflect changes in circumstances which may arise during the construction phase of the project.

1B-36 PERSONNEL

The Contractor shall:

1) Ensure suitably qualified personnel are responsible for preparing, implementing and monitoring the Health and Safety Plan for the duration of the construction phase of the project.
2) Obtain the prior written approval of the CDM Principal Designer before changing any of the personnel referred to above.

1B-37 HAZARDS OF HEALTH AND SAFETY GENERALLY

The Contractor shall advise the CDM Principal Designer immediately of any deficiencies in the Pre-tender Health and Safety information provided or of unforeseen hazards to health and safety which may become apparent as the project proceeds.

1B-38 CONTRACTORS

The Contractor shall take all necessary measures to satisfy themselves that all Contractors, whether appointed by them directly or not, are competent and have allocated sufficient resources to comply with the requirements on Contractors imposed by the latest Construction (Design and Management) Regulations.

1B-39 INSTRUCTION OF EMPLOYER'S STAFF

The Contractor shall, in conjunction with their Specialists and Commissioning engineer, instruct the employer's staff.

Instruction shall not commence until the following has been achieved:

1) Full commissioning of all services.
2) Checking Verification of Systems.
3) Random Checks of system(s) by Engineer.
4) Note: client instruction shall not take place on same day as commissioning activities for any system.

A programme for all instruction / demonstrations shall be developed in advance and issued to the following parties:

1) Main Contractor
2) The Contractor and their Specialists / Sub-Contractors.
3) Commissioning specialist
4) Electrical/Mechanical Contractor
5) Client's facilities management representatives.
6) Client user group(s) representative.
7) Contract Administrator
8) Engineer

For each system the following procedure shall be used:

1) Prepare documentation for instruction including:
    a) Relevant as fitted drawings / technical drawings.
    b) Relevant section of the O&M manual, including Job specific information, operating instructions, maintenance instructions etc.
    c) Final commissioning results.
2) An invitation to attend the client instruction shall be issued to the parties detailed above at least seven days before the date of the instruction. Invitation shall include:
    a) Electronic (PDF) copies of all of the documentation for commissioning described above.
    b) Agenda for the day's activities developed from the minimum requirements detailed below.
    c) Pro-forma sign off sheet for all attendees.
3) The following parties are required to attend from the contracting team.
    a) The Contractor and their Specialists / Sub-Contractors.
    b) Commissioning specialist
    c) Main Contractor
4) Agenda for system instruction, the following sets out the minimum requirements:
    a) Tour of installed system including identifying all key parts of the system and demonstrating these are correctly indicated on the as fitted drawings.
    b) Presentation of commissioning results and demonstrate system operating correctly.
    c) Presentation of operating and maintenance manuals.
    d) Demonstrate day to day and emergency operating procedures.
    e) Any discrepancies identified during the demonstration shall be scheduled by the Contractor along with actions / programme for rectification.

Formal acceptance of the system shall occur when all parties are satisfied with the system and understand correct operation, all parties shall then sign the pro-forma described above.

The Contractor shall include in their tender and programme sufficient time to incorporate the client instruction methodology described above.

APPENDIX I - CDP RESPONSIBILITY SCHEDULES

Key

- ● Lead Input/Responsibility
- ❍ Secondary Input

Electrical Installation

LV DISTRIBUTION SYSTEMS		CPW	Contractor
1	Initial Design Concepts	●	
2	Location of main distribution equipment, sizing of the same and design of associated spaces	●	
3	Detailed design including sizing of all cables and primary containment (ladder, rack, main runs of basket and trunking)	●	
4	Specification including all cable types	●	
5	Design of secondary containment (conduit, supplementary runs of trunking and basket.)		●
6	Support systems including necessary liaison with Building Contractor and Structural Engineer and Fire Advisor. All such systems shall be appropriately fire rated for the services supported.		●
7	Cable referencing systems based on the principles outlined in the Specification.		●
8	Liaison with others to identify number, location and technical requirements of all interfaces.		●
9	Panel layout and compliance check for all bespoke switchgear and factory built assemblies	❍	●
10	Controls wiring and software for all bespoke switchgear and factory built assemblies.		●
11	Fabrication drawings to include specific requirements of finally selected manufacturers		●

INTRUDER ALARM SYSTEMS		CPW	Contractor
1	Initial Design Consultation with client, insurer, CPO	●	
2	Scheme designed to suit Building Security strategy, alarm zones identified	●	
3	Detector Types, control points, alarm annunciators & Layout Drawings	●	
4	Specification	●	
6	Identify Systems to be interfaced	●	
7	Wiring Types	❍	●
8	Size and route of primary cable containment (tray, basket, trunking)	●	●
9	Design check, advise of any additional equipment necessary to achieve compliance		●
10	Installation Drawings with Address References, fully coordinated with services, structure.		●
11	Liaison with others to identify number, location and technical requirements of all interfaces.		●
12	Sizing of cables, Power Supplies, System Capacity	❍	●

INTRUDER ALARM SYSTEMS		CPW	Contractor
13	Size and location of secondary cable containment (conduit and supplementary tray/basket)		●
14	Support systems including necessary liaison with Building Contractor and Structural Engineer and Fire Advisor. All such systems shall be appropriately fire rated for the services supported		●
15	System/Panel Software		●
16	Design compliance statement. Acceptance of design responsibility for certification purposes		●
17	Verify Maintenance access and maintainability	❍	●
18	Any required changes to achieve fully working system following testing & commissioning	❍	●
19	Insurer, CPO Sign off		●

ACCESS CONTROL		CPW	Contractor
1	Initial Design Consultation with client, insurer, CPO	●	
2	Scheme designed to suit Building fire & security strategy, alarm zones identified	●	
3	Device locations, types & Layout Drawings.	●	
4	Specification	●	
5	Identify Systems to be interfaced	●	
6	Size and route of primary cable containment (tray, basket, trunking)	●	
7	Wiring Types	❍	●
8	Design check, advise of any additional equipment necessary to achieve compliance		●
9	Installation Drawings with ID References, fully coordinated with services, structure.		●
10	Liaison with others to identify number, location and technical requirements of all interfaces		●
11	Cause & Effect Schedule of pre-sets and alarm inputs	❍	●
12	Sizing of cables, Power Supplies, Matrix & Recording System Capacity	❍	●
13	Size and location of secondary cable containment (conduit and supplementary tray/basket)		●
14	Support systems including necessary liaison with Building Contractor and Structural Engineer and Fire Advisor. All such systems shall be appropriately fire rated for the services supported		●
15	System Software		●
16	Design compliance statement. Acceptance of design responsibility for certification purposes		●
17	Verify Maintenance access and maintainability	❍	●
18	Any required changes to achieve fully working system following testing & commissioning	❍	●
19	Insurer, CPO Sign off		●

FIRE ALARM		CPW	Contractor
1	Initial Design Consultation with client, insurer, building control	●	
2	Scheme designed to suit Building fire strategy, alarm zones identified	●	
3	Detector Types, call points & Layout Drawings	●	
4	Specification	●	
5	Details of required evacuation regime (single/two stage, progressive horizontal)	●	
6	Sounder or PA/VA requirements, sounder locations & outputs	●	
7	Identify Systems to be interfaced	●	
8	Wiring Types to be Specified	●	
9	Main primary cable containment	●	
10	Cause & Effect Schedule	❍	●
11	Design check, advise of any additional equipment necessary to achieve compliance		●
12	Audibility calculations, advise of any additional sounders necessary to achieve compliance		●
13	Installation Drawings with Address References, fully coordinated with services, structure etc.		●
14	Liaison with others to identify number, location and technical requirements of all interfaces.		●
15	Sizing of cables, Power Supplies, System Capacity	❍	●
16	Secondary cable containment/supports.		●
17	Design compliance statement and acceptance of design responsibility for final system		●
18	System/Panel Software		●
19	Verify Maintenance access and maintainability	❍	●
20	Any required changes to achieve fully working system following testing & commissioning	❍	●
21	Building Control Sign Off		●

EMERGENCY LIGHTING		CPW	Contractor
1	Initial Design Consultation with client and building control, agreement of muster point	●	
2	Agree requirements for safety lighting and standby lighting (as defined by BS 5266)	●	
3	Review and integration of agreed strategy on exit signage and self-illuminated exit signage	●	
4	Consideration of central vs local batteries and agreement of strategy	●	
5	Initial discussion on open areas and high risk task rooms and provision of draft list	●	
6	Agreement of requirement for lighting (and hence emergency lighting) for plant on roof	●	
7	Scheme design to suit agreed building evacuation strategy and BS 5266	●	
8	Specification, including wiring types and containment, luminaire type selection and aesthetics	●	
9	Sizing and location of battery room (Central battery system only)	●	
10	Attendance at Consultation and Risk Assessment workshops	●	
11	Agree final list hazard rooms, open plan areas, points of emphasis, etc. as BS5266		●

EMERGENCY LIGHTING		CPW	Contractor
12	Design check, advise of any additional equipment necessary to achieve compliance		●
13	Lighting calculations including horizontal and vertical illuminance, glare and uniformity		●
14	Installation Drawings with References, fully coordinated with services, structure etc.		●
15	Sizing of batteries		●
16	Secondary cable containment/supports.		●
17	Design compliance statement and acceptance of design responsibility for final system		●
18	System/Panel Software (for automated test)		●
19	Verify Maintenance access and maintainability	❍	●
20	Any required changes to achieve fully working system following testing & commissioning	❍	●
21	Building Control Sign Off and Occupier Instruction	❍	●

VOICE / DATA SYSTEMS		CPW	Contractor
1	Initial Design Consultation with client.	●	
2	Wiring standard to be agreed.	●	
3	CPW/Client responsibility matrix to be agreed	●	
4	Specification	●	
5	Server and wiring cabinet locations and design of associated spaces.	●	
6	Identify Systems to be interfaced (telephone, BMS, Fire Alarm etc.)	●	
7	Size and route of primary cable containment (tray, basket)	●	
8	Design check to confirm suitability of containment proposals (space and cable bend radius)		●
9	Design check of cable routes to confirm 90m distance limit will be achieved		●
10	Installation Drawings with ID References, fully coordinated with services, structure.		●
11	Liaise with other specialists to identify number, locations of all interfaces.		●
12	Size and location of secondary cable containment (conduit and supplementary tray/basket).		●
13	Sizing of cabinets, confirming allocation for patch panels, switches, UPS, data storage, servers etc.	❍	●
14	Sizing / planning Wi-Fi transmitters.	❍	●
15	Verify maintenance access & maintainability	❍	●
16	Any required changes to achieve fully working system following testing & commissioning	❍	●
17	Client sign off		●

Mechanical Installation

PIPEWORK EXPANSION AND CONTRACTION		CPW	Contractor
1	Performance specification	●	

PIPEWORK EXPANSION AND CONTRACTION		CPW	Contractor
2	Initial routing of services in principle	●	
3	Design/Specification of expansion control measures	❍	●
4	Design and coordination of fixing methods for brackets, anchors etc., including agreeing with Structural Engineer.	❍	●
5	Verify maintenance and accessibility.	❍	●
6	Client sign off.		●

Section 2A

General Installation Clauses - Pipework

Contents

2A-1 GENERAL REQUIREMENTS

The Contractor shall supply, install and commission the pipework installations as detailed on the Tender drawings and within this specification, employing skilled personnel to the standards described.

2A-1-1 DEFINITIONS

Refer to the definitions contained within the BESA TR series of documents and the following:

DEFINITIONS / ABBREVIATIONS			
ACoP	Approved Code of Practice	GBV	Globe Valve
AMETAL	Alloy developed for chilled water and cold fluid applications to resist corrosion	GM	Gun Metal
AAV	Automatic Air Vents	GV	Gate Valve
BCWS	Boosted Cold Water Service	HTHW	High Temperature Hot Water
BESA	Building Engineering Services Association	LTHW	Low Temperature Hot Water
BFV	Butterfly Valve	MAV	Manual Air Vents
BV	Ball Valve	MCWS	Mains Cold Water Service
CHW	Chilled Water Service	MI	Malleable Iron
CI	Cast Iron	MTHW	Medium Temperature Hot Water
CS	Commissioning Station, close coupled fixed orifice type	NRV	Non-Return Valve
CST	Cast Steel	OP	Orifice Plate
DHWS	Domestic Hot Water Service	S/S or SS	Stainless Steel
DI	Ductile Iron, Spheroidal Graphite Iron (SGI) or graphite rich cast iron	TCWS	Tank Cold Water Service
DPR	Differential Pressure Regulator	WRAS	Water Research Advisory Service
DRV	Double Regulating Valve	WSP	Water Safety Plan
DZR	Copper alloy with inhibiter & heat treatment to prevent dezincification		

2A-1-2 REFERENCE TO OTHER SECTIONS OF THIS SPECIFICATION

This section defines common requirements for all pipework systems and shall be read in conjunction with the standards for the particular pipework system used and the specific sections of this specification.

This section of the specification shall not be used in isolation and must be read in conjunction with the particular sections, commissioning and standard clauses, all of which define further the requirements for the pipework installations.

2A-1-3 STANDARDS APPLICABLE

Works shall be completed in accordance with all applicable industry standards. Some of the most relevant standards associated with this section are scheduled below:

STANDARDS	
BESA SUS 01: Guide to good practice: Heat metering	BS EN 1092 Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories
BESA TB005: Controlling legionella	BS EN 1254 Copper and copper alloys. Plumbing fittings
BESA TB013: Thermal storage	BS EN 1287 Sanitary tapware. Low pressure thermostatic mixing valves. General technical specifications

STANDARDS	
BESA TB015: Leak checking – Direct and indirect methods	BS EN 1515 Flanges and their joints. Bolting
BESA TB017: Pressure testing with changing ambients	BS 6920 Suitability of non-metallic materials and products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Parts 1 to 5 inclusive.
BESA TB032: Protection of pipework penetrating fire-separating elements	BS EN 9606 Qualifications testing of welders. Fusion welding
BESA TB036: Pinhole corrosion in pipework	BS EN 10216 Seamless steel tubes for pressure purposes
BESA TR 3: Guide to good practice – Jointing of copper and its alloys	BS EN 10217 Welded steel tubes for pressure purposes
BESA TR 5: Welding of carbon steel pipework	BS EN 10220 Seamless and welded steel tubes. Dimensions and masses per unit length
BESA TR 11: Guide to the use of plastic pipework	BS EN 10226 Pipe threads where pressure tight joints are made on the threads
BESA TR 20/1: Low temperature hot water heating (LTHW)	BS EN 10241 Steel threaded pipe fittings
BESA TR 20/2: Medium temperature hot water (MTHW)	BS EN 10242 Threaded pipe fittings in malleable cast iron
BESA TR 20/3: High temperature hot water (HTHW)	BS EN 10253 Butt welding pipe fittings
BESA TR 20/4: Hot water service (HWS)	BS EN 10255 Non-alloy steel tubes suitable for welding and threading. Technical delivery conditions
BESA TR 20/5: Cold water service (CWS)	BS EN 12327 Gas Infrastructure. Pressure testing, commissioning and decommissioning procedure
BESA TR 20/6: Chilled water (CW)	BS EN 13501 Fire classification of construction products and building elements
BESA TR 20/7: Condenser / Cooling water	BS EN ISO 228 Pipe threads where pressure tight joints are not made on the threads
BESA TR 20/8: Steam & condensate	BS EN ISO 1456 Metallic and other inorganic coatings
BESA TR 20/9: Natural gas	BS EN ISO 10497 Testing of valves. Fire type testing requirements
BESA TR 30: Heat pump guide	BSRIA BG 29/2012 Pre-commission cleaning of pipework systems
BESA TR 36: Guide to good practice – Installation of rainwater harvesting in non-residential buildings	BSRIA BG 50/2013 Water treatment for closed loop heating and cooling systems
BESA TR 37: Installation of combined heat and power	BSRIA BG57/2015 Legionnaires' Disease - Risk Assessment
BESCA Welding Test Centre Certification	BSRIA BG58/2015 Legionnaires' Disease – Operation and Maintenance Log Books
BS 143 and BS 1256 Threaded pipe fittings in malleable cast iron and cast copper alloy	CIBSE TM13 Minimising risk of Legionnaire's Disease
BS 1427 Guide to on-site test methods for the analysis of waters	Gas Safety Regulations
BS 1710 Specification and identification of pipelines and services	HSE GS4 Safety requirements for pressure testing

STANDARDS	
BS 2486 Recommendations for treatment of water for steam boilers and water heaters	HSE L8 Guidance on regulations Legionnaires' Disease – The Control of Legionella bacteria in water systems
BS 2633 Specification for Class I arc welding of ferritic steel pipework for carrying fluids	HSE L56 Safety in the installation and use of gas systems and appliances
BS 2879, Specification for draining taps (screw-down pattern)	HSE L80 A guide to the Gas Safety (Management) Regulations 1996, Guidance on Regulations
BS 2971 Specification for Class II arc welding of carbon steel pipework for carrying fluids	HSE L82 A guide to the Pipelines Safety Regulations 1996
BS 6068 & BS EN 872 Water Quality Determination of suspended solids	HSE L122 Safety of pressure systems
BS 6644 Specification for selection, installation, inspection, commissioning, servicing and maintenance of gas-fired boilers of rated inputs between 70 kW and 1.8MW net	HSE HSG 139 The safe use of compressed gases in welding, flame cutting and allied processes
BS 6798 Specification for selection, installation, inspection, commissioning, servicing and maintenance of gas-fired boilers of rated input not exceeding 70kW net	HSE HSG 253 The safe isolation of plant and equipment
BS 7592, Sampling for Legionella bacteria in water systems – Code of practice	HSE HSG 274 Part 2 The control of Legionella bacteria in hot and cold water systems
BS 8537 Copper & copper alloys. Plumbing fittings	Institute of Gas Engineers and Managers (IGEM) General Series Standards (G)
BS 8551 Provision and management of temporary water supplies and distribution networks (not including provisions for statutory emergencies) – Code of practice	Institute of Gas Engineers and Managers Legislation Series (GL)
BS 8552 Sampling and monitoring of water from building services closed systems – Code of practice	Institute of Gas Engineers and Managers Gas Measurement Series (GM)
BS 8554 Code of practice for the sampling and monitoring of hot and cold water services in buildings	Institute of Gas Engineers and Managers Safety Series Standards (SR)
BS 8558 Guide to the design, installation, testing and maintenance of services supply water for domestic use within buildings and their curtilages	Institute of Gas Engineers and Managers Transmission and Distribution Series Standards (TD)
BS 8580 Water quality - Risk assessments - Code of practice	Institute of Gas Engineers and Managers Utilization Series Standards (UP)
BS 8680 Water Quality – Water Safety Plans – code of practice	PD 855468 Guide to flushing and disinfection of services supplying water for domestic use within buildings and their curtilages
BS 9999 Code of practice for fire safety in the design, management and use of buildings	(The) Water Act
BS EN 545, 598 & 969 Ductile iron pipes, fittings, accessories and their joints for water, sewage, gas pipelines respectively	(The) Water Supply (Water Fittings) Regulations
BS EN 806 Specifications for installations inside buildings conveying water for human consumption	(The) Water Supply (Water Quality) Regulations
BS EN 1057 Copper & copper alloys. Seamless, round copper tubes	

Where the above standards refer to supporting documentation and standards these shall be fully complied with in all respects.

Where discrepancy is found between this specification and the relevant standards, the Contractor shall obtain written clarification from the Engineer prior to submission of the tender. Where a discrepancy has not been clarified prior to tender submission, the Contractor shall include the most onerous requirements.

2A-1-4 SYSTEM MATERIAL SELECTION

All pipework and components shall be selected from the tables on the following pages in respect to the type of materials required.

PIPEWORK SELECTION TABLE	STEAM	CONDENSATE	HTHW	MTHW	LTHW	CHW
Mild Steel 'Heavy Grade' to BS EN 10255 and BS EN 10220	O	X	✓	✓	✓	✓
Mild Steel to ASME / ASTM A106 Grade B Schedule 40	✓	X	O	O	O	O
Victaulic Grooved Mild 'Heavy Steel'	X	X	X	X	O	O
Galvanised Mild Steel 'Heavy Grade' to BS EN 10255 and BS EN 10220	X	O	X	X	X	O
Stainless Steel 316L	O	O	X	X	O	O
Copper Tube to BS EN 1057 'normal wall thickness' (previously BS 2871 Table X) **(Note 1)**	X	X	X	X	O	O
Copper Tube to BSEN 1057 'thick wall thickness' (previously BS 2871 Table Y) **(Note 2)**	X	✓	X	X	X	X
Press fit, Stainless Steel AISI 316 and Copper BS EN 1057 R250 / R290 **(Notes 3 & 4)**	X	X	X	X	O	O
George Fischer Instaflex **(Note 3)**	X	X	X	X	X	O
ABS Durapipe SuperFLO **(Note 3)**	X	X	X	X	X	O

PIPEWORK SELECTION TABLE	CWS	HWS F&R	BURIED WATER	COMP. AIR
Galvanised Mild Steel Heavy Grade to BS EN 10255 and BS EN 10220	X	X	X	✓
Stainless Steel 316L	O	O	X	O
Copper Tube to BS EN 1057 'normal wall thickness' (previously BS 2871 Table X) **(Note 1)**	✓	✓	X	O
Press fit, Stainless Steel AISI 316 and Copper BS EN 1057 R250 / R290 **(Notes 3 & 4)**	O	O	X	X
George Fischer Instaflex **(Note 3)**	O	O	X	X
PE80 Polyethylene **(Note 3)**	X	X	O	X
PE80 Barrier Protected Polyethylene **(Note 3)**	X	X	✓	X

PIPEWORK SELECTION TABLE	ABOVE GROUND NATURAL GAS	BURIED NATURAL GAS	FUEL OIL	OVERFLOW & WARNING PIPES	VENTS	MAV AIR BOTTLE BLEED LINES	AAV AIR VENT DRIP PIPES
Mild Steel 'Heavy Grade' to BS EN 10255 and BS EN 10220	✓	X	✓	X	X	X	O
Stainless Steel 316L	X	X	X	O	X	O	O
Copper Tube to BS EN 1057 'normal wall thickness' (previously BS 2871 Table X) **(Note 1)**	O	X	X	✓	✓	X	X
Copper Tube to BSEN 1057 'thick wall thickness' (previously BS 2871 Table Y) **(Note 2)**	X	X	X	X	X	✓ (8mm)	✓ (8mm)
Press fit, Stainless Steel AISI 316 and Copper BS EN 1057 R250 / R290 **(Notes 3 & 4)**	X	X	X	O	X	O	O
PE80 Polyethylene **(Note 3)**	X	✓	X	X	X	X	X

Note 1 - **As manufactured by:**

- **Wednesbury Copper Tube, their 'Black Label' pipe.**
- **Yorkshire Copper Tube, their 'Yorkex' pipe.**
- **The Lawton Tube Co. Ltd, their 'TX' pipe.**

Note 2 - **As manufactured by:**

- **Wednesbury Copper Tube, their 'White Label' pipe.**
- **Yorkshire Copper Tube, their 'Kuterlon' pipe.**
- **The Lawton Tube Co. Ltd, their 'TY' pipe.**

Note 3 - **Installed strictly in accordance with the manufacturer's best practice installation guidelines.**

Note 4 - **Pressfit refers to Geberit Mapress and Pegler Yorkshire Xpress as these are the only press fit systems permitted.**

Key

✓	Default material / jointing system that shall be included for at tender and used for the installation.
X	Shall not be used.
O	May only be used when specifically allowed in particular section of this specification.

2A-1-5 COMPONENT SPECIFICATION TABLES

LOW TEMPERATURE HOT WATER (LTHW) HEATING SYSTEM				
PRESSURE RATING – PN 16 UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT	**SIZE RANGE(S) (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	GV or BV	DZR or Bronze	All areas
	65mm to 200mm	GV	DI or CI	All areas
	65mm to 200mm	BFV	CI, SS or DI EPDM seat lever operated SS disc	Only be used for external & plant room areas
	> 200mm	GV	CI, SS or DI	All areas
	> 200mm	BFV	SS or DI EPDM seat, gear operated & SS disc	Only used for external & plant room areas
Regulation	15mm to 50mm	DRV	DZR or Bronze	
	65mm to 200mm	DRV	DI, GM or CI	
	> 200mm	DRV	DI, GM or CI	
Flow Measurement & Regulation	15mm to 50mm	CS – DRV + OP	DZR, Bronze or SS	
	65mm to 150mm	CS – DRV + OP	SS or CI	
	> 150mm	CS – DRV + OP	SS or CI	
Non-Return Valve	15mm to 50mm	NRV – Gravity	Bronze, GM, DZR or DI	Pressure drop < 1 kPa
	65mm to 200mm	NRV – Gravity	DI or CI	Pressure drop < 1 kPa
	> 200mm	NRV – Gravity	DI or CI	Pressure drop < 1 kPa
Wafer Non-Return Valves	> 50mm	NRV – Double door wafer	DI or CI	Pressure drop < 1 kPa Only if agreed by Engineer
Orifice Plates	All Sizes	OP	DZR, SS & GM	
Strainers with test points	15mm to 50mm	ST	Bronze, DZR or GM SS mesh cages	Pressure drop < 2 kPa
	> 50mm	ST	GM or DI SS mesh cages	Pressure drop < 2 kPa
Union Joints	15mm to 65mm	Navy	MI, GM & SS	Navy pattern
Internally galvanised pipes, valves and fittings shall not be permitted.				

MEDIUM TEMPERATURE HOT WATER (MTHW) HEATING SYSTEM				
PRESSURE RATING – PN 16 UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT FUNCTION	**SIZE RANGE(S) (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	GBV	Bronze	All areas
	65mm to 200mm	GV	CI	Hospitals
	65mm to 200mm	GBV	CI, DI or CST	Elsewhere
	> 200mm	GV	CI	All areas
Regulation	15mm to 50mm	DRV	DZR or Bronze	
	65mm to 200mm	DRV	CI	
	> 200mm	DRV	CI	
Flow Measurement and Regulation	15mm to 50mm	CS – DRV + OP	DZR or Bronze	
	65mm to 200mm	CS – DRV + OP	CI body / SS orifice	
	> 200mm	CS – DRV + OP	CI body / SS orifice	
Non-Return Valve	15mm to 50mm	NRV – Gravity	DZR or Bronze	Pressure drop < 1 kPa
	65mm to 200mm	NRV – Gravity	CI	Pressure drop < 1 kPa
	> 200mm	NRV – Gravity	CI	Pressure drop < 1 kPa
Orifice Plates	All Sizes	OP	SS	Fixed orifice
Strainers with test points	15mm to 50mm	ST	Bronze and GM SS mesh cages	Pressure drop < 2 kPa
	> 50mm	ST	CI SS mesh cages	Pressure drop < 2 kPa
Union Joints	15mm to 65mm	Navy	MI	Navy pattern
Internally galvanised pipes, valves and fittings shall not be permitted.				

HIGH TEMPERATURE HOT WATER (HTHW) HEATING SYSTEM				
PRESSURE RATING – PN40 (AS REQUIRED TO ACHIEVE COMBINED PEAK TEMPERATURE AND TEST PRESSURE) UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT FUNCTION	**SIZE RANGE(S) (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	GV	Bronze	All areas
	65mm to 200mm	GV	CI	Hospitals
	65mm to 200mm	GBV	CI, DI or CST	Elsewhere
	> 200mm	GV	CI	All areas
Regulation	15mm to 50mm	DRV	DZR or Bronze	
	65mm to 200mm	DRV	CI	
	> 200mm	DRV	CI	
Flow Measurement and Regulation	15mm to 50mm	CS – DRV + OP	DZR or Bronze	
	65mm to 200mm	CS – DRV + OP	CI body / SS orifice	
	> 200mm	CS – DRV + OP	CI body / SS orifice	
Non-Return Valve	15mm to 50mm	NRV – Gravity	DZR or Bronze	Pressure drop < 1 kPa
	65mm to 200mm	NRV – Gravity	CI	Pressure drop < 1 kPa
	> 200mm	NRV – Gravity	CI	Pressure drop < 1 kPa
Orifice Plates	All Sizes	OP	SS	Fixed orifice
Strainers with test points	15mm to 50mm	ST	Bronze or GM SS mesh cages	Pressure drop < 2 kPa
	> 50mm	ST	CI SS mesh cages	Pressure drop < 2 kPa
Union Joints	15mm to 65mm	Navy	MI	Navy pattern
Internally galvanised pipes, valves and fittings shall not be permitted.				

STEAM SYSTEM				
PRESSURE RATING – PN 40 UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT FUNCTION	**SIZE RANGE(S) (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	BV	CST or GM	All areas
	65mm to 200mm	GBV	DI or CST Bellows sealed	All areas
	> 200mm	GBV	DI or CST Bellows sealed	All areas
Low temperature difference Non-Return Valve	15mm to 50mm	NRV	SS or CST	Pressure drop < 20 kPa
	65mm to 200mm	NRV	SS or CST	Pressure drop < 20 kPa
	> 200mm	NRV	SS or CST	Pressure drop < 20 kPa
Y-type strainers	15mm to 50mm	ST	GM or SS SS mesh cages	Pressure drop < 10 kPa
	> 50mm	ST	DI or Steel SS mesh cages	Pressure drop < 10 kPa

CONDENSATE SYSTEM				
PRESSURE RATING – AS PER ASSOCIATED STEAM SYSTEM				
VALVE / COMPONENT FUNCTION	**SIZE RANGE(S) (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	BV	Bronze, GM and SS	
	65mm to 200mm	GBV	DI or SS Bellows sealed	
	> 200mm	GBV	DI or SS Bellows sealed	
Low temperature difference Non-Return Valve	15mm to 50mm	NRV	SS	Pressure drop < 20 kPa
	65mm to 200mm	NRV	SS	Pressure drop < 20 kPa
	> 200mm	NRV	SS	Pressure drop < 20 kPa
Strainers	15mm to 50mm	ST	Bronze, GM and SS SS mesh cages	Pressure drop < 10 kPa
	> 50mm	ST	Bronze, DI and SS SS mesh cages	Pressure drop < 10 kPa

CHILLED WATER (CHW) COOLING SYSTEMS				
PRESSURE RATING – PN 16 UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT FUNCTION	**SIZE RANGE (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	GV or BV	DZR, Bronze, GM, AMetal or ABS	All areas
	65mm to 200mm	GV	AMetal, SS, DI or ABS	All areas
	65mm to 200mm	BFV	AMetal, SS, DI and ABS EPDM seat, lever operated	Only be used for external & plant room areas
	> 200mm	GV	AMetal, SS, DI and ABS	All areas
	> 200mm	BFV	AMetal, SS, DI and ABS EPDM seat, gear box operated	Only be used for external & plant room areas
Regulation	15mm to 50mm	DRV	DZR, Bronze, GM, AMetal or ABS	
	65mm to 200mm	DRV	AMetal, SS, DI and ABS	
	> 200mm	DRV	SS, DI and ABS	
Flow Measurement & Regulation	15mm to 50mm	CS – DRV + OP	DZR, Bronze, GM, AMetal DI, ABS and SS	
	65mm to 150mm	CS – DRV + OP	AMetal CI, ABS and SS	
	> 150mm	CS – DRV + OP	AMetal CI, ABS and SS	
Non-Return Valve	15mm to 50mm	NRV – Gravity	Bronze, GM, AMetal, ABS and SS	Pressure drop < 1 kPa
	65mm to 200mm	NRV – Gravity	Bronze, DI and ABS	Pressure drop < 1 kPa
	> 200mm	NRV – Gravity	Bronze, DI and ABS	Pressure drop < 1 kPa
Wafer Non-Return Valves	As NRV Above		As NRV Above	Pressure drop < 1 kPa Only if permitted by Engineer
Orifice Plates	All Sizes	OP	SS, GM and ABS	
Strainers complete with integral test points	15mm to 50mm	ST	Bronze, GM, AMetal and ABS SS mesh cages	Pressure drop < 2 kPa
	> 50mm	ST	GM, DI and ABS SS mesh cages	Pressure drop < 2 kPa
Union Joints	15mm to 65mm	Navy	MI, GM, SS and ABS	Navy pattern
All valves installed on chilled water circuits shall be of the extended spindle type for application of insulation to ensure fully vapour sealed.				

DOMESTIC HOT AND COLD WATER SYSTEMS INCLUDING BOOSTED, TANK FED GRAVITY AND MAINS COLD WATER SERVICES (DHWS, MCWS, BCWS AND TCWS)				
PRESSURE RATING – PN 16 UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT FUNCTION	**SIZE RANGE (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 54mm	GV or BV	DZR and SS	All areas
	> 54mm	GV	DZR and SS	All areas
	> 54mm	BFV	DZR and SS	Only be used for external & plant room areas
Final connections to outlets for re-washering only.	15mm to 22mm	BV	DZR and SS	Full Bore, lever operated chromium plated where exposed.
Regulation	15mm to 54mm	DRV	DZR and SS	LSVs not permitted for regulation purposes
	> 54mm	DRV	DZR and SS	LSVs not permitted for regulation purposes
Flow management and regulation	15mm to 54mm	CS – DRV + OP	DZR and SS	
	> 54mm	CS – DRV + OP	DZR and SS	
Check Valves	15mm to 54mm	NRV – Gravity	DZR and SS	Low pressure drop
	> 54mm	NRV – Gravity	DZR and SS	Low pressure drop
Orifice Plates	15mm to 54mm	OP	DZR and SS	
	> 54mm	OP	DZR and SS	
Strainers complete with integral test points	15mm to 54mm	ST	DZR and SS SS mesh cages	Pressure drop < 2 kPa
	> 54mm	ST	DZR and SS SS mesh cages	Pressure drop < 2 kPa
All components above shall be Water Regulations and WRAS approved. All BV's installed on water services circuits shall be of the extended spindle type for application of insulation to ensure fully vapour sealed.				

NATURAL GAS SYSTEM				
PRESSURE RATING – PN 16 UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT FUNCTION	**SIZE RANGE(S) (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	BV or GV	DZR, Bronze and CI Nitrile diaphragm Gas Regulation approved	
	> 50mm	BV or GV	DZR, Bronze and CI Nitrile diaphragm Gas Regulation approved	
Strainers	15mm to 50mm	ST	GM and Bronze SS mesh cages	
	> 50mm	ST	CI SS mesh cages	
For tender allow that the first isolating valve on entry to a fire zone shall be Factory Mutual (FM) approved or Fire Safe to BS EN ISO 10497 unless agreed otherwise with the Engineer.				

FUEL OILS SYSTEM				
PRESSURE RATING – PN 16 UNLESS DETAILED OTHERWISE IN PARTICULAR SECTION				
VALVE / COMPONENT FUNCTION	**SIZE RANGE(S) (Ø)**	**VALVE TYPE**	**VALVE / COMPONENT MATERIAL(S)**	**NOTES**
Isolation	15mm to 50mm	GV or BV	CI (GV), DZR (BV) and Bronze (BV)	
	> 50mm	GV or BV	DZR, Bronze and CI	
	> 50mm	BFV	DZR, Bronze and CI Nitrile liner	
Check Valves	15mm to 50mm	NRV	GM and Bronze High temperature Vitron® seals	
	> 50mm	NRV	CI High temperature Vitron® seals	
Strainers with mesh area and size suitable for grade of oil used.	15mm to 50mm	ST	GM and Bronze SS mesh cages	
	> 50mm	ST	CI SS mesh cages	
Union Joints	15mm to 50mm	Navy	GM and Bronze	
For tender allow that the first isolating valve on entry to a fire zone shall be Factory Mutual (FM) approved or Fire Safe to BS EN ISO 10497 unless agreed otherwise with the Engineer.				

2A-1-6 COMPONENT MANUFACTURERS

All components shall be manufactured and supplied by one of the manufacturers scheduled in the table below. All components of the same type shall be from the same manufacturer to ensure consistency across the project.

COMPONENT	ACCEPTABLE MANUFACTURER
Differential Pressure Control and Flow Limiting Valves	Oventrop UK Limited Samson Controls Limited Frese Limited Crane / Hattersley Pegler Yorkshire Group Limited
Thermostatic Mixing Valves	Grohe Caradon Mira Limited Horne Engineering Limited Pegler Yorkshire Group Limited
Test Points	Oventrop UK Limited Crane / Hattersley Pegler Yorkshire Group Limited
End of line DHW temperature controlled return valves / temperature maintaining valves	Oventrop Aquastrom Frese Limited Pegler Yorkshire Group Limited
Oil components	Oventrop UK Limited
Natural gas / LPG components	Oventrop UK Limited
End of Line Temperature Limiting Valves	Oventrop UK Limited
Automatic Air Vents	Spirotech Limited 'Spirotop'
Expansion bellows	BOA Flexible Solutions Limited Pipe Solutions Ltd Bellows Technology Ltd FLEXEJ Ltd
Anti-Vibration Equipment	TEK Ltd
Steam & Condensate valves	Spirax Sarco Limited TLV Euro Engineering UK Limited
Steam components	Spirax Sarco Limited TLV Euro Engineering UK Limited
All others including IV, CS, etc.	Crane / Hattersley Oventrop UK Limited Pegler Yorkshire Group Limited

2A-2 GENERAL REQUIREMENTS FOR PIPEWORK SYSTEMS

2A-2-1 INTRODUCTION

This Section of the Specification details the general requirements applicable to all pipework systems and shall be read in conjunction with the detailed requirements as specified.

The Contractor shall adhere to the good practice guidelines detailed in the BSRIA pre-commissioning guide in order to minimise the works required at the pre-commissioning stage of the project.

2A-2-2 COMPLIANCE WITH LOCAL WATER AUTHORITY

The Contractor shall:

1) Issue all water services (domestic and external services, etc.) working drawings to the local authority for their comment with regard to water regulations and local requirements (except where Contractor is able to self-certify the scheme with the local authority).
2) Agree with local authority all tests and certification required by the water authority before connection of the water supply to the building.
3) Ensure that any certification required is submitted within the time scales specified by the authority in order to ensure that the connection of the water supply is not delayed.
4) Ensure that all systems fully comply with the local water authority's particular requirements.

2A-2-3 WATERSAFE REGISTRATION AND WATER SERVICE CONNECTIONS

The Contractor shall be a "WaterSafe" Approved Contractor and fully adhere to the customer commitments, conditions of membership and scheme rules of WaterSafe. All operatives shall have undergone all necessary training and shall provide proof of competence before completing any work on domestic water or incoming water service systems.

The WaterSafe Approved Contractor shall carry out all necessary legal notification to the water supplier.

On completion of works by the WaterSafe Approved Contractor they shall issue a Completion Certificate to prove full compliance with Water Fittings Regulations and Byelaws.

All pipework, branches and final connections to all baths, basins and sink taps, shower fittings, W.C. cisterns etc. shall be undertaken by the Tenderer. The whole installation shall be carried out to this Specification by a WaterSafe qualified Plumber.

All hot and cold water taps and spray taps to basins shall be supplied under a separate contract unless detailed otherwise in the particular clauses.

All connections shall be completed in tube to match the distribution system, flexible connections (stainless steel or otherwise) shall not be used.

2A-2-4 STAMPED FITTINGS

All fittings, such as control valves, stop cocks, ball valves and emptying taps etc., shall bear the WRAS stamp. All necessary testing fees shall be included by the Contractor.

All materials, valves and fittings shall carry a product conformity marking to meet those required by the UK government.

Where applicable, marking shall consist of the required logo and the four-digit identification number of the notified body involved in the conformity assessment procedure.

Failure to comply with this requirement shall require the Contractor to replace any components without the relevant Conformity marking with a compliant product at their own expense.

2A-2-5 PIPEWORK CLEARANCES

Pipework shall be fixed to give the following minimum clearances between the face of the pipe or, if insulated, the face of the insulation and the adjacent surface.

PIPEWORK CLEARANCES		
SERVICE TYPE	**ADJACENT SURFACE**	**MINIMUM SPACING**
Any	Wall	25mm
Any	Ceiling	50mm

PIPEWORK CLEARANCES		
SERVICE TYPE	**ADJACENT SURFACE**	**MINIMUM SPACING**
Any >30°C <100°C (Insulated)	Any >30°C <100°C (Insulated)	25mm
Any Insulated >30°C <100°C	Insulated Domestic Water <20°C	180mm (HWS shall be above CWS)
Any (un-insulated)	Any (un-insulated)	25mm
Any (insulated)	Any (un-insulated)	90mm
Any (insulated)	Conduit or Trunking	50mm
Any (un-insulated)	Conduit or Trunking	150mm
Refer to additional requirements detailed in specialist pipework systems (e.g. Instaflex etc.)		
In addition to the above, sufficient space shall also be allowed to facilitate easy application of thermal insulation materials of the thickness specified elsewhere in this specification and allow access for maintenance or removal without disturbance of the remaining pipework or services.		

2A-2-6 EXPANSION AND CONTRACTION

The Contractor shall be responsible for the design and installation of all systems necessary to allow provision for free movement for expansion and contraction of the pipework systems and building movement / settlement. Movement due to expansion and contraction shall be taken up by:

1) Changes of direction or the offsetting of pipework to form loops and offsets. These shall be formed by using welded or pulled bends shop-fabricated with flanged ends, the whole assembly being annealed after manufacture to remove any stresses due to welding. When installing offsets at least 50% cold draw shall be applied.
2) Specialist systems, such as Instaflex and plastic pipework systems, have increased expansion rates and particular requirements, manufacturers published guidance shall be followed in full, expansion bellows / joints shall not be used.
3) Higher rates of expansion and specific methods of controlling expansion associated with specialist pipework systems shall be taken into account and methods employed agreed with the manufacturer and Engineer
4) Where natural flexibility free movement solutions cannot be employed, the provision of expansion joints or bellows shall be installed in accordance with the manufacturer's instructions for both installation details and guiding. Expansion joints or bellows shall only be used when offsets or loops are not possible. Expansion joints shall be pre-cold-drawn with a retaining clip, which must be removed after installation. Expansion joins shall be capable of at least 2,000 complete reversals of movement at the system working conditions. Expansion joints shall be capable of withstanding a pressure 1.5 times their design pressure (or system test pressure if greater) without deformation.
5) Anchors and guides shall be supplied and installed to ensure that all movement is taken up by the method adopted. The anchors shall be of sufficient strength to withstand the anticipated forces and a check shall be made that the building structure, to which the anchors and guides are attached, is adequate for the loads imposed. Anchors shall be provided to prevent excess stresses to pipework joints and equipment.
6) Detailed arrangements of all anchors and guides shall be submitted to the Engineer and Structural Engineer for comment before manufacture commences.

In the event that natural flexibility cannot be used due to building fabric restraints and bellows are required to be installed:

- All bellows shall be thick wall spirally wound multi-layered all stainless steel (316L) quality units with a corrosion resistant inner ply or sleeve for all pipework.
- Additionally, for copper pipework the bellows shall be bronze construction to avoid flux corrosion.
- All steam, HTHW & MTHW shall be twin wall stainless steel type with leak indication.

2A-2-7 BRACKETS AND FIXINGS GENERALLY

The Contractor shall design, supply and install all brackets and fixings, including any secondary steelwork, necessary to make the project complete.

All insulated services shall be provided with proprietary insulated pipe supports as detailed in the thermal insulation standards of this specification where pipework is insulated.

Each pipe support shall:

1) Be arranged as near as possible to joints.
2) Take its due proportion of pipe and component weights.
3) Allow for expansion and contraction.
4) Support the pipework via rollers, chairs and flat iron stirrup guides as appropriate.
5) Meet any structural constraints imposed by the Structural Engineer.
6) Be provided with fixings into structure (i.e. Rawlbolt, Rawlplugs etc.) shall be suitable for the load and the material being fixed to and installed fully in accordance with the manufacturer's recommendations.
7) Details of all types and makes of brackets and fixings to be used shall be given to the Engineer prior to ordering or manufacturing and their comment obtained.
8) Where proprietary pipework and jointing systems are agreed then all brackets / pipe supports shall be as recommended by the particular system manufacturer in terms of type, design and centres.
9) All supports with protruding bolts or threaded rods shall be provided with proprietary end caps to protect eyes and skin from injury. End caps shall be provided to all bolts and rods irrespective of height due to risk during routine maintenance and servicing.

Pipe rings shall be used on services, which do not require a vapour seal and shall:

1) On plain mild steel tube, up to 50mm (inclusive) be black japanned malleable iron.
2) On chromium plated or stainless tubes shall be of the same material as the pipe.
3) On copper exposed to view be polished cast bronze.
4) In all other cases shall be Munsen ring type.

PIPEWORK SUPPORT METHODS	
LOCATION / PIPEWORK TYPE	**SUPPORT METHOD WHICH SHALL BE EMPLOYED**
Within plant rooms, tank rooms, risers	Supported on or suspended from rolled steel angles, channel or 'unistrut' system either galvanised or painted
Where external to building or within humid environments	Supported on or suspended from rolled steel angles, channel or 'unistrut' system all of which shall be hot dip galvanised after manufacture
Un-insulated pipework exposed to view and fixed to partitions / walls	Screw fixed school board brackets
Un-insulated pipework exposed to view and fixed to partitions / walls in clean environments, healthcare premises and catering areas	Screw fixed school board brackets, hospital pattern with extended stem for ease of cleaning
Insulated pipework	As detailed in 'thermal insulation' section of this specification

Pipework supports shall be provided at intervals not greater than those detailed in the following table:

PIPEWORK SUPPORTS - MAXIMUM INTERVAL BETWEEN SUPPORTS (IN METRES)														
NOMINAL SIZE (MM).	HEAVY GRADE STEEL		COPPER		GROOVED STEEL		STAINLESS STEEL PRESS FIT		COPPER PRESS FIT		ABS @ < 50°C		PE	
	H	V	H	V	H*	V*	H*	V*	H*	V*	H*	V*	H*	V*
≤16	2	2.5	1.2	1.5	2	2.5	1.5	2	1.2	1.5	0.5	0.7	0.2	0.3
≥17 and ≤23	2	2.5	1.5	2	2	2.5	2.0	2.5	1.5	2	0.6	0.9	0.3	0.5
≥24 and ≤29	2.5	3	1.5	2	2.5	3	2.2	3	1.5	2	0.7	1.0	0.5	0.8
≥30 and ≤36	2.5	3.5	2	2.5	2.5	3.5	2.5	3.5	2	2.5	0.8	1.2	0.7	0.8
≥37 and ≤43	3	4	2.3	2.5	3	4	3	4	2.3	2.5	0.9	1.3	0.8	1
≥44 and ≤55	3.5	5	2.5	2.8	3.5	5	3.5	5	2.5	2.8	1.0	1.5	0.9	1.1
≥56 and ≤68	4	6	2.7	3	4	6	4	6	2.7	3	1.1	1.6	1.0	1.2
≥69 and ≤81	5	7	2.9	3.3	5	7	5	7	2.9	3.3	1.2	1.8	1.1	1.4
≥82 and ≤109	6	10	3	3.5	6	10	6	10	3	3.5	1.2	1.8	1.2	1.6
≥110	7	12	3.3	3.8	7	12	7	12	3.3	3.8	1.3	1.9	1.3	1.8
Notes: H=Horizontal spacing, V = vertical spacing *- Refer to manufacturer's specific requirements for additional support locations to suit jointing method For the plastic pipework systems, the manufacturer's bracket and support systems shall be employed throughout to their recommended spacing for horizontal and vertical pipework distribution														

Additional supports shall be provided as detailed in BESA documents (e.g. double supports on low level exposed pipework, additional supports on push fit systems etc.)

All nuts & bolts on brackets, flanges, equipment, etc. shall:

1) Be high grade (8.8 grade as a minimum).
2) Shall have a washer under the bolt.
3) Bolts shall be of appropriate length with no more than 2-3 threads showing but visible indication that all the nut thread is used (i.e. not too short).

2A-2-8 EQUIPMENT SUPPORT AND PROTECTION

All items of plant shall be provided with proprietary stands or supports and these shall be:

1) Provided whether shown on the tender drawings or not.
2) Be independent of the adjacent distribution systems (ductwork or pipework, etc.).
3) Where supported from the floor, legs shall be mounted on a weight bearing up stand, which extends at least 50mm above finished floor level in order to maintain floor finish integrity.
4) Details of supports shall be supplied to both the Engineer and Structural Engineer for comment prior to manufacture.
5) Supports shall be manufactured from steel, painted before erection, except when installed externally or in a damp environment where the supports shall be hot dip galvanised after manufacture.
6) Where located on a flat roof, support shall be provided by a specialist support system which shall:
    a) Bear weight onto the roof membrane without causing damage or undue stress.
    b) Be located over structural members.
    c) Meet the Structural Engineer's requirements.
    d) Be manufactured by Roof-Pro Ltd, Tel 01234 843790 or approved equivalent.
7) Any exposed moving machinery (i.e. drives, belts, fan blades, chains, projecting set screws, etc.) shall be provided with protective guards which shall:

a) Be manufactured from robust hot dipped galvanised welded steel open mesh and frame.
b) Be easily removed for maintenance access.
c) Do not vibrate or transmit vibration to the building structure or equipment served.
d) To facilitate speed checks, removable bolted sections shall be provided opposite the shaft ends.

2A-2-9 CONNECTION TO PLANT AND COMPONENTS

Connection to plant and components shall:

1) Be completed via suitable flexible connections to any item of rotating machinery or equipment likely to vibrate.
2) Be provided with unions/ flanges and isolating valves (whether shown upon the drawings or not) to allow the plant/ component to be replaced without disrupting the service or any adjacent services.
3) Not support the plant/ component.

2A-2-10 ANTI-VIBRATION MOUNTINGS

Specialist anti-vibration mountings and flexible connections shall be designed and provided to all items of rotating or vibration producing plant, these shall:

1) Be selected by the manufacturer making allowance for building structure, weight and characteristics of the equipment supported.
2) Be of the laterally stable steel spring type mounting.
3) In the case of small pumps (<1.5 l/s) neoprene mountings are acceptable.
4) Limit vibration transmission to the structure, degree of isolation (vibration efficiency) shall be at least 95%.
5) Final connections shall be via braided stainless steel flexible connections selected to match the anti-vibration mountings.
6) Prevent any discernible re-radiated noise and vibration to adjacent rooms/ areas either through the building structure or distribution systems.

2A-2-11 FLEXIBLE CONNECTIONS

Flexible connection shall be provided where shown on the drawings, either side of each pump, on all connections to chillers and other centrifugal reciprocating or vibrating equipment and where detailed elsewhere in this specification. They shall:

1) Be line size.
2) Be suitable for working temperatures up to 100°C, the bellows carcass shall be Aramid reinforced throughout or stainless steel hose.
3) Have swivel type flanges/ screwed connections.
4) Be suitable for heating circuits and a design life of 120 months at 100°C and after this time have a minimum burst pressure of 30 bar.
5) The date of manufacture shall be moulded on the bellows. For traceability membranes shall have an indelible identification showing manufacturer, country of origin and the type.
6) Tie bars with rubber top hat washers shall be used where the working pressure exceeds 3 Bar Gauge up to 50mm nominal bore and 2 Bar Gauge for larger sizes. Where untied bellows are used the manufacturers recommendations for anchors and guides shall be followed. Tie bars shall be threaded and their length adjustable.

2A-2-12 FLEXIBLE CONNECTIONS IN DOMESTIC WATER SYSTEMS

On all healthcare and projects where susceptible or high-risk users are present the Contractor shall:

1) Not use flexible connections, except for situations described in HTM04-01A Clause 3.41, specifically:
   a) To allow for vibration of equipment.
   b) To accommodate vertical displacement of high and low baths and sinks.
   c) To facilitate essential maintenance and access of bespoke equipment when no alternative is available.
2) Where fitted, flexible hoses should be kept as short as possible and be kink-free so as not to affect flow.
3) Not use flexible connections to general sanitary ware and taps unless agreed with the Client.
4) Review final connection details and any flexible with the sanitary ware/ tap manufacturer.

5) Review final connection details and any flexible with the Clients Infection Control Officer (or equivalent).
6) Provide an installation that meets the best practice recommendations.
7) Be as short as possible in length.
8) Shall use a suitable alternative to EPDM selected to minimise the forming of biofilms and risk from Pseudomonas/ Legionella, etc.
9) Be WRAS approved.
10) Provide food grade nitrile rubber bellows liner shall with KIWA Watertec Approval for hot water services.

On all other projects, the Contractor shall avoid flexible connections where possible, where unavoidable use of flexible connections shall be agreed with the Design Engineer and shall:

1) Be as short as possible, kink-free and in all cases less than 300mm in length.
2) Shall use a suitable alternative to EPDM selected to minimise the forming of biofilms and risk from Pseudomonas/ Legionella, etc.
3) Be WRAS approved.
4) Provide food grade nitrile rubber bellows liner shall with KIWA Watertec Approval for hot water services.
5) Review final connection details and any flexible with the sanitary ware/ tap manufacturer.
6) Review final connection details and provide a sample flexible connection installation with the Engineer so that the principles of acceptable installation are agreed.
7) Provide an installation that meets the best practice recommendations.

2A-2-13 PIPE CUTTINGS

Piping shall:

1) Be completed in accordance with both the pipe and fitting manufacturer's recommendations using proprietary tools where required.
2) Be cut clean and square with the axis of the pipe (or bevelled edge as required for welding) using a saw, pipe cutting tool or machine.
3) Any lubrication used during cutting shall be in accordance with both the pipe and fitting manufacturer's recommendations.
4) Be prepared by filing or grinding and all internal burrs shall be removed by filing or reaming.

The Engineer shall require the Contractor to disconnect any pipes for inspection; should inspection reveal any neglect of reaming, the Contractor shall be required to remove, re-fix and retest at their own expense, as much of the pipework as may be deemed necessary by the Engineer.

2A-2-14 TEES AND CROSSES AND BRANCHES

All tees, twin elbows and crosses shall be:

1) Easy sweep pattern.
2) Square pattern on air venting devices.
3) Square pattern on drain cocks.
4) Square pattern on gauges and test points.
5) Square pattern on sensors, if no requirement stated by manufacturer.

2A-2-15 UNIONS

Unions shall:

1) Be generally of malleable iron with two bronze seats, as the Navy pattern.
2) Have galvanised unions for galvanised pipework.
3) Have gunmetal unions for copper pipework.
4) Be fitted on the outlet of each screwed valve except in the case of draw-off points.

2A-2-16 VALVES

All valves shall be consistent across the works, i.e. all isolating valves, regulating valves, etc. on a particular service shall be of the same manufacturer and the same type and appearance.

Wheel or lock shield valves and stopcocks shall be:

1) Fitted where indicated on the drawings.
2) In accordance with the schedules detailed elsewhere in this section of the specification.
3) Fitted with unions adjacent to screwed valves to facilitate maintenance.
4) Complete with a cast iron surface access box indicating service of valve where installed underground.

2A-2-17 MALLEABLE IRON FITTINGS

All malleable iron fittings shall:

1) Be of the banded type, black or galvanised to match pipework material.
2) Be of the easy sweep pattern for all tees.
3) Have inclined angle easy transition pieces not exceeding 30 degrees for reductions and enlargements
4) Have long sweep pattern bends with centreline radius/ nominal bore of not less than 1.5. Where the use of a long sweep fitting would throw the pipework beyond an acceptable distance from the wall when exposed in rooms, short radius fittings can be used after first obtaining the acceptance of the Engineer.

Fabricated fittings shall be used only with written acceptance of the Engineer and if manufacturer's standard fittings are not available.

2A-2-18 FLANGES

Flanges shall be provided on all services for ease of maintenance and for mating to valves, equipment, etc.

Selection of the appropriate flange type, material and specification shall be in accordance with the British Standards detailed at the start of this section and shall:

1) Be at least the same pressure rating as that stated for components elsewhere in this specification.
2) Correlate to the pipework, material, equipment or component as defined in the relevant British Standard material group.
3) Negate any possibility of dezincification of the mating or surrounding materials.
4) Be selected to suit the operating and testing pressures/ temperatures of the system.
5) Have suitable gaskets, refer to BESA TR series documents for relevant service.

2A-2-19 DRAIN COCKS

Drain cocks shall:

1) Be fitted in the following locations:
   a) Where indicated on the drawings.
   b) As detailed in specific sections of this specification.
   c) At all low points on all water systems to ensure complete drainage.
2) Be screw type (removable).
3) Be of a suitable type/ size, refer to table below.
4) Have a chromium plated finish where exposed to view.
5) Be complete with serrated hose connection to retain a rubber hose.
6) Have an operating spindle fitted with a renewable 'O' ring gland.
7) Be fitted within 75mm of the floor and be in accordance with the Water Regulations.

DRAIN COCK SIZE		
PURPOSE / LOCATION	**PIPEWORK SIZE**	**DRAIN COCK**
Plant rooms (drainage only)	≤50mm dia. 51mm to 150mm >150mm	15mm dia. oblique (or 'Y') renewable washer screw down type 25mm dia. lock shield valve & union adapter to serrated hose connection 50mm dia. lock shield valve & union adapter to serrated hose connection
Exposed to view	≤100mm dia.	15mm dia. lock shield type

DRAIN COCK SIZE		
PURPOSE / LOCATION	**PIPEWORK SIZE**	**DRAIN COCK**
	> 100mm	25mm dia. lock shield type
Plant Rooms / Risers / Voids used for flushing	All	Lock shield Valve and Union adapter to serrated hose connection, larger size as recommended by flushing specialist, 25mm dia. minimum
Plant Rooms / Risers where used for fast fill	All	Lock shield Valve and Union adapter to serrated hose connection. Sized to suit system volume, 25mm dia. minimum.

2A-2-20 COMMISSIONING AND BALANCING VALVES

To promote reliable and accurate balancing of water systems, commissioning valves shall be supplied and installed in the pipework systems and shall:

1) Be fitted in the following locations:
   a) Where indicated on the drawings.
   b) As detailed in specific sections of this specification (Whether indicated on drawings or not).
   c) Where required for correct and efficient commissioning.
   d) Generally, be installed on the return of:
      i) Each heating and cooling primary circuit.
      ii) Each heating and cooling secondary circuit.
      iii) Each heating, cooling and recovery battery.
      iv) Each refrigeration machine chilled water evaporator and condenser.
      v) All major plant items e.g. boilers etc.
      vi) All mains and sub-mains leaving plant rooms or main risers.
2) Be either combined (i.e. orifice plate plus DRV close coupled) or discreet (orifice plate on flow with DRV on return). All fixed orifice commissioning sets shall be selected to provide an accuracy of measurement of +/- 5% of design flow rate.
3) Use Venturi measurement devices where an accuracy better than +/- 3% of design flow is to be achieved.
4) Where specifically allowed in writing by the Engineer variable orifice plates may be used on less critical circuits where accuracy shall be at least +/- 10% of design flow.
5) Have a maximum velocity through commissioning set of 1.2m/s up to 50mm diameter, 2.0m/s for 65mm diameter and above.
6) Measurement component shall be installed to manufacturer's recommendations subject to a minimum of 5 pipe diameter of straight pipe upstream, 3 pipe diameters downstream, whichever is the most onerous requirement.
7) All commissioning valves shall be selected such that excessive closing of the valve is not necessary for correct regulation, utilising smaller diameter valves than the adjacent pipework as necessary, Contractor shall include for necessary reducers within their tender. Contractor shall obtain excess pressures and design flow rates from designer prior to ordering commissioning sets.
8) All commissioning valves shall be selected such that they provide sufficient signal for accurate measurement (say 1 – 4.7kPa), low flow units shall be used where necessary to achieve good readings.
9) Where no specific size is indicated, line size commissioning valves shall be included at Tender stage and the final size to be selected when accurate flow rates and pressures are known, the valve sizes shall be confirmed with the Engineer prior to ordering. However, for tender, as the commissioning valve will not necessarily be of full line size, the installation shall provide reducers immediately adjacent to these valves as necessary.

The commissioning stations (CS) shall be installed with sufficient best practice straight run of pipework either side of the valves fully in accordance with the valve manufacturer's best practice recommendations.

Both the Engineer and the Commissioning Engineer shall review all commissioning valve selections. Valve selection information shall be scheduled. The schedule of information shall include:

1) Pressure drop for each valve, signal strength (between 1 – 4.7kPa).
2) Flow rate.
3) Size of valve.
4) Associated pipeline size.

This schedule shall be provided in sufficient time, minimum of 10 working days, for all comments to be returned and implemented prior to the commissioning valves being ordered.

2A-2-21 DIFFERENTIAL PRESSURE REGULATORS AND DIFFERENTIAL PRESSURE COMMISSIONING STATIONS

Differential pressure regulators (DPR) regulating and differential pressure commissioning stations shall be provided as indicated upon the Tender drawings, which shall:

1) Have a worst acceptable accuracy of +/- 5% of design sub-circuit pressure.
2) Have a bronze body on systems operating below 120°C. Cast iron shall be an acceptable alternative on 65mm diameter and above.
3) Have a pressure rating to match system, subject to a minimum pressure rating of PN16 (or greater depending on media fluid).
4) Have a maximum port velocity of 2m/s.
5) Have a minimum available adjustment +/- 25% of design flow rate.
6) Be capable of operating against pressure development of system pump, subject to the following minimums:
   a) 200kPa for valves up to 50mm diameter.
   b) 350kPA for valves 65mm diameter and above.
7) Have a maximum pressure drop of 5kPa for accurate control.
8) Measure and control pressure imposed on the sub-circuits and as detailed on the Tender drawings.
9) Have a pressure range of 30-60kPa for Tender, confirm final requirement with Engineer prior to ordering of the valves.
10) Be supplied, installed and commissioned in accordance with the manufacturer's recommendations to achieve above requirements.
11) Be suitable for the system fluid, pressure, temperature and materials (as recommended by manufacturer) where this conflicts with above requirements clarify with Engineer.

Both the Engineer and the Commissioning Engineer shall review all differential pressure regulators and differential pressure commissioning valve selections. Valve selection information shall be scheduled, the schedule of information shall include:

1) Pressure drops for each valve.
2) Flow rate.
3) Size of valve.
4) Associated pipeline size.

This schedule shall be provided in sufficient time, minimum of 10 working days, for all comments to be returned and implemented prior to the commissioning valves being ordered.

2A-2-22 PRESSURE INDEPENDENT CONTROL VALVES

Pressure independent control valves consisting of differential pressure controller, and control valve shall be provided as indicated upon the Tender drawings and these shall:

1) Have valve body and material to suit systems operating below 120°C. Cast iron shall be an acceptable alternative on 65mm diameter and above.
2) Have a pressure rating to match system, subject to a minimum pressure rating of PN16 (or greater depending on media fluid).
3) Have a maximum port velocity of 2m/s.
4) Be designed and provided with integral flow verification metering stations however if metering stations are not integral to the control valves chosen then separate metering stations shall be supplied and installed to verify the actual flow rate of all pressure independent control valves.

5) Have a minimum available adjustment +/- 25% of design flow rate.
6) Maintain a valve authority in the range of 0.8 to 1.0 at all times.
7) Comply with the performance/ selection criteria stated elsewhere in this specification for the differential pressure component of the valve.
8) Have flow rate adjustment that shall:
   a) Not reduce the stroke of the control valve on valves of 50mm diameter and below.
   b) Not reduce the stroke by more than 30% on valves above 50mm diameter.
9) Be supplied, installed and commissioned in accordance with the manufacturer's recommendations to achieve above requirements.
10) Be suitable for the system fluid, pressure, temperature and materials (as recommended by manufacturer) where this conflicts with above requirements clarify with Engineer.

2A-2-23 FLOW LIMITING VALVES

Flow limiting valves shall be provided as indicated upon the Tender drawings, which shall:

1) Have a bronze body on systems operating below 120°C, cast iron shall be an acceptable alternative on 65mm diameter and above.
2) Have a minimum pressure rating of PN16 (or greater depending on media fluid).
3) Have a maximum port velocity 2m/s.
4) Have a maximum pressure drop of 20kPa.
5) Have a maximum control tolerance +/- 5%.
6) Have a minimum available adjustment +/- 25% of design flow rate.
7) Be suitable for the system fluid, pressure, temperature and materials (as recommended by manufacturer) where this conflicts with above requirements clarify with Engineer.
8) Have combined isolating and flow limiting valves with the replaceable cartridge type flow setting to limit maximum flow to the individual outlet on final domestic supplies to wash hand basins and the like.

2A-2-24 SELF REGULATING TEMPERATURE VALVES

Self-regulating temperature valves shall be provided as indicated upon the Tender drawings, which shall:

1) Have a bronze body on systems operating below 120°C, cast iron shall be an acceptable alternative on 65mm diameter and above.
2) Have a minimum pressure rating of PN16 (or greater depending on media fluid).
3) Have a maximum port velocity 2m/s.
4) Have a minimum valve authority of 0.25.
5) Have a maximum pressure drop of 5kPa.
6) Have a maximum control tolerance +/- 5%.
7) Have a minimum available adjustment +/- 25% of design temperature, factory pre-set non-adjustable valves shall only be used where specifically allowed in writing by the Engineer.
8) Be suitable for the system fluid, pressure, temperature and materials (as recommended by manufacturer) where this conflicts with above requirements clarify with Engineer.

2A-2-25 DOMESTIC HOT WATER RETURN REGULATION

To enable domestic hot water return regulation, valves shall be provided whether shown on drawings or not to all of the following locations:

1) Spine mains.
2) Sub-branches.
3) Final branches.
4) Loops installed for future/ phased expansion.

Regulation shall be achieved as detailed in the specific sections of this specification and shall be by one of the following methods as directed in section M1 of this specification:

1) Double regulating valves which shall be:

a) Installed on the return legs.
b) Line size.

2) Dual function temperature limiting valves shall:
   a) Be installed in the returns of final branches and loops with commissioning stations installed in the return of spine mains and sub-branches.
   b) Have a primary thermostatic head, factory pre-set at temperature agreed in writing with Engineer, typically in the range of 57°C to 60°C.
   c) Have a secondary (pasteurisation) function factory pre-set at 70°C.
   d) Have both functions (normal operation and pasteurisation) to be adjustable on site for fine tuning during the commissioning process.
   e) Be complete with manufacturer's integral calibrated temperature gauge and proprietary insulation box cover which when fitted, still allows temperature to be read.
   f) Have performance and accuracy of temperature control in each mode, each valve shall be verified on site and recorded in manuals.

Any BMS temperature monitoring points shall be provided separate to these valves unless the selected valve has a tapping provided specifically for either a thermometer or temperature sensor and if so this may be used for the BMS temperature monitoring.

No other valve type (e.g. lock shield, gate, globe, butterfly etc.) shall be used for regulating purposes.

2A-2-26 AIR VENTS AND ELIMINATORS

Automatic Air Vents shall only be used at key points as agreed with the Engineer or shown on the Tender Drawings, where installed, they shall:

1) Air vents and associated pipe connections should be line-size up to 25 mm, then 25 mm minimum for all larger pipes.
2) Be installed as recommended by BSRIA BG29 for heating, cooling and heat rejection water systems.
3) Automatic air vents should be isolated during normal system operation to avoid the risk of leakage.
4) Be installed where indicated on the tender drawings.
5) Be as detailed in specific sections of this specification.
6) Be installed at all high points on all water systems to ensure complete venting where self-venting through the mains cannot take place or would not prove satisfactory.
7) Be complete with local isolation valve for maintenance purposes.
8) Be Spirotech Spirotop or engineer approved equal with the same 20 year warranty.
9) Be installed fully in accordance with manufacturer's recommendations such that guarantee is fully maintained.
10) Not be located in sections where they could allow air to be admitted during normal operation of the system.
11) Be clearly marked on 'as fitted' drawings showing accurate locations.
12) Have a minimum of a 50mm square branch (or line size if greater) with a 50mm diameter air bottle of a minimum length of 250mm. Dead legs, between branches and vents, shall NOT exceed 2 pipe diameter.
13) Be complete with cap and 8mm brass needle type air cock or air valve where there is a risk of scalding.
14) Have 8mm diameter bleed pipe extended from the bottle where the air cock/ valve is fixed out of reach (e.g. steps/ scaffold, etc. would be required to gain access) which shall:
    a) Terminate in an air cock / valve 1.4m above finished floor level, ideally over a drain if possible.
    b) Have air cock / valve located in a convenient but unobtrusive location.
    c) Run in heavy quality mild steel tube with malleable iron fittings neatly run on the surface to a local drain where installed in voids, risers, plant rooms etc.
    d) Not be installed where exposed to view in rooms unless unavoidable where it shall be installed in copper run within the thickness of a partition wall or in a wall chase. This shall only be adopted with written permission of the Engineer.
15) Be installed with a local isolation valve to allow vent replacement in the case of an automatic air vent, without needing to drain excessive quantities of system water.

In accordance with current British Standards, domestic hot and cold water systems shall avoid the use of air eliminators wherever possible, by using top connections to mains and venting via taps, where this is impossible air eliminators shall be used as a last resort and shall:

1) Be agreed with the Engineer prior to its use.
2) Be complete with check valve and isolation valve for maintenance purposes.
3) Be complete with a 15mm automatic air vent whose outlet shall be piped with an 8mm copper pipe to the nearest foul drain point.
4) Terminate via a tundish arrangement to a trapped waste or over a gulley suitable to accept pipework discharges without obstructing access for cleaning and rodding.

2A-2-27 THERMOMETERS, PRESSURE, ALTITUDE AND VACUUM GAUGES

All Gauges shall:

1) Be mounted with the diameter gauge in the vertical position.
2) Have a minimum diameter of 100mm.
3) Factory calibrated and individually certified in:
    a) Temperature: °C (between 2°C and 5°C per division)
    b) Pressure: Bar (gauge) or millibar.
    c) Altitude: metres head of water.
    d) Vacuum: millimetre Hg (gauge).
4) Have a black finished steel case and chromium plated bezel.
5) Have a black pointer and clear black lettering and scale on a white background.
6) Be fitted with a tamperproof loose red pointer that can be set on site to the working condition by removal of the front plate.
7) Be flangeless for direct mounted gauges.
8) Be either back or front flanged to suit either surface or flush mounted panel arrangements respectively for panel mounted pressure gauges.
9) Have either back or bottom entries to suit the mounting arrangements.
10) Carry the name of the manufacturer and shall all be of the same manufacturer and appearance as all other gauges used on the project.

Dial thermometers shall:

1) Have a suitable range for the service connected such that they can be accurately read, i.e. -40°C to +40°C on chilled or cold water, 0°C to 100°C on LTHW.
2) Be of the vapour pressure type with brass bulb.
3) Have a black finished steel case and chromium plated bezel.
4) Be flangeless for direct mounted gauges.
5) Be either black or front flanged to suit either surface or flush mounted panel arrangements. Capillary tube dial thermometers shall have plain bulbs with either loose pockets or flanges to suit the mounting arrangements for panel mounted dial thermometers.
6) Be visible and readable from ground level or permanent access platforms, i.e. no steps or access equipment needed to read gauges.

Pockets shall:

1) Be filled with heat conducting grease.
2) Be installed in a bend with the pocket facing into the fluid flow on domestic water systems.

Pressure, altitude and vacuum gauges shall:

1) Have a suitable range for the service connected such that they can be accurately read, i.e. 0 to 4 bars on a system with a working pressure of 1.5 bar.
2) Be of the bourdon gauge tube type with BSP male thread.
3) Be fitted with a bronze lever handle gauge cock with BSP female thread ends and a chromium plated finish.

4) Have a 'U' or ring siphon interposed between the gauge, cock and tapping point, where practical fitted adjacent to the latter.
5) Have a siphon on steam lines, formed from steel tube and shall be filled with water prior to the gauge being put into service.
6) Be visible and readable from ground level or permanent access platforms, i.e. no steps or access equipment needed to read gauges.

Capillary tubes shall:

1) Be of correct length (excess shall be no more than 300mm and shall be neatly coiled and fixed).
2) Have armoured flexible sheath.
3) Have radius bends not less than recommended by the manufacturer.
4) Be routed for minimum risk of damage.
5) Be routed as agreed with the Engineer.
6) Be clipped to cable trays provided by the Contractor where cable trays are suitable containment.

2A-2-28 TEST POINTS

Test points, also called Binder Test Points and labelled on drawings as TP or BT, shall:

1) Installed on the side of the pipes and not at either the top or bottom of the pipes as stated to comply with BSRIA BG29.
2) Be fitted in the following locations:
    a) Where indicated on the drawings.
    b) As detailed in specific sections of this specification (whether shown on drawings or not).
    c) Be installed before and after all:
        i) Pumps.
        ii) Strainers.
        iii) Non-return valves.
        iv) Heating, cooling and run around coils.
        v) Radiant panel, convectors and other emitters, except radiators.
        vi) Control devices such as control valves.
        vii) Plant items e.g. boilers, chillers etc.
        viii) DPR/DPCV/STAP/BPV valves – note also can be integral to valve assemblies if available.
3) Be of the binder type self-sealing test point with screw down cap.
4) Be extended spindle type to protrude above the thermal insulation.
5) Be PN 16 rated (or greater depending on media fluid).

Insulation shall be dressed around test points such that insulation, vapour seals and cladding are not compromised and access can be obtained without damage to finishes/ function. Extended stem type shall be used to all insulated services.

2A-2-29 WALL, FLOOR, ROOF AND CEILING PENETRATIONS

Where pipes penetrate through walls, floors, roof and ceilings, the penetrations shall:

1) Not restrict expansion/ contraction movement.
2) Where insulated services pass through a structure, the provision must accommodate the insulation unless omitted by detail.
3) At fire barriers, the fire integrity of the barrier must be maintained by converting the insulation to a non-combustible type, e.g. mineral wool, all suitably fire stopped. This comment relates to non-fire rated insulation such as phenolic insulation.
4) At fire barriers and structures, the thickness of insulation may be varied but care must be taken to prevent heat transfer sufficient to cause deterioration of the building fabric.
5) All services with a vapour barrier shall be arranged such that the vapour barrier is continuous through the wall / fire barrier by use of oversized sleeve or equivalent.

6) Where phenolic insulation must be installed then fire collars shall be installed over the insulation to maintain continuous vapour barrier and fire rating of the structure.

7) Maintain acoustic properties of the structure being penetrated, this shall be achieved either from detailed provided by an acoustic specialist or if no acoustic specialist employed by packing all air gaps with, suitably fire rated if required, flexible material such as Rockwool FirePro products.

8) Be provided a puddle flange on external walls.

2A-2-30 KEYS AND VALVE HANDLES

At the completion of the work, the following keys and valve handles shall be provided by the Contractor, who shall also obtain a receipt for the same:

1) 4 No. keys of each type and size for lock shield valves, panel doors, equipment access doors, etc., drain cock (each size) and 6 No. air cock keys.

2) External underground valve handles (2 No. per size installed) shall be provided.

2A-2-31 PAINTING AND IDENTIFICATION OF PIPEWORK, BRACKETS ETC

All pipework, including services not insulated, shall be:

1) Identified with colour bands as required by the latest British Standard.

2) Provided with the service description, pipe size and direction of flow.

Where colour identification on existing services are different to latest British Standards, the new services shall be referred to the Engineer for a decision on which standard shall apply.

All cut edges, supports, flanges, nuts and bolts and any other exposed metal shall be painted with one coat of 'Red Oxide' paint prior installation and a second coat applied after installation is complete. Where necessary, Red oxide paint to be heat resisting.

All exposed ferrous pipework, brackets and supports in boiler houses, plant rooms, tank rooms and external to buildings shall further be decoratively painted with two coats of an approved colour gloss paint, which shall be heat resisting where applicable (or hot dip galvanised after manufacture) as directed by the Engineer.

Gas pipework shall be painted with primer and two coats of gloss to comply with current gas regulations (yellow ochre).

All plant and equipment with ferrous surfaces shall have at least two coats of protective paint applied at the manufacturer's works.

If manufacturer's finishes are damaged on site, these shall be repaired or replaced to an 'as new' condition to the satisfaction of the Engineer and the manufacturer who shall confirm that warranties shall not be affected.

2A-2-32 CHROMIUM PLATING

All hot and cold water pipes, valves, fittings and pipe clips, where exposed for short runs only in toilet, kitchen, food preparation, shower, bathroom and sluice areas shall be chromium plated unless stated otherwise in the Particular Clauses later in this Specification. Exposed and uninsulated pipework shall be minimised as far as absolutely practical and must be in accordance with current industry standards.

2A-2-33 EQUIPOTENTIAL BONDING

The main incoming piped services shall be bonded by the site electrician as close to the point of entry as possible, all subsequent bonding and cross bonding shall be completed by the Contractor.

2A-2-34 FIRE STOPPING

All pipework passing through fire barriers or cavity barriers shall be fire stopped by the Mechanical Contractor. The fire stopping systems shall be manufactured and installed by Promat Ltd or equal and approved. The fire barriers shall not compromise any vapour seals.

Each fire stopped position shall be provided with a signed and dated approved installer label. This label shall signify that the fire stopping has been installed to the manufacturer's requirements.

2A-3 COMMON REQUIREMENTS FOR VARIOUS SYSTEM TYPES

2A-3-1 STEEL PIPEWORK

Steel pipework shall be installed as detailed in the BESA TR20 Guide relevant to the service being installed, subject to the following additional requirements/amendments.

Mild steel pipework shall:

1) Be low carbon heavy grade pipe (red band).
2) Mild steel press fit systems are not permitted.
3) Be supplied with standard works anti-corrosive lacquer finish.
4) Be stainless steel on overflows, vents and drains (or alternatively copper).
5) Have a minimum pipe size of 15mm diameter on any part of the circulating system.
6) Jointing shall be:
   a) Threaded connections on LTHW and CHW pipework with a working pressure less than or equal to 7 bar (gauge) for 50mm diameter pipework and below.
   b) Threaded connections on 65mm pipework shall only be used where this does not compromise the system in terms of the required working / test pressure and operating temperature and only if stated as permitted in the particular clauses of this specification or on the tender drawings.
   c) Welded connections in all other cases.
   d) Joints in inaccessible locations shall be avoided. Should this not be possible, written permission shall be obtained from the Engineer and welded joints employed.
7) All pipework within non-accessible voids and ceiling spaces shall be of fully welded construction. Note – removable suspended ceiling tiles are classified as accessible voids but services above plasterboard or non-removable ceilings are classified as non-accessible voids.
8) Blank ends shall be formed using welded cap ends on pipework 32mm diameter and below, flanges shall be used in all other cases.
9) All branches shall be formed utilising proprietary fittings, branches welded in square or welded shoes shall not be used.
10) All threads shall be taper type, parallel shall only be used to match control valves and the like where taper threads are not available.

2A-3-2 WELDING

1) Acceptable Welding Certificates for all steel pipes:
   a) Steam pipework – Class I welding to BS listed in 'General Standards Applicable'.
   b) All services with a normal operating pressure above 16 Bar(G) class I welding to BS listed in 'General Standards Applicable'.
   c) Hospital/ Health Projects, all services apart from steam – Class II welding to BS listed in 'General Standards Applicable'.
   d) All services elsewhere up to 16 Bar(G) and within the temperature range -20°C to +220°C shall be to one of the following:
      i) Class I welding to BS listed in 'General Standards Applicable'.
      ii) Class II welding to BS listed in 'General Standards Applicable'.
      iii) BESA TR/5 'Welding of carbon steel pipework' compliant and fully certificated welder who holds a current 'SKILLcard' for the welding class and type being undertaken.
2) Supervision/ Quality Control:
   a) The Contractor shall ensure that the standard of quality of work is fully in accordance with the standards set out in the specified welding standard/ certificate.
   b) The welder's individual mark shall be stamped adjacent to each weld
   c) A copy of the certificate, individual mark and date of issue shall be issued to the Engineer for each welder employed on the project prior to each welder commencing work on site, copies shall also be included in the O&M manuals.
   d) Any weld without an individual mark shall be tested by non-destructive testing, then marked by BESA inspector (or cut out and remade) all at Contractor's own expense.
3) Non-Destructive Testing shall carried out on welded pipe joints and:
   a) Be completed outside normal working hours or when site/ area is unoccupied for health and safety reasons.

b) Be completed by an independent BESA / Insurance approved inspector to the standard matching the specified welding certificate.

c) Be radiographic or ultrasonic as suitable, to be determined by inspector.

d) The decision of the inspector shall be binding on the Contractor at no additional cost to the contract.

e) The following levels of testing shall be included for at tender stage and carried out during the installation:

SERVICE	PERCENTAGE TESTED
All buried pipes	100%
Steam and condensate	100%
High Temperature Hot Water (HTHW)	100%
Medium Temperature Hot Water (MTHW)	100%
Low Temperature Hot Water (LTHW)	5%
Chilled Water (CHW)	5%
Domestic Hot Water Services (DHWS)	5%
Domestic Cold Water Services (DCWS)	5%
Low Pressure Natural Gas	5%
Oil	5%
All other services	100%

4) Any production welds that fail the test shall be repaired/ replaced and a further 5% of welds tested, further failures shall require 100% of welder's work to be tested and made good all at Contractor's own expense.

5) Welding particulars:

a) Building protection using appropriate materials shall be provided to prevent scorching and fire damage.

b) Where electric welding is employed, the Employer's supply shall not be used, either temporary power or suitable (power/ noise/ emissions) generator provided.

2A-3-3 VICTAULIC GROOVED PIPEWORK AND FITTINGS

Where Victaulic grooved pipework systems have been specified, the following shall apply to the installation:

1) Victaulic as a term when used within this specification applies to 'Victaulic Company' products and not a generic term for other grooved systems. Other grooved systems are not permitted.

2) All references to 'Victaulic' detailed in this specification and on all tender drawings applies to the 'Victaulic Mild Carbon Heavy Steel System' and not any other systems offered or available.

3) All pipework used with Victaulic couplers, fittings and valves shall be cut or roll grooved fully in accordance with the 'Victaulic Standard Groove Specification' submittal documents.

4) Only 'carbon steel pipe – grooved valves' shall be permitted and shall be fully as per other clauses of this specification in terms of valves seat materials, extended stems for insulation, construction materials, etc.

5) The entire installation shall adhere strictly to the manufacturers 'best practice' guidelines and recommendations including but not limited to 'Victaulic Installation Procedures – Quality Controls and Quality Assurance Standards'.

6) Be fully compatible with the fluid temperatures and pressures of the systems.

7) Only roll grooving machines manufactured by Victaulic shall be used on the project.

8) All installation personnel shall be fully trained by Victaulic in the correct and safe use and installation of their products. Signed and dated proof of training shall be provided for all installation staff prior to commencing any installation.

9) Regular site inspections shall be carried out by Victaulic personnel and all these visits shall be documented and recorded by both the Victaulic personnel in the form of their 'Job Walk Reports' and by the mechanical contractor as part of the installation. All observations and recommendations made by the Victaulic

personnel during their site visits shall be adopted and incorporated in the installation to ensure the complete installation is compliant with their recommendations prior to the system be pressured tested or flushed.

10) All documentation recommended in the 'Victaulic Installation Procedures – Quality Controls and Quality Assurance Standards' shall be incorporated into the O&M manuals.

2A-3-4 COPPER PIPEWORK

Copper pipework shall be installed as detailed in the BESA TR20 guide relevant to the service being installed, subject to the following additional requirements/amendments.

Copper pipework shall:

1) Be chromium plated after mock up assembly when exposed to view in toilets/ tea points, kitchen, etc.
2) Have a minimum pipe size of 15mm diameter on any part of the circulating system.
3) Jointing shall be:
   a) Soft solder on pipework up to and including 54mm diameter that are within the temperature/ pressure limitations for the solder/ fitting.
   b) Brazed on pipework 67mm diameter and above, as well as all sizes of condensate (steam systems) services.
   c) Compression fittings on final connection to equipment and valves where no alternative is available (i.e. ball-o-fix valves) excluding steam condensate systems (where no compression joints are permitted).
4) Joints in inaccessible locations shall be avoided. Should this not be possible, written permission shall be obtained from the Engineer and brazed joints employed.
5) SOFT SOLDER JOINTS - Lead free solders shall be used.

2A-3-5 BRAZED JOINTS

Brazing shall be used for the following copper pipe installations:

1) Water services and chilled water copper pipework 67mm diameter and above.
2) All gravity and pumped (steam) condensate services.
3) All inaccessible copper pipework (e.g. concealed in partitions, etc.)

All brazing shall:

1) Be completed by suitably qualified and experienced fitter who has current certification to demonstrate competence for the particular works being undertaken. Copies of certificates shall be provided prior to works commencing.
2) Bronze brazing shall not be used without the written permission of the Engineer due to the risk of dezincification.
3) Silver brazing shall be used unless agreed otherwise in writing with the Engineer.
4) Fittings shall be Pegler Yorkshire General High Duty fittings. All of which shall be BSI Kite Mark stamped and WRAS approved.
5) Supervision/ Quality Control:
   a) The Contractor shall ensure that the standard of quality of work is fully in accordance with the standards set out in the specified brazing standard/ certificate.
   b) The blazer's individual mark shall be stamped adjacent to each joint.
   c) A copy of the certificate, individual mark and date of issue shall be issued to the Engineer for each pipe fitter who carries out any brazing work on the project prior to each fitter commencing work on site. Copies of all certificates shall also be included in the O&M manuals.
   d) Any joint without an individual mark shall be tested by non-destructive testing, then marked by BESA inspector (or cut out and remade) all at Contractor's own expense.
6) Non-Destructive Testing shall be carried out on brazed pipe joints and :
   a) Be completed outside normal working hours or when site/area is unoccupied for health and safety reasons.
   b) Be completed by an independent BESA /Insurance approved inspector to the standard matching the specified brazing certificate.

c) Be radiographic or ultrasonic as suitable, determined by inspector.

d) The decision of the inspector shall be binding on the Contractor at no additional cost to the contract.

e) The following levels of testing shall be included for at tender stage and carried out during the installation:

SERVICE	PERCENTAGE TESTED
All buried pipes	100%
Steam and condensate	100%
Low Temperature Hot Water (LTHW)	5%
Chilled Water (CHW)	5%
Domestic Hot Water Services (DHWS)	5%
Domestic Cold Water Services (DCWS)	5%
Low Pressure Natural Gas	5%
All other services	100%

f) Any production brazed joint which fails the tests shall be repaired/ replaced and a further 5% of brazed joints tested, further failures shall require 100% of blazer's work to be tested and made good all at Contractor's own expense.

7) Brazing particulars:

a) Building protection using appropriate materials shall be provided to prevent scorching and fire damage.

2A-3-6 MAPRESS & XPRESS SYSTEMS

This shall apply to the following systems:

1) Geberit Mapress copper.
2) Geberit Mapress stainless steel.
3) Pegler Yorkshire XPress copper.
4) Pegler Yorkshire XPress stainless steel.

When using above systems the Contractor shall:

1) The manufacturer's proprietary system components shall be used along with approved components such that the full manufacturer's warranty is fully maintained. (e.g. Yorkshire Xpress shall only be used with Yorkshire pipework).
2) Not be used for final connection to plant / equipment, except connections to sanitary ware.
3) Be installed fully in accordance with manufacturer's written instructions.
4) Take into account of the increased requirements for expansion/ contraction using natural flexibility.
5) Be of a minimum pressure rating of PN16.
6) When offered as an alternative the system resistance shall not be increased, Contractor shall include for increased pipe sizes as necessary.
7) Ensure that the following is included for and provided by the manufacturer:
   a) All fitters to have attended manufacturer's training course and have appropriate current certification.
   b) Site progress inspections with written inspection reports and details of corrective action/ comments to be completed by manufacturer own Engineers.
   c) Site completion inspections with written inspection report and details of corrective action/ comments to be completed by manufacturer own Engineers.
   d) 25 year installation and materials warranty provided by manufacturer, project specific certificate to be provided.
8) Offsite fabrication shall be employed to the maximum extent, on site jointing shall be the minimum necessary to connect prefabricated sections.

9) Each joint shall be marked with the fitter's individual symbol/ initials (after joint has been crimped) corresponding with a key included in the O&M manuals to allow quality monitoring of jointing process and visual check that joint has been crimped. Any joints not permanently marked shall be cut out and replaced.

10) Manufacturer's storage recommendations shall be meticulously complied with due to increased susceptibility of these systems.

11) In areas of high humidity, externally and wherever moisture may be in contact with the system (e.g. chilled water, etc.), the manufacturer's recommendations with regard to additional corrosion protection such as anti-corrosion tape to fittings shall be complied with in full.

12) Condition of specialist jointing tools and jaws / terminals, etc. shall be continuously monitored and replaced in accordance with manufacturer's recommendations.

13) Only manufacturers own seals / "O" rings, etc. shall be used, where a choice of material is offered, this shall be selected to give the maximum life for the system as a whole (e.g. Butyl rubber rather than PTFE).

14) Connections to valves and equipment shall be completed in accordance with the fitting/ pipework manufacturer's recommendations using preparatory fittings wherever they are available.

15) When installed in confined spaces and voids the manufacturer's minimum recommended spacing around the services shall be provided to enable future connections and repairs to be undertaken without removing adjacent services, etc.

16) Supports for the pipework system shall:
    a) Be the manufacturer's purpose designed support system incorporating pipe carriers.
    b) Be suitable for the expansion/ contraction system employed.
    c) Prevent stress on joints, particularly when connecting to risers & equipment.

2A-3-7 PLASTIC PIPEWORK SYSTEMS

This shall apply to the following systems:

1) George Fisher Instaflex
2) Polyethylene systems.
3) Protected polyethylene systems.
4) ABS system.

When using above systems, the Contractor shall:

1) Use the manufacturer's proprietary system components along with approved components such that the full manufacturer's warranty is fully maintained. (e.g. George Fisher Instaflex shall only be used with Instaflex pipework).
2) Not to be used within plant rooms.
3) Not be used for final connection to plant / equipment.
4) Not be used where exposed to view.
5) Be installed fully in accordance with manufacturer's written instructions.
6) Take into account of the increased requirements for expansion / contraction using natural flexibility.
7) Be of a minimum pressure rating of PN16.
8) Ensure that the following is included for and provided by the manufacturer:
    a) All fitters to have attended manufacturer's training course and have appropriate current certification.
    b) Site progress inspections with written inspection reports and details of corrective action / comments to be completed by manufacturer own engineers (George Fisher only).
    c) Site completion inspections with written inspection report and details of corrective action / comments to be completed by manufacturer own engineers (George Fisher only).
    d) 12 year installation and materials warranty provided by manufacturer, project specific certificate to be provided (George Fisher only).
9) **Any installation concerns raised by Contract Administrator shall be addressed by the manufacturer's technical representatives attending site to inspect the installation and then provide a definite written statement on the installation being fully in accordance with the manufacturer's best practice recommendations and if not deemed to be in accordance the installation shall be rectified at no cost**

to the contract to be fully in accordance with the manufacturer's recommendations. The Engineer shall be invited to attend site for this manufacturer's inspection.

10) Maximum off site fabrication and on site jointing shall be the minimum necessary to connect prefabricated sections.

11) Employ the following jointing techniques:

a) On site shall be electro fusion using manufacturer's proprietary fittings and automatic heating and control unit.

b) Off site in manufacturer's works shall be electro fusion, butt or socket fusion process.

c) Each joint shall be recorded by the operator/ fitter and included in the O&M manuals to allow quality monitoring of jointing process. Any joints not properly recorded shall be cut out and replaced.

12) Manufacturer's storage recommendations shall be meticulously complied with due to increased susceptibility of these systems.

13) Condition of specialist jointing tools and jaws/ terminals, etc. shall be continuously monitored and replaced in accordance with manufacturer's recommendations.

14) Connections to valves and equipment shall be completed in accordance with the fitting/ pipework manufacturer's recommendations using preparatory fittings wherever they are available.

15) When installed in confined spaces and voids, the manufacturer's minimum recommended spacing around the services shall be provided to enable future connections and repairs to be undertaken without removing adjacent services, etc.

16) Supports for the pipework system shall:

a) Be the manufacturer's purpose designed support system incorporating pipe carriers (alternatives such as cable tray / basket, etc. shall not be accepted).

b) Be suitable for the expansion/ contraction system employed.

c) Prevent stress on joints, particularly when connecting to risers & equipment.

d) Be provided with brackets at support centres recommended by the manufacturer.

17) Where pipework is supplied pre-insulated with Armaflex insulation, this shall then be supplemented with insulation / covering such that an equivalent thermal performance, physical surface protection and spread of flame rating is provided as that detailed in the thermal insulation section of this specification.

2A-4 AMENDMENTS TO BESA TR SERIES DOCUMENTS

2A-4-1 GENERAL

This Section of the Specification details the unique requirements associated with each system type. The BESA pipework guides are used as the basic requirements with any clarifications/ alterations/ additional requirements set out within this Section of the Specification.

Where the term "should", "may" "preferably" or "will" is used within the documents, the procedure shall be fully complied with, and included for at tender stage, any deviation from these standards shall only be permitted in exceptional circumstances and with the written permission of the Engineer obtained beforehand.

Where any discrepancy is found between the BESA documents and this Specification, the issue shall be raised and agreed prior to tender submission, where clarification is not obtained prior to tender the most onerous condition shall be included.

General requirements detailed earlier within this Specification show clarifications/ alterations/ additional requirements that are applicable to all of the BESA guides.

2A-4-2 AMENDMENTS

1) Table defining support intervals shall not be applied, refer to an earlier clause of this specification for requirements.

2) Main earth bonding to services at entry point to building shall be provided by the Contractor.

3) Where items are detailed in the specific sections or within this section of the specification, they shall be complied with over and above the requirements in the BESA documents.

4) On variable volume systems, regulation/ balancing shall be provided in accordance with this specification in addition to any pressure differential valves, etc.

5) For thermal insulation, refer to thermal insulation section of this specification and the current building regulations.

6) For testing, flushing, cleaning and water treatment, refer to requirements detailed later in this section of the specification.

7) Identification shall be in accordance with the BESA documents with the additional requirements set out in this specification.

2A-5 PRESSURE TESTING / PURGING

2A-5-1 PRESSURE TESTING

The Contractor shall pressure/ leak test all systems to the following standards:

1) Produce and issue for comment a method statement for pressure/ leak testing which shall:
   a) Be fully in accordance with HSE guidance document (Refer to standards at the beginning of this section).
   b) State pressure, test duration and testing fluid for each service being tested.
   c) Provide a programme for the testing works with dates for witnessing.
   d) Confirm that proposed pressures are within the manufacturer's maximum pressures for the material used.
   e) Address each of the requirements detailed in this section of the specification.
   f) Incorporate any comments made by Engineer, etc.

2) Pressure / leak tests shall be completed prior to joints being covered / painted to allow a full visual inspection for evidence of leaks.

3) System pressure shall be monitored by calibrated pressure gauges installed at the closest and furthest points from where pressure is introduced. Where distance from highest to lowest point exceeds 15m, gauges shall also be fitted at the highest and lowest point of the system.

4) Pre-commissioning shall commence within 48 hours of pressure test to prevent contamination due to untreated water/ water residue remaining in system, where this cannot be achieved either treat water with inhibitor/ biocide or drain down and fully dry system (hot air drying) all as recommended in BSRIA guides.

5) Where pressure test fails, the fault / leak(s) shall be located and repaired and then the pressure tests undertaken again, this process shall continue (at Contractor's own expense) until a successful test is achieved and witnessed.

6) Systems shall be pressure tested in accordance with the 'Minimum Requirements for Pressure Testing' detailed below.

MINIMUM REQUIREMENTS FOR PRESSURE TESTING				
Systems shall be pressure tested to whichever is the greater of the following 3 requirements: **a) Minimum pressures detailed in this table or,** **b) As detailed in the particular specification sections or,** **c) 1.5 times working pressure if greater than those tabulated below.**				
SERVICE	**MATERIAL**	**TEST PRESSURE**	**TIME**	**NOTES**
Steam	Steel	15 bar(g)	4 hrs	
Condense (gravity)	Copper	10 bar(g)	4 hrs	
Condense (pumped)	Copper	15 bar(g)	4 hrs	Same pressure as steam system
MTHW & HTHW Heating	Steel / Copper	10 bar(g)	4 hrs	
LTHW Heating, Chilled Water	Steel / Copper	5 bar(g)	4 hrs	
	Plastic	5 bar(g)	4 hrs	Allow for additional expansion of pipe
Domestic Services	S/S & Copper	7 bar(g)	4 hrs	

MINIMUM REQUIREMENTS FOR PRESSURE TESTING				
Systems shall be pressure tested to whichever is the greater of the following 3 requirements: **a) Minimum pressures detailed in this table or,** **b) As detailed in the particular specification sections or,** **c) 1.5 times working pressure if greater than those tabulated below.**				
SERVICE	**MATERIAL**	**TEST PRESSURE**	**TIME**	**NOTES**
	Plastic	5 bar(g)	4 hrs	Allow for additional expansion of pipe
Domestic Services, below ground	S/S & Copper	7 bar(g)	4 hrs	
	Plastic	5 bar(g)	4 hrs	Allow for additional expansion of pipe
All domestic water subject to pressure from utility mains above & below ground	S/S & Copper	14 bar(g)	4 hrs	
	Plastic	14 bar(g)	4 hrs	Allow for additional expansion of pipe
Natural Gas, above ground	Steel / Copper	In accordance with current gas regulations and H&S approved code of practice.		
Natural Gas, below Ground	Steel / Copper	In accordance with current gas regulations and H&S approved code of practice.		
Open Vents	Copper	5 bar(g)	4 hrs	
Oil Lines	Steel	2 bar(g)	4 hrs	
Drains	All	0.7 bar(g)	4 hrs	
	Specialist	1.5 bar(g)	4 hrs	Laboratories, contaminated waste, etc.
Fire mains, dry risers etc.	All	15 bar(g)	4 hrs	
Thermal solar systems	All	7 bar(g)	4 hrs	
Compressed air	Steel	10 bar(g)	4 hrs	

All pressure testing shall incorporate the following:

a) Specialist plant and portions of the works, which cannot be exposed to the main system test pressure shall be tested separately in sections/ phases as required.

b) Where specialist pipework systems are employed (e.g. Geberit Mapress, Pegler Yorkshire Xpress Fit and Instaflex), manufacturer's requirements shall be adhered to, any conflict shall be brought to the attention of the Engineer.

c) Where materials expand under pressure (i.e. plastic pipework), provide calculations to demonstrate permissible pressure loss during test period.

d) Local authority shall be consulted to confirm pressures meet their minimum requirements (gas, water, etc.).

2A-5-2 PURGING (NATURAL GAS, LPG ETC.)

All pipework shall be purged in accordance with the current ACoP published by Gas Safe as well as current Gas Regulations and HSE guidance.

2A-6 PREPARATION OF SYSTEM FOR COMMISSIONING

The term "pre-commission" is used throughout this section of the specification to mean the flushing, chemical cleaning and dosing of the system.

Where the guides state typical practice, this shall be taken as being required unless particular circumstances allow/ require an alternative approach, the Contractor shall include for the most onerous solution in all cases and only deviate from typical practice when written acceptance of the Engineer is obtained.

Where the guide advocates strainers at all terminal devices, etc., this has not been provided due to the level of increased energy consumption and maintenance required, the Contractor shall therefore ensure that the pre-commissioning of the system is completed to the highest possible standard such that these secondary strainers are not required.

2A-6-1 SPECIALIST CONTRACTOR

Except for a small number of cases detailed below, the pre-commissioning of all water systems shall be completed by a Specialist Contractor employed by the Contractor.

The Contractor shall employ one of the following specialists to complete the pre-commissioning, flushing and domestic water services sterilisation works detailed later in this specification section:

WATER TREATMENT SPECIALISTS			
COMPANY NAME	**TEL. NO.**	**EMAIL ADDRESS**	**LOCATED**
Airtech Commissioning Limited	0121 4154141	heather.underhill@airtechcomm.co.uk	Birmingham
Cardiff Commissioning Limited	029 2052 1111	cardiffcomm@cix.co.uk	Cardiff
Dakro Environmental Limited	0121 559 6431	Enquiries@dakro.co.uk	Cradley Heath
GES Leicester Limited	0116 277694	ges.limited@btconnect.com	Leicester
Goodwater Limited	0118 973 5003	info@goodwater.co.uk	Wokingham
Kebble Environmental Services	01279 417 878	enquiries@kesltd.co.uk	Harlow
MWS (UK) Limited	01204 676 370	info@mws-ltd.co.uk	Bolton / Essex
PH Water and Air Technologies	01252 543668	www.phwatertechnologies.co.uk	Farnborough
Richmond Hydrochem Special Projects	024 7666 6482	info@richmondhydrochem.co.uk	Coventry
Rock Compliance Limited	01932 243 982	info@rockcompliance.co.uk	Nottingham

Where the client has a Water Safety Plan in place that has additional requirements such as (but not limited to) 'Water Treatment Specialists' must be members of Legionella Control Association (LCA) then these additional requirements from the WSP shall be complied with when choosing the 'Water Treatment Specialist' for the project.

The cases where the pre-commissioning does not need to be completed by a Specialist are:

1) Minor modification to system where draining down occurs locally and involves the removal / replacement of less than 100 litres of system water. (e.g. relocating a radiator).
2) Replacement of a component of a new / existing system where draining down occurs locally and involves the removal / replacement of less than 100 litres of system water.

In those cases where a Cleaning Specialist is not required, the Contractor shall undertake the works detailed in this section of the specification with the following modifications:

1) Drained section of system shall be pre-commissioned before opening up to the main system.
2) Any inhibitor used shall be compatible with that used in the main system, where the inhibitors in the main system are not known, a sample shall be taken and analysed by a Water Treatment Specialist and their advice followed with regard to cleaning and dosing methods employed.
3) The existing main system water shall not be used for pre-commission or filling the section of the system being worked upon, either dedicated temporary pumps or mains water shall be used.
4) Upon completion of the works, a sample of the water shall be taken immediately prior to opening up the section to the main system and a laboratory analysis performed to ensure the overall system inhibitor protection measures are maintained; the results are to be included in the O&M documentation.

2A-6-2 SYSTEM REVIEW AND METHOD STATEMENTS

Prior to submitting Tender, a Water Treatment Specialist shall be consulted to ensure that the requirement and costs for temporary pumps, water supplies, tanks etc. are included at Tender stage to allow the systems to be adequately pre-commissioned.

The requirements for pre-commissioning of the systems shall be reviewed in detail and agreed at an early stage in the project before installation works commence.

All pre-commissioning works shall be completed in accordance with the BSRIA pre-commissioning documents, refer to standards at the beginning of this section and incorporating the requirements set out within this specification.

The initial review of the system shall:

1) Confirm the quality of the available water supply for initial fill is suitable as detailed in BSRIA standards and also water in all systems always contains sufficient biocides and inhibitors at all times and not just on completion of works.
2) Ensure that sufficient facilities have been included to allow the system to be pre-commissioned in accordance with the guidance, checking for adequacy of flushing points, bypasses, etc.
3) Determine the method of circulating water to achieve required capture velocities. If system pumps are to be used, the Contractor shall ensure that the manufacturer's warranty is not affected in any way. Temporary pumps shall be used where the system pumps are not suitable.
4) Determine how flushing velocities can be achieved. Low energy design practice is tending to reduce operating velocities thereby, reducing the likelihood that system pumps will be capable of achieving required flushing velocities.
5) Consider materials used throughout the system (Note: aluminium heat exchangers are becoming far more prevalent).
6) Consider specialist pipework systems being employed (e.g. Geberit Mapress, Pegler Yorkshire Xpress Fit, and Instaflex) where manufacturer's particular requirements shall be incorporated, and any conflict shall be brought to the attention of the Engineer.
7) Consider methods of construction and likely level of contamination (i.e. welding method employed, use of plastic or mechanical jointing to minimise contamination, working practice, etc.)
8) Ensure sufficient information has been obtained from the Designer to allow pre-commissioning to be completed.
9) Availability of drains, necessity of using temporary tanks, etc.

A method statement shall be provided to detail the pre-commissioning process for each system or part thereof, in addition to the conclusions of the initial review, the following shall be addressed and provided within the statement:

1) A schedule of the pre-commissioning stages to be undertaken.
2) Details of all chemicals to be used during the pre-commissioning and reasoning for the selection of the same.
3) A programme for the pre-commissioning works along with dates for witnessing.
4) Method of water circulation to be employed.
5) Confirmation from local water authority that chemical discharge is accepted along with a copy of the temporary license obtained if necessary (Liaison and obtaining temporary license shall be the responsibility of the specialist); where approval cannot be obtained in sufficient time, an alternative disposal method shall be employed that meets current regulations at no additional cost.
6) Marked up drawings to indicate each flushing circuit and process with minimum velocities to be achieved.
7) Details of any temporary plant and equipment to be used along with temporary power supplies/ generators as appropriate.
8) Laboratory results and recommendations of water samples taken prior to pressure testing and if system maintained full for more than 2 weeks, prior to flushing.
9) All necessary health and safety information, risk assessments and COSHH information.

The method statement shall be submitted and reviewed along with any comments incorporated prior to commencement of pre-commissioning works.

2A-6-3 CHEMICAL CLEANING

Chemical cleaning of the system shall:

1) Be completed in accordance with the described guides and method statements.
2) Continue until satisfactory cleanliness is achieved as defined in the described guides.
3) Be witnessed by the Clerk of Works or Commissioning Specialist.

4) Recorded by the Tenderer and certified by the Clerk of Works or Commissioning Specialist.
5) Be completed in the absence of any filters, meters, circulating pumps, traps, valves, controllers, non-return valves and items of equipment which may be damaged or prevent adequate flushing, all of which shall be removed during the flushing process by the Contractor and re-instated upon completion.

2A-6-4 SYSTEM ADDITIVES

Based upon the laboratory results described above and system particulars the appropriated inhibitors, biocides, antifreeze, etc. shall be introduced into the system via a dosing pot or combined pressurisation and dosing tank system.

System additives shall be introduced, via a dosing pot, which shall:

1) Be adequately sized for the system (10 Litres minimum).
2) Be a proprietary pre-fabricated unit with fill funnel, check valve, drain and service valves that shall be positioned in a location agreed by the Engineer.
3) A fill tundish level that allows operatives to safely lift and poor water treatment chemicals.
4) Be provided whether indicated on drawings or not, assuming a distance of 5 metres from its system connection point.

A permanent laminated label shall be fixed adjacent to the dosing pot stating date/quantity/% of system volume used in initial treatment.

The Contractor shall monitor the effectiveness of the additives during initial operation and take all necessary action to ensure that system has sufficient treatment during the initial operation, all at Contractor's own expense.

The effectiveness of system additives shall be checked at the following intervals:

1) 7 days after system is made operational.
2) 3 Months after practical completion.
3) Immediately prior to the end of defects period.

Each system check shall include the following:

1) Samples shall be taken from representative points in each system to ensure that the treatment has been successful.
2) An analysis of these samples shall be undertaken by an Independent UKAS accredited laboratory.
3) If treatment levels are below recommended levels then additive level shall be topped up as necessary.
4) If treatment levels have dropped below expected levels for normal system operation (i.e. leak or excessive top up with fresh water is occurring), the system shall be inspected and cause identified and repaired before additives are topped up as appropriate, a report shall be provided detailing cause and corrective actions, chemicals added and recommendations for further monitoring.
5) Should alteration, draining down and refilling of system by Client's maintenance personnel be identified as the cause of low water treatment levels, the Contractor shall immediately inform the Client (in writing) of any corrective action that needs to be undertaken to return the system to recommended levels.

The Contractor's O&M documentation shall clearly identify the necessity of monitoring and maintaining system water treatment levels in order to prevent system corrosion and not invalidating manufacturers' guarantees/ warranties.

Any failure of pipework/ equipment occurring due to non-compliance with the above shall be replaced at the Contractor's own expense.

2A-6-5 DE-AERATION

Removal of air from the system is an on-going process that shall be continued by the Contractor until all air has been removed.

The de-aeration process shall be undertaken at the following times:

1) On a continuous basis during the system fill period and for at least 4 hours thereafter.
2) Immediately prior to commencement of commissioning and on a daily basis during commissioning.
3) Twice a day for the first 7 days after the system has been filled.
4) On a weekly basis until no air is released for two consecutive weeks.

Where automatic air vents and air separators are employed these shall be checked on a daily basis for correct operation and any signs of leakage of water.

2A-6-6 STEAM & GASES

Steam and gas installations shall be scavenged with steam or compressed air.

2A-6-7 TRACE HEATING

All external water pipework, including vent and drain lines shall be fully trace heated prior to insulation. The trace heating shall be of the self-regulating type.

The trace heating shall be completed with all necessary junction boxes, fixing tape, warning labels and seals for a complete installation and shall be interfaced with the BMS.

The system shall be installed as follows:

1) One circuit for flow and one for return joined in parallel by a suitable junction box, which shall then connect back to a power supply point.
2) Installed spirally around each pipe to give an output sufficient to prevent pipework from freezing.
3) Adequately wrapped around exposed items such as valves, etc.
4) Provided with correct installation items including entry boxes.
5) Self-regulating to maintain pipe at 4°C at a design ambient of –20°C.
6) Installation shall be NVENT RAYCHEM, their XL-Trace Low Smoke Zero Halon Self Regulating Heating Cable H-watt system or equal and approved.
7) Entire installation shall be fully in accordance with manufacturer's best practice recommendations.
8) Heat output per metre of pipe shall exceed the permitted heat loss of the insulated pipe as listed in section 2D of this specification.

2A-7 HEATING, COOLING AND HEAT REJECTION CLOSED LOOP SYSTEMS FLUSHING AND SAMPLING

All water systems shall be flushed to remove any construction debris, swarf, hemp, flux, etc as relevant to be fully removed from the installations so that they are clean and ready for filling or disinfection as required.

Where flushing loops are not indicated on the design drawings, the Contractor shall include for either temporary disconnection and installation flushing hoses or a permanent flushing bypass complete with isolating valve, this shall be provided at no additional cost to the contract.

Where permanent flushing loops are provided isolation valves shall be provided as the loops must be closed off on completion of flushing. In accordance with BSRIA BG29 **no permanently installed dead legs in flushing loops shall be more than 3 diameters pipe long** so where the resulting dead leg exceeds 3 pipe diameters long a single normally closed isolation valve is not acceptable and 2 isolation valves shall be provided one local to each branch from the circulating pipe OR the pipework shall be offset to ensure the dead leg diameters limit is complied with.

Flushing and sampling of all systems shall:

1) Be completed in accordance with the described guides and method statements, specifically including but not limited to:
    a) BSRIA BG29 for pre-commission cleaning of heating, cooling and other closed loop systems.
    b) BSRIA BG50 for water treatment for closed heating and cooling systems.
    c) BS 8552 for sampling and monitoring of heating, cooling and other closed loop systems. The FIVE life stages of prior to the completion and handover shall be carried out, documented and included in the O&M manual. The stages of sampling as detailed in BS 8552 shall be adhered to.
2) Be carried out in accordance with the 'Sampling and Analysis Plan' produced by the 'Water Treatment Specialist' in line with the recommendations detailed in BSRIA BG29. This plan should set out a full list of water quality parameters to be achieved at the end of the clean and at practical completion with values as recommended by the cleaning specialist
3) Continue until satisfactory cleanliness is achieved as defined in the described guides.
4) Be witnessed by the Clerk of Works or Commissioning Specialist.
5) Recorded by the Tenderer and certified by the Clerk of Works or Commissioning Specialist.

6) Be completed in the absence of any filters, meters, circulating pumps, traps, valves, controllers, non-return valves and items of equipment which may be damaged or prevent adequate flushing, all of which shall be removed during the flushing process by the Contractor and re-instated upon completion.

No system shall be left charged with untreated water for a period in excess of 48 hours, where this period is exceeded, the BSRIA recommendations with regard to biocides and cleansing, etc. shall be followed in full at the Contractor's own expense.

If treatment process proves unsuccessful, the Engineer shall instruct for repeat treatment at the Contractor's expense.

It may not be practical to achieve sufficient flushing velocities through low loss headers, thermal stores, etc. so these must be kept clean by a combination of:

1) The use of flushing bypasses so that suspended solids do not enter these components.
2) Removable ends on vertical low loss headers complete with bolted blanking plates. Horizontal low loss headers are not permitted.
3) Provision of multiple inspection chambers to allow visual physical inspection of internal surfaces and prove internal cleanliness of all vessels. Dated digital images of the internal condition of all vessels shall be included within the operating and maintenance manuals.

2A-8 DOMESTIC WATER SERVICES FLUSHING, DISINFECTION AND SAMPLING

On all projects, the Contractor shall:

1) Be completed in accordance with the described guides and method statements, specifically including but not limited to:
   a) BS 8558 – Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – Complementary guidance to BS EN 806.
   b) PD 855468 – Guide to the flushing and disinfection of services supplying water for domestic use within buildings and their curtilages.
   c) BS 8580 – Water quality – Risk assessments for Legionella control – Code of practice.
   d) HSE HSG 274 Part 2
   e) For healthcare projects, HTM 04-01 Parts A and B.
2) Fill, pressure test and flush the system using water from an appropriate source for example:
   a) Mains water supply.
   b) Temporary site supply.
   c) Potable drinking water bowser.
3) Disinfect the complete system including pipework, tanks, etc. in accordance with the British Standard defined in the standards section of this specification.
4) HTM requirements shall also be adhered to on all healthcare and related projects.
5) The Engineer shall be notified 48 hours prior to disinfection taking place so that arrangements can be made to witness the procedures.

   Provide and maintain safety labels and signs in accordance with the British Standard and as follows:
   a) Warning signs at every outlet during chlorination process.
   b) Warning signs at principle drinking water points and common area such as site canteen, office and entrance stating water on site is not suitable for drinking, these signs to be maintained until satisfactory laboratory results are obtained.
6) After completion of the disinfection, maintain the service in safe condition by regular flushing out of the systems, until the date of Practical Completion (twice weekly flushing routine for entire system including hose reels, etc. formally recorded and witnessed by the Clerk of Works or the Commissioning Specialist). Calculate the water capacity of the various sections of the systems and the amount water to be drawn off to ensure that completely fresh mains water is drawn into the system twice weekly.
7) Should twice weekly flushing not be adequately completed, the system shall be re-chlorinated and sample taken/ analysed.
8) Provide certification showing the areas/ sections treated, the levels of chorine solution used.

9) An analysis of these samples shall be undertaken by an Independent UKAS accredited laboratory at the Contractor's expense. The fully satisfactory and compliant results, compliant with above quoted standards, shall be provided within the Operating and Maintenance Manuals. Non-satisfactory or non-compliant results shall be repeated after any necessary remedial works, all remedial works and retesting shall be at the contractor's expense.

10) Take samples between 2 and 7 days after completion of disinfection , note this delay is mandatory so samples shall not be taken until after 48 hours after disinfection has been completed. This delay between disinfection and taking samples for testing is to ensure that the treatment has been successful and shall be carried out fully in accordance with the previously listed standards.

Samples shall be used to obtain laboratory analysis which shall:

a) Be taken at representative locations throughout each system as follows:
   i) Incoming mains supply.
   ii) Sentinel point on each system (e.g. DHW, MCW, BTCW, etc.).
   iii) Each storage tank (where fitted).
   iv) In agreed locations throughout the remainder of the systems at the **sampling rate of one sample per 8 outlets** (or pair of outlets where serving WHB or the like). (1 sample per 8 outlets or 12% of outlets required for the results to be statistically relevant).

b) Be analysed by a UKAS accredited laboratory in accordance with British Standards and Public Health Laboratory Recommendations.

c) Include an 'E' Coli, total viable count (TVC) at both 22ºC and 37ºC, Coliform bacteria, chemical analysis, copper content, lead content, Pseudomonas aeruginosa, disinfection residuals and legionella test.

d) Analysis of results and clear statement with regard to suitability for human consumption.

e) Early issue of results (before legionella results are available) where required by local authority in order to connect the new mains water supply.

11) In the event of any of the test results not being acceptable, the Contractor shall flush out, re-chlorinate and re-test as previously specified at no additional cost to the contract.

12) Practical completion of the works shall not be given until chlorination is complete and full satisfactory laboratory results have been obtained.

The Contractor shall employ one of the previously listed 'Water Treatment Specialists' to carry out the domestic water services sterilisation.

2A-9 RECORDS AND DOCUMENTATION

On completion of the activities described within this section of the specification complete records of ALL completed works and certificates of compliance shall be provided to both the design team and within the Operating and Maintenance Manuals.

Incomplete, non-compliant or unsatisfactory, in terms of compliance with the Standards listed in this specification, shall require all pre-commissioning, cleaning, flushing and sterilisation to be carried again at no cost to the client.

As an aid to meet this requirement for complete records and documentation all of the following must be provided at the relevant contract programme stages and a complete set of these documents shall be included within the Operating and Maintenance Manuals:

1) Record of all Local Water Authority and WaterSafe Registration to verify the potable water installation is fully WRAS compliant.
2) Pressure test certificates for every service.
3) Non-destructive test certificates for welded and brazed pipework.
4) Gas Safe certificates.
5) Flushing certificates.
6) Water sample test result certificates.
7) Full UKAS certification of EVERY water system to verify the installation are fully compliant with regulations, best practice guideline and industry standards.
8) Certificate of manufacturer's satisfaction of the installations where plastic, press fit or grooved pipework systems have been installed.

9) Records of actual biocides and inhibitors used, and concentrations recorded for each system so that the client has a record of how the systems need to be treated, etc.

10) Records that potable systems are being flushed and this flushing is being witnessed by either by the duty holder (as defined under HSE HSG 274 Part 2) or the clerk of works if one is appointed on the project.

11) Example record sheets provided in BSRIA BG29 pre-commissioning and cleaning document shall be used as a basis for pre-commissioning and cleaning record keeping.

12) An acceptable water quality certificate of conformity for system cleanliness shall be provided for each water system. A typical example of an acceptable acceptance certificate is provided within BSRIA BG29.

13) Any other relevant documents that will be beneficial to the client over the life of the building.

Section 2C

General Installation Clauses – Mechanical Commissioning

Contents

2C-1 GENERAL REQUIREMENTS

This section of the specification identifies general testing and commissioning requirements applicable to all services and sections within this specification.

2C-2 DEFINITIONS

Commissioning – The advancement of an installation from the state of static completion to full working order to the specified requirements. It includes the setting to work of an installation, the regulation of the system and the fine tuning of the system.

Commissioning Specialist – The firm (or person) appointed by the Mechanical Contractor to carry out specified duties in connection with commissioning engineering services in accordance with the commissioning specification. The Commissioning Specialist shall be someone with relevant training and experience who is a corporate member of the Commissioning Specialists Association.

Commissioning Manager - The person belonging to or appointed by the Commissioning Specialist to manage the commissioning process, being responsible for overall planning, supervision and witnessing of the results of the integrated Commissioning of all installed building services. The Commissioning Manager shall be someone with relevant training and experience who is a corporate member of the Commissioning Specialists Association

Commissioning Management Organisation (CMO) - The firm (or person) appointed by the Main Contractor to manage the commissioning process, being responsible for overall planning, supervision and witnessing of the results of the integrated commissioning of all installed building services.

Engineer – The Mechanical and Electrical Engineering Design Consultant (CPW)

Controls Specialist – The firm appointed by the Mechanical Contractor to design, install, set to work and commission the automatic controls or Building Energy Management systems (BEMS/BMS)

For all other definitions refer to the relevant CIBSE Commissioning Codes.

2C-3 REFERENCE TO OTHER DESIGN DOCUMENTS

This section of the specification shall not be read in isolation. It must be read in conjunction with the other sections of this specification, the drawings and other documents referred to therein. The Mechanical Contractor is to ensure that their Commissioning Specialist has access to all of these and any other relevant documents during the tender and afterwards in the following construction phases.

2C-4 STANDARDS APPLICABLE

Works shall be completed in accordance with all applicable industry standards. Some of the most relevant standards associated with this section are scheduled below:

STANDARDS & GUIDES		
PUBLISHER	**STANDARD**	**SUBJECT**
BSRIA	AG16	Variable flow water systems
BSRIA	AG20	Commissioning of pipework systems – Design considerations
BSRIA	BG2	Commissioning water systems
BSRIA	BG8	Model commissioning plan
BSRIA	BG11	Commissioning job book - A framework for managing the commissioning process
BSRIA	BG25	HVAC Troubleshooting
BSRIA	BG29	Pre-commission cleaning of pipework systems
BSRIA	BG44	Seasonal commissioning
BSRIA	BG46	Domestic ventilation systems – A guidance for measuring airflow rates
BSRIA	BG49	Commissioning air systems

STANDARDS & GUIDES		
PUBLISHER	**STANDARD**	**SUBJECT**
BSRIA	BG63	Building Performance Evaluation in Non-Domestic Buildings
BSRIA	BG64	Building Performance Evaluation in Domestic Buildings
CIBSE	Commissioning Code A	Air distribution systems
CIBSE	Commissioning Code B	Boilers
CIBSE	Commissioning Code C	Automatic controls
CIBSE	Commissioning Code L	Lighting
CIBSE	Commissioning Code M	Management
CIBSE	Commissioning Code R	Refrigeration
CIBSE	Commissioning Code W	Water distribution systems
CIBSE	KS09	Commissioning variable flow pipework systems
CIBSE	TM31	Building Logbook toolkit
CSA	Guidance Note 2	Constant Flow Regulators
CSA	Guidance Note 3	Variable Volume Water Systems
CSA	Guidance Note 5	Site Safety for Commissioning Engineers
CSA	Guidance Note 8	Inverter Drives for Fans and Pumps
CSA	Guidance Note 12	De-aeration in Hot Water Service Systems
CSA	TM 1	Standard Specification for the Commissioning of Mechanical Engineering Services Installations for Buildings
CSA	TM 2	Guide to Trouble Shooting for Air Distribution Systems
CSA	TM 3	Test Sheets
CSA	TM 4	Design of Collection Hoods for Testing & Balancing
CSA	TM 5	Efficient Control of System Water Quality
CSA	TM 7	Commissioning of Steam Systems
CSA	TM 8	Trouble Shooting Refrigeration Equipment
CSA	TM 9	Water Treatment and the Commissioning Engineer
CSA	TM 10	Site Performance Testing of Heating & Cooling Coils
CSA	TM 11	Alternative Pipework System & Fixed Orifice Flow Measurement
CSA	TM 14	Pressurisation Units, Design, Operation & Maintenance
CSA	TM 15	The Theory of Balancing Water Distribution Systems
CSA	TM 18	PICVs Function and Commissioning
CSA	TM 19	Thermal Balancing of HWS and CWS

Where the above standards refer to supporting documentation and standards these shall be fully complied with in all respects.

Where discrepancy is found between this specification and the relevant standards, the Contractor shall obtain written clarification from the Engineer prior to submission of the tender. Where a discrepancy has not been clarified prior to tender submission, the Contractor shall include the most onerous requirements.

2C-5 SCOPE OF WORK

The Mechanical Contractor shall allow for a named, suitably qualified, Commissioning Specialist to undertake all commissioning work as detailed in this Specification and as follows:-

1) All management and advice activities during design, installation, pre-commissioning, commissioning and verification stages of the project. The management activities shall be compliant with the guidance given in the above 'Standards Applicable'. The commissioning activities shall be fully integrated into the construction process from the point of appointment of the Mechanical Contractor, right through to handover and beyond to fine tuning the building services during occupation. Appointing the Commissioning Specialist part way through the construction phase shall not be tolerated.
2) Early involvement in the project to advise on the commissionability of the building services design, whether that design is by the Engineer or the Mechanical Contractor and also advise on the time periods to carry this work so that it can be included in the overall construction programme. It is essential that this activity is undertaken in a timely manner to ensure that the systems can be commissioned satisfactorily without delay or additional cost.
3) Oversee all pre-commissioning activities carried out by the installers as prescribed in the aforementioned commissioning guides and as specified in this and other sections of the specification and drawings. This includes overseeing and verifying the commissioning activities of specialist plant items such as chillers, boilers, DX cooling systems, BMS, etc. which are often specialised in nature and are commissioned by the Manufacturer. The commissioning of specialist equipment, such as those aforementioned, especially where they integrate with the air and water distribution systems shall require careful consideration and integration within the commissioning plan. The Mechanical Contractor and the Commissioning Specialist shall agree any divisions of responsibility to fully appreciate their respective scopes of work.
4) All physical works involved in all commissioning activities including setting to work and dynamic proving in order to achieve the design intent. This includes returning to site for balancing and regulation adjustments during the maintenance period. Performance tests on heating and air conditioning systems shall be undertaken in peak weather conditions, irrespective of when completion takes place.
5) Demonstration to the Engineer a proportion of final system flow rates.
6) Provision of all seven formal stage gate reports.
7) Provision of all necessary documentation, including test records, commentary, diagrams and reports for O & M manuals.
8) Give notice to the Building Control Body or Local Authority declaring that a commissioning plan has been followed so that every system has been inspected and commissioned in an appropriate sequence and to a reasonable standard; and the results of the tests confirm that the performance is reasonably in accordance with actual building designs, including written commentaries where excursions are proposed to be accepted.

The Mechanical Contractor shall allow for all costs associated with the above and the foregoing being included within their tender price. It shall be noted that it is the Mechanical Contractor's responsibility to ensure that the Commissioning Specialist has viewed all tender documents and outline programme during tender stage to ensure that all necessary costs from their Commissioning Specialist have been included.

The Mechanical Contractor shall also include for all fees charged by the Nominated or other Insurance Companies for all supervision and examination at the manufacturers' works during construction of all pressure vessels and similar equipment and the witnessing of works tests in addition to site tests and the incidental work involved.

Two copies of all test certificates shall be supplied to the Commissioning Specialist.

2C-6 COMMISSIONING SPECIALIST

All commissioning works, except for equipment covered by 'Commissioning of Equipment by Manufacturers', listed at the end of this section, shall be commissioned by one of the following Commissioning Specialists. No other companies will be accepted for this work under any circumstances unless agreed in writing with the Engineer, any alternative commissioning specialists offered to the Engineer for consideration must be Members of Commissioning Specialists Association (CSA).

COMPANY NAME	TEL. NO.	EMAIL ADDRESS	LOCATED
Airtech Commissioning	01214154141	heather.underhill@airtechcom.co.uk	Birmingham
Airtech Premier	01252873723	accounts@airtechpremier.co.uk	Hook
Ashfords Environmental Services	01784465838	services@ashford-group.co.uk	Ashford
Building Services Commissioning	01522868190	info@bscLimiteduk.com	Lincoln
Cardiff Commissioning	02920521111	cardiffcomm@cix.co.uk	Cardiff
Central Commissioning (UK)	01827251379	enquiries@centralcommissioning.co.uk	Tamworth
Combat Commissioning Services	07887842915	cambatcommissioning@ymail.com	Sutton Coldfield
CML Commissioning Management	01206761911	mail@cml-group.co.uk	Colchester
Cross Count Limited	01279508204	enquiries@crosscount.com	Stansted
End Systems Limited	01942673229	enquiries@endsystems.co.uk	Leigh
H & V Commissioning Services	01563821991	talk2us@handv.co.uk	Ayrshire
Kebble Environmental Services	01279417 878	http://www.keslimited.co.uk	Harlow
Westwood Commissioning Services	07597326732	admin@westwoodcommissoningservices.com	Cannock

2C-7 COMMISSIONING MANAGEMENT

Unless specified otherwise, the Commissioning Specialist shall manage their own activities, establish clear lines of communication and be responsible for ensuring the commissioning is completed in accordance with this specification and the agreed programme. For some large or complex projects, it may be necessary for the Main or Principal Contractor to employ a CMO. Should this be necessary, then the Commissioning Specialist would be informed of this intention within the specific section of the specification under the heading "COMMISSIONING MANAGEMENT" or similar. The Commissioning Specialists shall allow for all associated costs and time required where Commissioning Management is proposed for the project.

2C-8 HEALTH & SAFETY

The Commissioning Specialist has a duty under the Construction Design and Management Regulations to review the commissioning plan and bring any safety matters to the attention of the Main Contractor. Any actions resulting from this Health and Safety review shall be confirmed and managed by the Main Contractor prior to any commissioning work being undertaken. The Commissioning Specialist shall be aware of the general risks associated with building services and be conversant with applicable legislation.

Reference shall be made to Health & Safety Legislation affecting Commissioning and the Safety sections contained within the relevant commissioning codes.

2C-9 WITNESSING AND VERIFICATION

Witnessing and verification of tests shall be required to enable confidence to be established for the commissioning results. Unless specified otherwise, the witnessing and verification shall be undertaken by one of the following depending on the particular project:

1) Where an additional Commissioning Specialist is employed for the role of Commissioning Management, all witnessing and verification of the complete system shall be carried out by the Commissioning Specialist and fully witnessed in its entirety by the Commissioning Manager.

2) Where a Clerk of Works is employed, all witnessing and verification of the complete system shall be carried out by the Commissioning Specialist and fully witnessed in its entirety by the Clerk of Works. Some of the simpler installations may only require a percentage of the systems to be witnessed by the Clerk of Works. The percentage of the system to be partially witnessed shall be agreed with both the Clerk of Works and Engineer prior to the commissioned systems being offered for witnessing and verification. At tender allow for all systems to be 100% witnessed.

3) Where neither of the above applies, the Commissioning Specialist shall also allow for a proportion of tests to be witnessed by the Engineer. The proportion of tests to be witnessed by the Engineer shall be 20%, though this could be reduced to 10% at the discretion of the Engineer on very large systems.

4) For all projects, the Engineer has the right to ask for a higher proportion of witnessing should the verification or witnessing exercise be unsuccessful. In this instance, the Mechanical Contractor shall bare all additional costs associated with this additional work.

5) For all projects, the Commissioning Specialist shall inform the Engineer of the verification programme who shall at their discretion, invite the Client representative.

6) For all projects, the Commissioning Specialist shall obtain counter signatures on all commissioning sheets to obtain certification that the results are within tolerance. No re-writing of test sheets shall be permitted following witnessing by the Commissioning Manager, Clerk of Works or Engineer.

7) For all projects, the commissioning specialist shall witness and verify 100% BMS and controls hardware and software function, integration and performance.

2C-10 TESTING AND PRE-COMMISSIONING

The Mechanical Contractor shall define and agree with the Engineer the responsibility for testing and pre-commissioning activities, i.e. whether the installer or the Commissioning Specialist is undertaking the activities. In some cases, the installer would undertake these activities and in this case, the Commissioning Specialist shall adopt an overseeing role to ensure the test results are satisfactory and all the pre-commissioning checks have been undertaken, documented and any remedial activities are undertaken to the satisfaction of the Engineer. Reference shall be made to all other sections of this specification, 'Standards Applicable' documents and the drawings to fully understand the scope of the overseeing role.

2C-11 COMPLIANCE WITH PART L OF THE BUILDING REGULATIONS

Part L of the Building Regulations is concerned with the conservation of fuel and power. All works approved under Part L of the Building Regulations shall be commissioned in accordance with the design intent. This applies to heating, ventilation, cooling / refrigeration, lighting, controls and hot & cold water systems. The Commissioning Specialist shall ensure that they are conversant with these Regulations, supporting Second Tier documents, and in particular the criterion that deals with the commissioning of the building services. The Commissioning Specialist shall ensure that they follow the guidance given in the approved procedure. They shall also provide a written notice to the Building Control Body that shall include a declaration confirming that:-

1) The commissioning plan has been followed so that every system has been inspected and commissioned in an appropriate sequence and to a reasonable standard.

2) The results of tests confirm that the performance is sufficiently in accordance with the actual building designs, including written commentaries where excursions are proposed for acceptance.

2C-12 BUILDING LOG BOOK

A Building Logbook is required under Part L of the Building Regulations to ensure that the building uses no more power than is reasonable. The Main Contractor shall be responsible for the compilation and timely issue of this document to the building owner/ Client to enable them to manage the building's energy from the date of practical completion.

The Commissioning Specialist shall be responsible for the preparation, completion and timely handover of key elements of this document to the Mechanical Contractor. These include but are not limited to:-

1) Commissioning, handover and compliance

2) Metering, monitoring and targeting strategy

3) Building energy performance records

4) Relevant compliance and test certificates

It is essential that the Commissioning Specialist is conversant with the standard logbook template so they can provide the right level of information in the correct standard format and in a timely manner.

The Mechanical Contractor shall coordinate and obtain all other information necessary to complete the mechanical and electrical elements of the logbook. This includes but is not limited to obtaining information from the Engineer / Design Team, Electrical Contractor and Builder or Main Contractor. This must be programmed in and completed in advance of practical completion.

The logbook shall follow the standard format described within CIBSE TM31 and the guidance from the Carbon Trust which is illustrated within a CD as part of TM31. All information supplied to be incorporated within the logbook shall be provided both electronically and in hard copy.

The logbook shall make reference to other documents such as the O&M manual and the Health & Safety File. The completed logbook shall be issued in hard and electronic versions so that as a living document, it can be amended easily at a later date should it be required. It must be issued to the Main Contractor and Engineer for approval at least 2 weeks before practical completion.

2C-13 COMMISSIONING PROGRAMME

The Commissioning Specialist shall produce a detailed commissioning programme, which shall be fully integrated into the main contract construction programme. The commissioning programme shall be developed at the same time as the installation programme to ensure that the requirements for commissioning are incorporated in the construction activities.

The commissioning programme shall be broken down into individual services including sub-contract works and shall include but not be limited to the following tasks:

1) Review design drawings and specifications for commissioning requirements (commission-ability).
2) Review installation drawings and technical submissions for commissioning requirements.
3) Review the installation for compliance with specifications and drawings intent for commissioning.
4) Produce detailed commissioning method statements.
5) Testing and pre-commissioning.
6) Off-site testing of plant items.
7) Pipework system cleaning and dosing.
8) Pressure testing of ductwork where applicable.
9) Setting to work of plant systems and commissioning and performance testing.
10) Open system scans.
11) Demonstration of flow rates to the Verification Specialist and Engineer.
12) Soak tests.
13) Prepare testing and commissioning reports.
14) Statutory demonstrations of life safety systems, to building end user and statutory authorities.
15) Prepare and complete the relevant sections of the building logbook.
16) Prepare final record documentation.
17) Prepare and submit the commissioning completeness notice to Building Control.
18) Training and awareness sessions with the building owner/ user.

The commissioning activities shall be fully co-ordinated within the programme by the Commissioning Specialist. The Commissioning Specialist shall indicate the resourcing requirements within the programme tasks. The programme shall show critical activities and milestones to enable focus to be maintained on these items in order to minimise the risk of delay. The commissioning programme shall be submitted to the Engineer no later than 6 weeks after the date of contract commencement, for approval. The dates involved shall be kept within the periods originally computed for testing and subsequently inserted as part of the 'Programme of Works'. Following completion and approval of this programme, the Commissioning Specialist shall review the programme in relation to the construction progress at the regular site attendance meetings. The testing shall proceed on the dates given but not less than 14 days following the notification to the Engineers of the state of readiness.

All Specialist Sub-Contractors and Specialist Suppliers to the Mechanical Contractor must note that they shall attend promptly on the times and dates stated. Failure to do so will result in the schedule being extended and any parties failing to attend shall be responsible for reimbursing the other parties involved for loss of time.

Notification of the testing programme commencement shall not be less than 14 days and no cancellations will be allowed.

2C-14 DESIGN FAMILIARISATION

Immediately following appointment and prior to works commencing on site, the Commissioning Specialist shall:-

1) Inspect the design drawings and this Specification in order to fully familiarise themselves with all the engineering services to be commissioned.
2) Be fully satisfied that all necessary provision has been made for commissioning of the services including items such as volume control dampers, commissioning stations and pressure stabilising valves, etc.
3) The Commissioning Specialist shall issue a report to the Engineer to include:-
    a) The details of any additional items that the Commissioning Specialist considers shall be included.
    b) Any further information needed to complete the installation.
    c) Detailed testing and commissioning program for the works.

2C-15 CONTRACTORS WORKING DRAWINGS

The Commissioning Specialist review the contractors working drawings as they are produced to ensure system is commissionable reviews to include:

1) Provision of sufficient measurement / regulation devices.
2) Location of regulation and measurement devices in terms of sufficient straight lengths for accurate readings.
3) Confirm flow rate through each device is within the accurate measuring range of said device.
4) Location of test points / test holes.
5) Location of BMS sensors where relevant (i.e. pressure transducers located correctly to achieve good readings).
6) Accessibility to regulation and control devices without obstruction from other services, structure or ceiling / boxing.
7) Adequate provision of access hatches in terms of size & location.

2C-16 SITE MEETINGS TO BE INITIATED

The Commissioning Specialist shall be required to attend monthly meetings from Contract Commencement to report on all stages of the commissioning, from initial planning / programming through to contract completion.

Two weeks prior to the first pre-commissioning activity, the Commissioning Specialist shall be required to commence attending weekly commissioning meetings, to report on the status of the commissioning, through to contract completion. The frequency of these meetings will be determined by the Engineer but the Contractor shall allow for weekly attendance.

The meetings shall be chaired by the Commissioning Specialist and the Mechanical Contractor shall attend with all their major Sub-Contractors.

The Engineer will not be present at any of these meetings but shall receive minutes of the same issued by the Commissioning Specialist.

2C-17 REVIEW SITE VISITS

During the installation of the contract works the Commissioning Specialist and the Mechanical Contractor shall visit site on a minimum basis of every two weeks to monitor the commission-ability of every aspect of the services in this Specification.

This shall include ensuring that all commissioning stations are installed in accordance with the manufacturer's instructions and all other items are installed in accordance with the approved working drawings and are fully accessible.

Any aspect of non-compliance with the above shall be reported in writing to the Mechanical Contractor who shall carry out the necessary remedial work. Copies of all reports shall be issued to the Engineer.

During the site visits, the Commissioning Specialist shall carry out an audit of static testing of services to ensure that this work is being carried out satisfactorily. A written log of all static tests audited shall be kept for inspection by the Engineer.

As a part of the on-site inspections, the Commissioning Specialist shall ascertain that all aspects of the services can be fully maintained after handover. A report shall be issued to the Mechanical Contractor detailing any item that cannot be fully maintained and a copy of the report shall be issued to the Engineer.

2C-18 COMMISSIONING RECORDS & TEST SHEETS

The Commissioning Specialist shall ensure that accurate records are taken for all checks and measurements undertaken within the commissioning scope of works. The records shall be completed at the time of undertaking the commissioning activity and shall include any additional commentary that will support the understanding of the results, either later in the commissioning programme or in the future after the building has been in operation for some time. It is essential that this anecdotal information is included as it will help future fine tuning of the services and enable informed decisions to be made during building modifications and improvements.

Standard commissioning pro forma checklists shall be used to record the results. These shall be based on the criteria and templates in the relevant BSRIA Guides listed earlier in this specification. The Commissioning Specialist shall issue the proposed pro forma to the Engineer for approval prior to undertaking any testing. The completion of these pro forma shall be completed only once (i.e. not subsequently transcribed by typing since this can lead to errors being introduced).

The design of the pro forma shall be well thought out in order to:-

1) Aid the efficient execution of the commissioning tasks.
2) Help the control of quality and progress of the commissioning tasks.
3) Provide a convenient means of comparing test results within design values.
4) Serve as a permanent record of commissioning data to be included in the project's operating and maintenance manual.

2C-19 FORMAL STAGE GATE REPORTS

The Commissioning Specialist shall produce formal written reports at the following seven Stage Gates.

Progression from one commissioning stage to the next shall only be allowed following the successful completion and sign off of the preceding stage. Completion of a stage shall be formalised by a Stage Gate Report, produced and signed by the Commissioning Specialist, with counter signatures by the Mechanical Contractor and the Engineer. The stage gate shall not be considered 'closed' until the signed off report is issued and duly accepted by the client and their design team.

STAGE REPORTS		
STAGE	**OVERVIEW**	**DETAILED REQUIREMENT INCLUDED IN REPORTS**
1	Pre-construction-design is commissionable	• Review mechanical services design and scope of commissioning, provide cost & programme advice. • Review design for commissioning requirements & feedback any comments. • Confirm comments and recommendations are incorporated into the design. • Sign off and issue report (Design Information Checklist) to confirm system is commissionable.
2	Installation is acceptable	• Production, review and support development of detailed commissioning programme. • Production of commissioning method statements and pro forma's for pre-commissioning, setting to work and balancing / regulation. • Review and support production of detailed method statements. • Undertake regular progress inspections (on & off site) to ensure compliance with design, commissionability & manufacturer's installation requirements and ensure defects are rectified prior to setting to work and commissioning. • Review and comment on progress inspections. • Undertake pressure & leakage testing in a phased approach as the installation progresses and rectify defects. Undertake whole system

STAGE REPORTS		
STAGE	**OVERVIEW**	**DETAILED REQUIREMENT INCLUDED IN REPORTS**
		pressure & leakage tests immediately after completion. Issue test sheets for approval. • Review and comment on records/reports. • Confirm any defects rectified to allow final inspection checklist to be signed off. • Undertake a final inspection of all systems in the mechanical specification using pre agreed pro forma checklist. • Comment on any systems and components that are not ready for pre-commissioning & follow up with mechanical contractor. • Issue report to confirm final inspection is satisfactory and systems are ready for pre-commissioning. • Sign off completed system inspection checklist report.
3	Pre Commissioning	• Confirm fill, vent, pressure test, flush, clean, chemical clean and provide water treatment to water distribution systems. • Undertake pre-commissioning activities of all systems in the specification using pre-agreed pro forma checklist. • Comment on any systems and components that are not ready for pre-commissioning and follow up with mechanical contractor to resolve. • Confirm any defects are rectified to allow pre-commissioning checklist to be signed off. • Issue report to confirm pre-commissioning inspection is satisfactory and systems are ready for commissioning. • Sign off pre-commissioning inspection report.
4	Final coordination of all commissioning reports	• Production of report / checklist identifying all relevant steps have been completed prior to setting to work of plant and equipment. Report to include will include but not be limited to the following: ✓ Essential design information. ✓ Manufacturer's essential data. ✓ Manufacturer's offsite tests. ✓ Pressure / leakage tests. ✓ Continuous installation inspections. ✓ Final installation inspections. ✓ System cleanliness inspections. ✓ Pre-commissioning inspections. ✓ Setting to work of fans, boilers, refrigeration plant, pressurisation units, Automatic Controls, pumps, chillers, CHP, natural vent, air compressors etc. ✓ BMS point to point checks. ✓ Life Safety Systems 100% point to point check. ✓ Possession of compliance documents and certificates for pressure systems regulations and F gas regulations. ✓ Sign off completed report for above.
5	Setting to work and open system scans	• Initial start-up of all plant and equipment. • Provision of specialist plant & equipment support as required to ensure effective operation. • Attendance at start up and subsequently operate all plant & equipment during the commissioning process. • Advise Mechanical Contractor of any Irregularities. • Produce setting to work checklist and issue to Mechanical Contractor and Engineer for comment and sign off. • Check plant performance for pumps, fans etc. and document on pro formas.

STAGE REPORTS		
STAGE	**OVERVIEW**	**DETAILED REQUIREMENT INCLUDED IN REPORTS**
		• Undertake a preliminary flow rate check (open system scan) with all regulating devices fully open prior to regulation. • Investigate and rectify any defects causing low flow rate conditions. • Sign off report.
6	Regulation and balancing – System commissioned	• Confirm any problems with plant & equipment rectified. • Regulate and balance systems to achieve design volumetric flow rates within specified tolerances. • Prepare & compile all final documentation including:- ✓ Part L commissioning compliance notification. ✓ Documentation required for the building logbook. ✓ All test sheets. ✓ All Formal Stage Gate Reports. ✓ Documents for the O&M manuals. ✓ Liaise with Fire Advisor, Building Control and other authorities for witnessing and sign off. • Review documentation for completeness, include in O&M manuals and help facilitate the engagement of statutory authorities. • Issue signed off report.
7	Operation and demonstration	• Undertake system soak tests for at least seven consecutive days. • Monitor soak tests and provide commissioning input to resolve irregularities if required. • Provision of labour and specialist equipment support, to enable demonstrations to be completed. • Witness Demonstrations. • Operate and demonstrate the commissioned systems to the engineer and client representative. • Demonstrate the effective operation of all life safety systems to the engineer and client representative. • Issue signed off report complete with satisfactory soak test results and witnessed demonstration sheets.

Each report shall have an executive summary indicating whether the system is compliant or not at that point and if not what follow up action is required.

Pro forma checklists as described above shall be appended to the report to record all the checks and comments made. The reports shall be issued to the Engineer and the Mechanical Contractor at the earliest opportunity for their comment.

2C-20 CALIBRATION OF INSTRUMENTS

The successful Commissioning Specialist must ensure that the instruments used have been correctly calibrated and produce documentation to this effect. Calibration must be carried out against laboratory standards which are either traceable to National Standards or have been derived by approved ratio techniques.

The calibration certificates shall include the following details:

1) Name of Calibration Laboratory.
2) Name of Equipment Manufacturer.
3) Equipment Model.
4) Serial Number of Equipment Being Calibrated.
5) Date of Manufacturer.
6) Date of Calibration.
7) Period of Validity of Calibration i.e. date for next re-calibration.

8) Deviation table where applicable.

If the Engineer has any doubt about the accuracy of any instrument, the Commissioning Specialist must have the instrument re-calibrated by a recognised Specialist.

A current calibration certificate shall be provided for all instruments used during the commissioning. The certificate must cover the duration for which the instrument is used.

Copies of these calibration certificates for all commissioning equipment used for each commissioned system shall be provided appended to relevant the commissioning sheets.

2C-21 METHOD STATEMENTS

The Commissioning Specialist and the Mechanical Contractor shall be responsible for compiling detailed commissioning method statements for all systems detailed in this Specification, this shall include obtaining method statements from all Commissioning Specialists and all suppliers of plant and equipment being installed on this contract, and amalgamating them into an overall method statement to provide a fully co-ordinated document for each service (including controls).

The document shall be sectionalised for each system to clearly indicate the work that will be carried out for pre-commissioning, commissioning and performance testing.

2C-22 INSPECTION OF MATERIALS

The Engineer shall be entitled at all reasonable times during the manufacture, to inspect, examine and test the materials and quality of installation of all plant to be supplied under this Specification and if part of the said plant is being manufactured on other premises, the Mechanical Contractor shall obtain permission to inspect, examine and test as if the said plant were being manufactured on the Mechanical Contractor's premises.

Such inspection, examination or testing if made shall not absolve the Mechanical Contractor or release them from any obligation under this Specification.

Written notice shall be given to the Engineer of the date and the place any plant will be ready for testing. Notification of the test shall not be less than 14 days. The Engineer shall give a minimum 24 hour notice in writing of their intention to attend the tests. Such tests shall however, normally be attended solely by the Mechanical Contractor and their Commissioning Specialist, the Mechanical Contractor shall forward to the Engineer a report of the test and the test readings.

Where the Specification requires for tests at outside premises, the Mechanical Contractor, except where otherwise specified, shall provide free of charge, such assistance, labour, materials, electricity, fuel, stores, oils and grease specified by the manufacturers, apparatus and instruments as may be required and as may be reasonable to carry out such tests efficiently.

If after inspecting, examining, or testing the plant, the Engineer decide that such plant or any part thereof is defective and not in accordance with the Specification, they may reject the said plant or any part thereof by giving, within reasonable time, notice in writing of such rejection stating therein the ground upon which the said decision is based. Normally the Commissioning Specialist shall filter out and resolve such problems without recourse to ask for advice from the Engineer.

At the commissioning and practical completion time of the Contract, all moving parts shall be adjusted and lubricated in accordance with the manufacturers' instructions, including the filling of oil wells, greasing of bearings, adjustment of belts, alignment of couplings, etc.

2C-23 FLUSHING AND CHEMICAL CLEANING

The Commissioning Specialist shall be responsible for ensuring that all pipework is flushed and chemically cleaned by others as detailed elsewhere in this Specification. The Commissioning Specialist shall supervise the flushing and cleaning of all services and be satisfied that all work is being carried out in accordance with the relevant governing documents and the 'Standards Applicable' listed in this Specification. The Commissioning Specialist shall issue a report to the Mechanical Contractor detailing any non-compliance with the above and a copy of the report shall be issued to the Engineer.

2C-24 TOLERANCES

All systems shall be regulated to tolerance bands to ensure that they meet the design intent.

Systems shall be commissioned in accordance with the tolerances detailed in the following table, except where more stringent requirements are detailed in the specific sections of this specification / drawings.

Where a tolerance is not defined in the Tender documents the levels within the CIBSE commissioning codes shall be used for tender and confirmed with the Engineer before commencing work.

Should the Commissioning Specialist be unclear of the performance effect (whether Low, Medium, High) of the systems within this specification then they shall seek advice from the Engineer.

The Commissioning Specialist shall consult the Engineer about acceptable tolerances for special process applications prior to the completion of the Mechanical Contractor's working drawings.

For a proportional balance to be achieved on water systems, the upper and lower tolerance levels shall not be exceeded. The index leg shall not be less than the minimum value and the remainder of the proportional balance shall be achieved within the overall tolerance and should aggregate to at least 100%.

The following table shows permissible tolerances for the most common applications for water and air systems. The Commissioning Codes W & A shall be referred to for all other applications. This table is to be read along with the associated notes and conditions of use within those Codes.

COMMISSIONING TOLERANCES		
COMPONENT DESCRIPTION		**FLOW RATE TOLERANCE (% DESIGN)**
LTHW heating systems Performance effect - MEDIUM	Terminal units where flow rate <0.1 l/s (e.g. radiators & FCUs)	90 – 110%
	AHU coils where flow rate >0.1 l/s	92.5 – 107.5%
	Branches	92.5 – 107.5%
	Mains	100 – 110%
Chilled water systems Performance effect - MEDIUM	Terminal units where flow rate <0.1 l/s (e.g. FCUs & chilled beams)	95 – 105%
	AHU coils where flow rate >0.1 l/s	100 – 110%
	Branches	100 – 110%
	Mains	100 – 110%
Close Control Chilled water systems Performance effect - HIGH	Terminal units where flow rate <0.1 l/s (e.g. FCUs & chilled beams)	95 – 105%
	AHU coils where flow rate >0.1 l/s	100 – 110%
	Branches	100 – 110%
Air flow for general mechanical ventilation systems Performance effect - LOW	Terminals	95 – 110%
	Branches	95 – 110%
	Main Duct	95 – 110%
Air flow for peak temperature limiting and air conditioning systems Performance effect - MEDIUM	Terminals	100 – 110%
	Branches	100 – 110%
	Main Duct	100 – 110%
Air flow for close control systems, safety related systems and fume exhaust systems Performance effect - HIGH	Terminals	100 – 105%
	Branches	100 – 105%
	Main Duct	100 – 105%

2C-25 PRESSURE TESTING

The Mechanical Contractor and their Specialist Sub-Contractors shall undertake hydraulic and / or pneumatic pressure testing of pipework in accordance with the relevant 'Standards Applicable' and this Specification. The Commissioning Specialist shall review the testing method, check instrument calibration, witness the test and counter sign the test certificates. The Commissioning Specialist shall inform the Mechanical Contractor and the Engineer of any test failures. Following a test failure, they shall monitor the progress of any remedial work and the subsequent pressure tests until a satisfactory result is achieved.

2C-26 COMMISSIONING OF EQUIPMENT BY MANUFACTURERS

Specialist plant and equipment shall be inspected / commissioned by the manufacturer's competent person and a full commissioning report provided and included in the O&M documentation. The manufacturer shall commission the following:

1) All variable speed pumps
2) Air handling units
3) Chillers
4) Boilers
5) CHP plant
6) Biomass boiler package including fuel storage and conveying systems
7) Gas fired radiant heating
8) Booster sets
9) Water treatment plant
10) Packaged domestic hot water generators
11) Refrigeration systems and heat pumps
12) Compressed air plant
13) Automatic controls and BMS
14) Energy metering by specialist or BMS as detailed in particular sections

The Commissioning Specialist shall include the commissioning period of all specialist plant and equipment within their plan and ensure that the coordination and timing of these activities fits in with the main commissioning programme and ultimately the construction programme. The Commissioning Specialist shall obtain the commissioning report and verify that all the checks have been completed and signed off with the system being safe prior to setting them to work as part of the overall building services systems.

The Mechanical Contractor shall inform the Commissioning Specialist of the divisions of responsibility between specialist plant manufacturers and the Commissioning Specialist when it comes to commissioning that plant.

2C-27 OPEN SYSTEM SCAN

An open system scan shall be undertaken prior to the regulation and balancing of all air and water distribution systems. The results shall be recorded and any irregularities rectified prior to adjusting dampers, regulating valves, fan and pump duties. Under no circumstances shall dampers or valves be regulated to rectify any significant under or over volumetric readings.

2C-28 DOCUMENTATION FOR OPERATING AND MAINTENANCE MANUALS

The Commissioning Specialist shall be responsible for providing the documentation listed below for inclusion in the operating and maintenance documentation:-

1) Fully signed original and copies of all commissioning records and test sheets as detailed earlier in this Specification (hard copy and PDF).
2) Details of any amendments to the installed plant and equipment (e.g. changes to belt and pulley sizes).
3) Details of any off site test sheets as detailed earlier in this Specification.
4) The Commissioning Specialist shall be responsible for programming the progress of compilation of record drawings and manuals and shall ensure these are completed in their entirety PRIOR to handover and Practical Completion.

2C-29 LIAISON WITH STATUTORY AUTHORITIES

The Commissioning Specialist shall arrange all necessary liaison with the statutory authorities as appropriate. This shall include but not be limited to the Building Control Officer and the Fire Advisor. The statutory authorities shall carry out all the required witnessing of the completed systems prior to their handover to the Client.

Section 2E

Electrical Installation Quality & Materials

Contents

2E-1 GENERAL DESCRIPTION

This section details the general electrical installation quality and materials requirements and shall be read in conjunction with all other sections of this specification. All electrical installation works shall be undertaken in strict accordance with the clauses detailed herein and the latest version of all applicable standards and guidance.

This section also sets default requirements for methods and/or materials where several alternatives exist. These default requirements shall be followed unless there is explicit instruction to the contrary in a subsequent section dealing with the relevant system in more detail. Where such instruction is unclear or only inferred, written clarification via the Contract Administrator shall be obtained prior to submission of tender costs and in the absence of such the more onerous requirements shall be included.

Throughout this specification references are made to the requirements and recommendations detailed within several statutory and non-statutory standards / documents. It shall be noted the information presented herein is in no way intended to replace the detailed information provided within these documents which must be fully adhered to where applicable.

2E-2 DEFINITIONS

Please refer to the definitions, symbols and abbreviations as detailed within Part 2 of BS 7671 – IET Wiring Regulations – Requirements for Electrical Installations and the following: -

ABBREVIATION / MEANING			
ACB	Air circuit breaker	AFDD	Arc fault detection device
BBC	Backbone bonding conductor	BN	Bonding network
BRC	Bonding ring conductor	CBN	Common bonding network
CPC	Circuit protective conductor	DB	Distribution board
DCL	Device for connecting a luminaire	DNO	Distribution network operator
EBB / ERB	Equipotential bonding busbar / Earth reference bar	ELV	Extra-low voltage
EMC	Electromagnetic compatibility	EMI	Electromagnetic interference
EPO	Emergency power off	EVCS	Emergency voice communication system (Disabled refuge system)
FELV	Functional extra-level voltage	FFE	Furniture, fixtures and equipment
HV	High voltage	LSC	Luminaire supporting coupler
ICT	Information communication technology	IK	Impact protection code
IMD	Insulation monitoring device	IP	Ingress protection code
IPS	Medical isolated power supply system	IT	Information technology
LPZ	Lightning protection zone	LV	Low voltage
MCB	Miniature circuit breaker	MCCB	Moulded case circuit breaker
MSDB	Multi service distribution board	MET	Main earthing terminal
PBB	Primary bonding busbar	PE	Protective conductor
PELV	Protective extra-low voltage	PEN	Protective and neutral conductor (combined)
PME	Protective multiple earthing	PV	Photovoltaic

ABBREVIATION / MEANING			
RBB	Rack bonding busbar	RCBO	Residual current circuit-breaker with integral overcurrent protection
RCCB	Residual current circuit-breaker without integral overcurrent protection	RCD	Residual current device (RCCB or RCBO)
RCM	Residual current monitor	SBB	Secondary bonding busbar
SELV	Separated extra-low voltage	SMDB	Sub-Main Distribution Board
SPD	Surge protective device	TBB	Telecommunications bonding backbone
TBC	Telecommunications bonding conductor	UBC	Unit bonding conductor
UPS	Uninterruptible power supply system	VoIP	Voice over internet protocol

It shall be noted the above abbreviation list is not exhaustive and all other definitions, symbols and abbreviations used within this specification shall be defined upon occurrence.

2E-3 STANDARDS APPLICABLE

Works shall be completed in accordance with all applicable industry standards. Some of the most relevant standards associated with this section are scheduled below: -

STANDARDS & DOCUMENTS	
BS 7671	IET Wiring Regulations, including On-Site Guide, Guidance Notes 1-8 and all Codes of Practice
All Statutory Regulations (and Associated Memorandum) detailed within Appendix 2 of BS 7671 – IET Wiring Regulations	
All British Standards detailed within Appendix 1 of BS 7671 – IET Wiring Regulations	
All current and relevant British Standards, as referenced throughout this specification	
For healthcare projects all current and relevant Health Technical Memoranda (HTM's) and Health Building Notes (HBN's)	
All current and relevant Energy Networks Association / ESI publications e.g. Technical Specifications (ENATS), Engineering Recommendations (ER) and Engineering Technical Reports (ETR)	
For Education projects, all current and relevant Building Bulletins by the DfES and other government agencies	
All current and relevant CIBSE (Chartered Institution of Building Service Engineers) guides and supporting documentation	
NJUG National Joint Utilities Group – NJUG Guidelines – Volumes 1 to 6	
The Construction Products Regulation	

Where the above standards refer to supporting documentation and standards these shall be fully complied with in all respects.

Any discrepancies between this specification and the relevant standards shall be referred to Engineer via the Contract Administrator for clarification prior to submission of the tender and in the absence of this clarification the Contractor shall include the most onerous requirements.

2E-4 STATUTORY REGULATIONS & BS 7671 IET WIRING REGULATIONS

All electrical installation quality and materials shall be selected, manufactured, installed, inspected and tested in accordance with the latest version of BS 7671 IET Wiring Regulations in addition to any statutory regulations.

2E-5 ELECTRICAL CONTRACTING CERTIFICATION SCHEMES

The Contractor shall undertake all works in accordance with industry best practice and must be registered with an appropriate certification scheme for the electrical installation works being undertaken which provides a six-year guarantee on completion of the works to rectify any non-compliance with the Building Regulations and BS 7671 IET Wiring Regulations.

This shall be the NICEIC / ELECSA – Platinum Promise registration scheme, or equivalent.

2E-6 THE CONSTRUCTION PRODUCTS REGULATION (CPR)

The Contractor shall ensure all electrical installation construction products are suitably certified for their intended use, UKCA marked in strict accordance with the latest requirements of The Construction Products Regulation and accompanied by a declaration of performance (DoP).

All cabling and equipment shall be covered by a British or Harmonized Standard.

All fixed wiring power, control and communication cables shall satisfy the requirements of the Construction Products Regulation in respect of their reaction to fire by being provided in strict accordance with their respective British and Harmonized Standards.

2E-7 ACCESSIBILITY & MAINTAINABILITY

Access and maintainability of electrical equipment shall be provided in accordance with the standards listed, and as follows: -

1) Adequate space shall be provided for the initial installation and for its potential replacement at a later date.
2) All equipment shall be installed such that it is accessible for operation, inspection, testing, maintenance and repair.
3) To prevent access by ordinary persons (as defined in BS 7671), equipment shall be located behind lockable doors / covers, or shall only be accessible by the use of a tool.
4) Equipment shall be suitably labelled, and adequate signage provided in accordance with BS 7671 and this specification.
5) Operating instructions shall be provided adjacent to all items of equipment where their function is not obvious.
6) Where items of equipment have removable lids, covers etc., it shall be possible to reinstate these to their original state without damaging cabling or equipment.
7) Access and adequate working space shall be provided to all wiring systems and items of equipment to facilitate maintenance or adaptation. This includes every electrical connection and joint, except for:
    a) Joints designed to be buried in the ground.
    b) Compound filled or encapsulated joints.
    c) Connections between a cold tail and the heating system e.g. ceiling / floor heating or trace heating system.
    d) Joints or connections made in equipment by a manufacturer where access is not required.
    e) Equipment complying with BS 5733, suitably marked as a maintenance free accessory and installed in strict accordance with the manufacturer's recommendations.
8) Suitable access arrangements shall be made for all equipment concealed within roof spaces, ceiling / floor voids and other non-accessible locations e.g. openable or removable access hatches / traps etc.
9) All switchgear and distribution equipment shall be located so that it can be operated and maintained safely.

2E-8 PROTECTION AGAINST ELECTRIC SHOCK

Protective measures shall be provided by the following: -

1) Basic protection – Protection against electric shock under fault-free conditions.
2) Fault protection – Protection against electric shock under single fault conditions.

Suitable provisions shall be made in the installation where danger or damage is expected to arise due to an interruption of supply.

Additional protection (e.g. RCD's and supplementary protective equipotential bonding) shall be provided as detailed. Type AC RCD's shall only be used to serve fixed equipment, where it is known that the load current contains no DC components.

The following protective measures are permitted:

1) Automatic disconnection of supply e.g. protective earthing, protective equipotential bonding, protective devices etc.
2) Double or reinforced insulation e.g. Class II equipment.
3) Electrical separation e.g. safety isolating transformer used to supply equipment (shaver socket).
4) Extra-low voltage (SELV and PELV) e.g. ELV lighting in a special location.

Automatic disconnection of supply shall be the primary protective measure. The other forms of protective measure (items 2 to 4 above) shall be provided if required e.g. within special locations.

The following protective measures, for application only where the installation is controlled or under supervision of skilled or instructed persons, are not permitted by this specification: -

1) Obstacles.
2) Placing out of reach.
3) Non-conducting locations.
4) Protection by earth-free local equipotential bonding.
5) Electrical separation for the supply to more than one item of current-using equipment.

2E-8-1 AUTOMATIC DISCONNECTION OF SUPPLY

This protective measure shall provide both Basic and Fault protection: -

BASIC PROTECTION

This shall be provided by: -

1) Basic insulation of live parts.
2) Barriers and/or enclosures.

Insulation shall completely cover live parts, be suitable for its environment and shall only be removable by destruction. It shall be capable of withstanding the electrical, mechanical, chemical and thermal stresses that it may be subjected to during service.

The insulation to electrical equipment shall comply with the relevant standard(s) for that item of equipment. Basic insulation of live parts shall not be provided by paint, varnish, lacquer or similar products.

Barriers and/or enclosures shall: -

1) Be provided to prevent contact with live parts.
2) Provide at least the degree of protection IPXXB or IP2X.
3) Provide at least the degree of protection IPXXD or IP4X to horizontal or top surfaces which are readily assessible.
4) Be suitable for the environment in which they are installed.

The removal of barriers, opening of enclosures etc. shall only be possible by:

1) The use of a key or tool, or
2) After disconnection of the supply to all internal live parts.

Any item made accessible that may retain a dangerous electrical charge shall be suitably labelled.

FAULT PROTECTION

This shall be provided by: -

1) Protective earthing.
2) Protective equipotential bonding.
3) Automatic disconnection in case of a fault.

When an earth fault occurs the impedance of the fault path shall be low enough to cause sufficient current to operate the circuit protective device within the required disconnection times given in BS 7671 without reliance on the operation of RCDs.

ADDITIONAL PROTECTION

Additional protection shall be provided when there is an increased risk of electric shock and shall include: -

1) Residual current devices (RCD's, RCCB's and RCBO's).
2) Supplementary protective equipotential bonding.

Additional protection shall: -

1) Not be used as a sole means of protection against electric shock.
2) Be provided by RCDs with operating current IΔn not exceeding 30mA and for non-delay type RCDs an operating time not exceeding 300ms.

This additional protection shall be provided: -

1) For socket-outlets with a rated current not exceeding 32A.-

   Note: A lighting distribution unit complying with BS 5733, shaver supply unit complying with BS EN 61558-2-5, luminaire track system, installation coupler, LSC or DCL is not regarded as a socket-outlet with regards to this requirement.
2) For mobile equipment with a current rating not exceeding 32A for use outdoors.
3) Within (household) premises, AC final circuits supplying luminaires.
4) For all LV final circuits: -
   a) Serving a location containing a bath or shower.
   b) Passing though zones 1 and/or 2 of a location containing a bath or shower.
5) For external lighting LV final circuits to bike stores, telephone kiosks, bus shelters, advertising panels and town plans.
6) Where additional protection is required within special locations as required by Part 7 of BS 7671.

Residual current device (RCD's, RCCB's and RCBO's) protection shall be provided to all socket-outlets.

Additional protection shall also be provided to special locations as required by Part 7 of BS 7671 using supplementary protective equipotential bonding conductors between simultaneous accessible exposed-conductive-parts and extraneous-conductive parts.

2E-9 PROTECTION AGAINST THERMAL EFFECTS

Arc fault detection devices (AFDD) conforming to BS EN 62606 shall be provided for single-phase AC final circuits supplying socket-outlets with a rated current not exceeding 32A in: -

1) Higher Risk Residential Buildings (HRRB).
2) Houses in Multiple Occupation (HMO).
3) Purpose-built student accommodation.
4) Care homes.

Note: HRRBs are assumed to be residential buildings over 18m in height or in excess of six storeys, whichever is met first. Building Control / Fire Advisor shall confirm the definition of the building(s).

For all other buildings, AFDDs conforming to BS EN 62606 shall be provided for single-phase AC final circuits supplying socket-outlets not exceeding 32A, unless there is explicit instruction to the contrary in a subsequent section of this specification.

AFDD's shall be installed: -

1) At the origin of the final circuits to be protected, and
2) In AC single-phase circuits not exceeding 230V.

Note: For busbar systems to BS EN 61439-6 and powertrack systems to BS EN 61534, AFDDs may be placed at the equipment location.

The use of AFDDs does not obviate the need for other protective measures. AFDD's shall be co-ordinated with overcurrent / residual current protective devices and installed in strict accordance with manufacturers' literature.

2E-10 PROTECTION AGAINST IMPACT – CONCEALED CABLING

LV final circuit cabling concealed within the building fabric / structure shall have the following protection against impact:-

<table>
<tr><th>CABLE TYPE AND CABLE SUPPORT / CONTAINMENT</th><th>CABLES UNDER FLOORS OF ABOVE CEILINGS</th><th>CABLES CONCEALED IN A WALL OR PARTITION AT A DEPTH OF LESS THAN 50mm</th><th>CABLES INSTALLED IN A WALL OR PARTITION THAT INCLUDES METALLIC PARTS (SEE NOTE 3)</th></tr>
<tr><td>Single core insulated non-sheathed cables in metallic cable trunking / metallic conduit</td><td colspan="3">Cable trunking and conduit shall be equipotential bonded and satisfy the requirements for a protective conductor.</td></tr>
<tr><td>Flat multicore insulated sheathed cables (T&E) in metallic cable basket / metallic conduit</td><td rowspan="2">Shall be run at least 50mm from the top or bottom as appropriate, of a joist or batten.
or
Where a 50mm depth cannot be achieved they shall be installed within metallic cable trunking (not cable basket) and metallic conduit that is equipotential bonded and satisfies the requirements for a protective conductor.</td><td colspan="2">Conduit shall be equipotential bonded and satisfy the requirements for a protective conductor.</td></tr>
<tr><td>Flat multicore insulated sheathed cables (T&E) clipped / fixed direct to the building fabric / metallic or plastic capping</td><td>Shall be installed within the prescribed zones detailed within BS 7671.
and
Additional protection shall be provided by RCD's (RCCB's or RCBO's).</td><td>Additional protection shall be provided by RCD's (RCCB's or RCBO's).</td></tr>
<tr><td colspan="4">Notes:-
1) As advised by the IET Wiring Regulations Technical Support Group, unbonded metallic conduit, metallic plate (e.g. on the top of joists) or metallic capping (e.g. run within walls) do not provide adequate mechanical protection
2) RCDs shall have an operating current not exceeding 30mA IΔn and for non-delay type RCDs an operating time not exceeding 300ms.
3) Other than just metallic fixings such as nails, screws or the like, e.g. metal stud partitions.</td></tr>
</table>

Default cabling / cable support and containment system, shall be included at Tender and used for installation.

May only be used when detailed in a subsequent section of this specification and on the drawings.

2E-11 IDENTIFICATION, NOTICES & LABELLING

This shall be provided in accordance with site standards, BS 7671, all supporting IET documentation and the respective standards for different systems.

Diagrams, charts and information or instruction notices shall comply with BS EN 61082-1, BS EN IEC/IEEE 82079-1, and where appropriate BS EN 81346-1.

Where there is a discrepancy between existing site standards and the accompanying specification(s) / drawing(s), written confirmation via the Contract Administrator shall be obtained prior to submission of tender costs to clarify the requirements, and in the absence of such the more onerous requirements shall be included.

Where locations are to be defined on labelling, diagrams, schedules / charts the room numbers / names used shall be agreed with the client to ensure co-ordination with the final site room referencing system.

Regarding manufacturers proprietary labelling (e.g. periodic inspection and testing, RCD notices, earthing and bonding connections, alternative or additional supplies and presence of SPDs), the only requirement is compliance with Section 514 and Appendix 11 of BS 7671.

2E-11-1 SAFETY SIGNAGE

Safety signage shall be: -

1) Provided as required for the electrical installation.
2) In strict accordance with The Health and Safety (Safety Signs and Signals) Regulations – Guidance on Regulations – HSE L64, BS 5499, BS ISO 3864, BS EN ISO 7010 and BS EN IEC/IEEE 82079-1.
3) Clearly visible and adequately illuminated by both general lighting and emergency lighting as required
4) Provided in strict accordance with their respective standards e.g. BS 5266 for self-illuminated emergency exit signs.
5) Provided in the following geometric shapes, safety colours and contrast colours: -

SIGN / NOTICE / IDENTIFICATION MEANING	GEOMETRIC SHAPE	SAFETY COLOUR	CONTRAST COLOUR	GRAPHICAL SYMBOL COLOUR	INSTRUCTION AND INFORMATION
Prohibition sign	Circle with diagonal bar	Red	White	Black	A sign prohibiting behavior likely to increase or cause danger e.g. no access for unauthorised persons.
Mandatory sign	Circle	Blue	White	White	A sign prescribing specific behavior e.g. eye protection must be worn.
Warning sign	Equilateral triangle with curved corners	Yellow	Black	Black	A sign warning of a hazard e.g. danger: electricity, nominal voltage exceeding 230 V to earth.
Emergency escape or first-aid sign	Rectangle (square or oblong)	Green	White	White	A sign giving information on emergency exits, first aid, or rescue facilities.
Fire / fire-fighting equipment	Rectangle (square or oblong)	Red	White	White	A sign giving information on fire equipment e.g. fire alarm call point etc.

2E-11-2 IDENTIFICATION, NOTICES & LABELLING COLOURS / TEXT SIZE

All labelling used for the identification of electrical services shall be provided in the following colours: -

SIGN / NOTICE / IDENTIFICATION TYPE	BACKGROUND COLOUR	TEXT COLOUR	NOTES
General information	White	Black	Labelling of general switchgear, electrical equipment and wiring accessories
Fire / fire-fighting equipment	Red	White	Labelling of fire / fire-fighting equipment and the circuits that feed them, (including disable refuge panels etc.)
Fire alarm devices	White	Red	Labelling of fire alarm devices

Identification and labelling of electrical equipment shall be carried out using a mixture of Traffolyte or printed adhesive labels (e.g. Brother / DYMO adhesive tape or similar), depending on the application, as specified hereafter. Critchley / Tyco HLX LSZH cable markers or similar shall be used for cables.

Traffolyte labels shall be fixed by either screws or bolts (not adhesive). Labels higher than 25mm shall have fixings in each corner.

All text shall be in capital letters of the following height: -

1) 25mm for warning notices.
2) 12mm for primary identification labels.
3) 6mm for secondary identification labels and all printed adhesive labels.

2E-11-3 IDENTIFICATION & LABELLEING OF ELECTRICAL EQUIPMENT

GENERAL REQUIREMENTS

1) Each item of switchgear, controlgear and electrical equipment shall be provided with labelling that indicates its purpose.
2) Switchgear and controlgear terminals shall be marked in accordance with BS 5472 and BS 6272.
3) Protective devices shall be labelled so that the circuit protected is easily identifiable and in accordance with BS EN 61439.
4) Indicating equipment shall be provided in strict accordance with BS EN 60073,BS EN 60447 and BS EN ISO 9241-300, where the remote operation of switchgear is necessary.
5) All switchrooms (including rooms containing battery systems), cupboards and risers shall have suitable warning signs.
6) A laminated 'Electric shock: First aid procedures' (resuscitation) poster shall be provided adjacent to every low voltage switch panel, MCCB panel board and MSDB multi-service distribution board.
7) All labelling shall be fully coordinated and consistent throughout.
8) Traffolyte identification labels shall be provided to every termination or joint box indicating the type of service contained.
9) All spare ways shall be labelled.
10) Additional labelling shall be provided as required by BS 7671 e.g. nominal voltage exceeding 230 V to earth, alternative supplies from different sources or circuits etc.
11) Traffolyte shall be used for all external labelling and for internal (circuit) labelling to switchpanels and feeder pillars.
12) Handwritten notices and identification labels are not acceptable under any circumstances.

Labelling shall be provided as detailed in the headings below, including the following external labelling to all items:

1) Switchgear / equipment reference number.
2) General description and Manufacturer's details.
3) Origin / source of supply (e.g. FED FROM ...).
4) Date of installation

LOW VOLTAGE SWITCH BOARDS & FEEDER PILLARS

External labelling to indicate the following: -

1) Form and type.
2) IP rating.
3) Earthing arrangements e.g. TN-C, TN-S, TN-C-S (PME), TT, IT.
4) Nominal voltage.
5) Nominal frequency in Hz .
6) Rated fault current.
7) Busbar rated current, I in A.
8) Incoming device; BS (EN) number, type, rated current in A, settings where relevant.
9) Incoming supply cable(s); circuit reference / number, no. of cables, no. of cores, size and type.
10) Incoming protective conductor cable(s), no. of cores, size and type (if separate).
11) Weight in kg.

Traffolyte labelling shall also be provided externally to all outgoing ways of low voltage switch panels and internally to all outgoing ways of low voltage feeder pillars. For each outgoing way the labelling shall clearly indicate the following: -

1) Circuit description, phase(s) present, supplied switchgear / equipment reference number, (or "Spare")
2) Destination location of the outgoing circuit including the building, floor and room number.
3) Protective device type, BS (EN) number, rating in A and settings (including spare ways fitted with protective devices).
4) Outgoing cable(s) type, size, no. of cables, no. of cores.
5) Outgoing protective conductor cable(s) type, circuit reference, no. of cables, no. of cores, size (if separate).
6) Date of installation if different to main panel

MCCB PANEL BOARDS, CONTROL PANELS, MSDB/SMDB/MCB DISTRIBUTION BOARDS & CONSUMER UNITS

External labelling shall generally be as described above for switch boards apart from those that are inapplicable e.g. form and type does not apply to final distribution boards. Traffolyte shall be used.

Printed adhesive labelling fixed to the manufacturer's internal labelling boxes adjacent to each outgoing way / circuit shall be provided to indicate: -

1) Circuit description and/or the supplied equipment reference number
2) Circuit type e.g. DB1, DB2, ring circuit, radial circuit etc.
3) Destination location of the outgoing circuit including the building, floor and room number.

Further technical details shall be provided on the schedules / charts provided internally for each MCCB panel board, MCB distribution and consumer unit (see section below).

ISOLATORS, FUSE SWITCH / SWITCH FUSE DISCONNECTORS & OTHER INDUSTRIAL SWITCHGEAR

External labelling shall generally be as described above for switchpanels apart from those that are inapplicable e.g. form and type does not apply.

CONTACTORS

External labelling to include No. of poles, Coil control voltage in V, Contactor rating in kW / V / I.

POWER FACTOR CORRECTION UNITS

External labelling to include rating in kVAr and the number of stages.

SURGE PROTECTION DEVICES

External labelling to include the classification e.g. Type 1, kA etc. and be located at or near the relevant distribution board, MCCB panel board, LV switch panel or similar.

ENERGY METERING

Traffolyte labelling shall be provided externally to all metering enclosures and shall clearly indicate the following:-

1) Equipment reference number.
2) General description.
3) Date of installation.

FIRE-FIGHTING / LIFE SAFETY & SECURITY EQUIPMENT

External traffolyte labelling to include: -

1) Any necessary instructions for an emergency situation.
2) Battery autonomy and date when new.
3) For breakers/isolators feeding critical systems, appropriate warning notices e.g. FIRE ALARM – DO NOT SWITCH OFF.
4) On fire fighters' switches, clear "ON" and "OFF" labels in letters not less than 10mm high. (When installed the "OFF" switch position shall be up.).

All emergency voice communication outstations shall be labelled with simple pictogram instructions on how to initiate a call.

Printed adhesive labelling shall be provided for the following: -

1) Fire alarm devices giving loop number, device number and device type.
2) Disabled persons call indicators giving source of call by floor/room number.
3) Fire suppressant release buttons e.g. "EXTINGUISHANT RELEASE".
4) Time delay facilities e.g. "EXTINGUISHANT HOLD-OFF".
5) All security devices giving ID reference.

2E-11-4 LABELLING TO WIRING ACCESSORIES & HIDDEN SERVICES

Labelling shall be provided as follows: -

WIRING ACCESSORIES

1) The face plates of all accessories such as socket outlets, fused connection units, isolators, light switches, etc. shall have printed adhesive labels that indicate the distribution board from which they are fed and their final circuit reference; this shall exclude dwellings.
2) All final circuit references shall be coordinated throughout and consistent on all accessories, schedules and drawings.
3) All fused connection units and isolators shall be labelled as to their purpose. Where available from the specified range, accessories shall have integral engraved labelling e.g. water heater, cooker, etc.
4) Socket outlets identified for cleaners' use shall have the integral engraved labelling 'CLEANER'S SOCKET'.
5) The buttons of scene setting panels shall be labelled showing all scene setting options / programmes to provide ease of use. Where this is not possible, a small laminated clearly legible pictogram shall be permanently fixed adjacent to the devices.
6) Small laminated pictograms shall also be permanently fixed adjacent to all devices where there is insufficient space for printed adhesive labelling e.g. lighting grid switches etc.
7) All data outlets shall have printed adhesive labels that indicate their unique agreed patch panel ID reference, as detailed within Section E5 Voice and Data Systems within this specification (where provided).

Traffoltye labelling shall be used for all externally located accessories and those within dedicated electrical switch rooms, plant rooms and service risers.

HIDDEN SERVICES

Where services are to be concealed above ceilings, colour coded identification markers shall be provided which shall be fixed to the underside of ceilings. These shall be fully co-ordinated with O&M manuals / as-installed information.

The following services shall be identified: -

1) Concealed power supply units.
2) Fire alarm detectors and interfaces.

3) Smoke / fire dampers.

4) Valves / commissioning sets etc.

Fire alarm remote indicators shall be clearly labelled to indicate their function. They shall be sited and/or labelled in such a way as to assist in determining the location of the detectors that they serve.

The appearance and use of colour coded markers must be agreed with the Engineer, Architect and Contract Administrator prior to installation.

2E-11-5 DIAGRAMS & DOCUMENTATION

DIAGRAMS

For each low voltage switch panel and MCCB/MSDB panel board a detailed low voltage distribution schematic(s) shall be provided, mounted within framed clear perspex and screw fixed to an adjacent wall.

The schematic shall be: -

1) Clearly legible.

2) Minimum size of A2.

3) Minimum text size of 4mm in height when printed.

4) Provided with a drawing legend that includes all the drawing symbols used on the schematic.

The low voltage distribution schematic(s) shall include all upstream switchgear and cabling together with the downstream distribution to the next level. All the panel labelling information as detailed earlier shall be repeated on the schematic.

The low voltage distribution schematics shall be provided in strict accordance with BS 5070 and BS EN 61082.

A drawing(s) shall be provided that details all electrical safety installations for firefighting and life safety services. The drawing(s) shall be located at the origin of the electrical installation and adjacent to any other electrical switchgear (e.g. MCCB panel board, MCB distribution board etc.) to which the firefighting / life safety systems relate.

The drawing(s) shall be mounted within framed clear perspex and screw fixed to an adjacent wall. The electrical safety installations drawing shall detail the exact location of the following: -

1) All electrical equipment and switchgear including switchgear / equipment reference numbers.

2) All firefighting and life safety equipment including final circuit designation and the particulars / purpose of the equipment.

3) Special switching and monitoring equipment for life safety power supplies.

Documentation shall be provided within or adjacent to all MCB distribution boards and consumer units that supply heating cables and embedded heating systems e.g. underfloor or ceiling heating systems, as required by BS 7671. This shall include: -

1) Manufacturer and type of heating units.

2) Number of heating units installed.

3) Length/area of heating units.

4) Rated power.

5) Surface power density.

6) Layout of the heating units in the form of a sketch, drawing, or picture.

7) Position/depth of heating units.

8) Position of junction boxes.

9) Cables, earthed conductive shields and the like.

10) Rated voltage.

11) Rated resistance (cold) of heating units.

12) Rated current of overcurrent protective device.

13) Rated residual operating current of RCD.

14) The insulation resistance of the heating installation and the test voltage used.

15) Product information containing provisions about approved materials in contact with the heating units, with necessary instructions for installation.

In addition to the above, the 'Information for the user of the installation' shall also be provided as detailed within BS 7671.

SCHEDULES / CHARTS

Schedules / charts shall be provided to all low voltage switch panels, MCCB panel boards, MCB distribution boards and consumer units, and shall include the following as a minimum: -

1) Switchgear reference number.
2) General description.
3) Date of installation
4) Circuit information including: -
   a) Circuit reference and phase.
   b) Circuit description and the supplied equipment reference number or final circuit type e.g. DB1. DB2, ring circuit, radial circuit etc. including the destination location of the outgoing circuit by building, floor and room number.
   c) Type of wiring.
   d) Reference method from Appendix 4 of BS 7671 – IET Wiring Regulations.
   e) Number of points served.
   f) Circuit conductor cross sectional area for both live and CPC.
   g) Maximum disconnection time (s) permitted by BS 7671.
   h) Maximum Zs permitted by BS 7671 (MCB not RCBO).
   i) Overcurrent protective devices: -
      i) BS (EN) number.
      ii) Type number.
      iii) Rating (A).
      iv) Short circuit capacity (kA).
   j) RCD operating current IΔn (mA) and type.
   k) Presence of AFDD(s).
5) Method used to provide protection against electric shock e.g. basic protection and fault protection.
6) Details of all final circuits having a high protective conductor current.
7) Details of any equipment or circuit vulnerable to 500V insulation resistance testing e.g. electronic devices.

It shall be noted the above schedules / charts shall be provided within or adjacent to the associated switchgear.

Where they are mounted adjacent to the item of switchgear they shall be mounted within framed clear perspex and screw fixed to the adjacent wall, however when they are mounted inside distribution boards (e.g. inside the front cover) they shall be laminated and suitably placed / attached.

Schedules / charts shall be provided that detail all current using equipment permanently connected to firefighting / life safety power supplies indicating: -

1) Nominal electric power.
2) Rated nominal voltage, current and starting current.
3) Duration.

The schedules /charts shall be located at the origin of the electrical installation and adjacent to any other electrical switchgear to which the firefighting / life safety systems relate. The schedules / charts shall be mounted within framed clear perspex and screw fixed to an adjacent wall. The schedules / charts shall include the nominal power, rated nominal voltage, current, starting current and duration.

All switchgear reference numbers / codes shall be coordinated throughout and the same on all identification labels, schedules and drawings.

All final circuit references shall be coordinated throughout and the same on all wiring accessories, schedules and drawings.

EXISTING DIAGRAMS, SCHEDULES & CHARTS

Where electrical installation works is undertaken that requires work to existing site LV distribution systems, firefighting / life safety systems and final circuit wiring, the diagrams, schedules and charts shall be updated in strict accordance with the above clauses and shall incorporate all existing installed information.

2E-11-6 IDENTIFICATION OF CABLES

All main and sub-main cabling shall be provided with identification labels / markers so that it can be identified for inspection, testing, maintenance, repair or alteration of the installation.

Printed identification labels / markers (e.g. Critchley / Tyco HLX LSZH cable markers or similar) shall be fixed as follows: -

1) Each end of the cable.
2) Locations where buried cabling enters / exits the ground.
3) Draw pit locations.
4) Building entry points.
5) Pass between floors.
6) Pass between 60-minute or greater fire compartments.

Each identification label shall include the following: -

1) Cable reference / circuit number.
2) Source and destination location(s).
3) Indication if the cable is run in parallel with other cables.
4) Date of installation in DD/MM/YYYY.

Cable route markers shall be provided to all underground cabling and shall include: -

1) Depth at which the cable is buried.
2) Cable operating voltage.

Cable markers / sleeves as a minimum shall be made from materials equivalent to that of the cabling being labelled e.g. LSZH, LSOH, OHLS etc. They shall also be selected to suit the environment in which they are installed.

Separate protective conductors that are not part of a multicore cable shall have identification labels as detailed above.

2E-11-7 IDENTIFICATION OF CONDUCTORS BY COLOUR & LETTERS / NUMBERS

Cores of cables shall be identified by both: -

1) Colour and,
2) Lettering and/or numbers.

At terminations and throughout the exposed length of every core shall be identifiable and where appropriate binding and sleeves for identification purposes shall comply with BS 3858.

Identification by colour or marking is not required for concentric conductors, bare conductors and the following when used as a protective conductor: -

1) Metal sheath or armour of cables.
2) Extraneous-conductive parts.
3) Exposed conductive parts.

Neutral or midpoint conductors shall be blue.

The colours green-and-yellow shall only be used for protective conductors and the colour combination shall not be less than 30% or more than 70% for each colour. The single colour green shall not be used except for copper strip earthing tape.

Green-and-yellow PEN conductors shall be labelled at the terminations by blue markings and blue PEN conductors shall be labelled at the terminations by green-and-yellow markings.

Lettering and numbering shall be provided to individual conductors or conductors in a group, in accordance with the following: -

1) Clearly legible and durable.
2) A strong contrast between characters and the insulation of the cable.
3) When used, the numbers 6 and 9 shall be underlined to avoid confusion.
4) Protective conductors shall not be numbered unless for circuit identification.
5) The number 0 shall be reserved for neutral and mid-point conductors.

Conductors shall be identified by colour and alphanumeric / marking as detailed in the table below: -

CONDUCTOR FUNCTION	COLOUR	ALPHANUMERIC / MARKING
Protective conductors	Green-and-yellow	CPC
Functional earthing conductor	Pink	–
AC power circuit[1)]		
Line of single-phase circuit	Brown	L1 / L2 / L3 as appropriate
Neutral of single- or three-phase circuit	Blue	N
Line 1 of three-phase AC circuit	Brown	L1
Line 2 of three-phase AC circuit	Black	L2
Line 3 of three-phase AC circuit	Grey	L3
[1)] Power circuits include lighting circuits.		

At terminations marker sleeves with lettering / numbering shall be provided to each cable core as detailed in the table above e.g. for a three phase circuit, brown shall be L1, black shall be L2, grey shall be L3, blue shall be N.

Protective conductors shall not be lettered / numbered other than for the purpose of circuit identification.

Where terminations are made into switchgear such as switch panels, MCCB panel boards, MCB distribution boards, consumer units, main earth terminals / bars and similar, marker sleeves shall be provided to each cable core.

These marker sleeves shall be in accordance with the alphanumeric marking in the above table and shall also detail the way / circuit reference for which they are terminated into e.g. for final circuits terminated into a three phase distribution board: -

OUTGOING WAY	FINAL CIRCUIT TYPE	CIRCUIT NUMBER / LINE or NEUTRAL or CPC CONDUCTOR	CABLE COLOUR	ALPHANUMERIC / MARKING
Way 1 Line conductors (L1, L2, L3)	Three phase	1/L1	Brown	1/L1
		1/L2	Black	1/L2
		1/L3	Grey	1/L3
Way 1 Neutral conductor	Three phase	1/N	Blue	1/N
Way 1 Circuit protective conductor	Three phase	1/CPC	Green-and-yellow	1/CPC
Way 2 Line conductor (L1)	Single phase	2/L1	Brown	2/L1
Way 2 Neutral conductor (L1)	Single phase	2/N	Blue	2/L1/N

OUTGOING WAY	FINAL CIRCUIT TYPE	CIRCUIT NUMBER / LINE or NEUTRAL or CPC CONDUCTOR	CABLE COLOUR	ALPHANUMERIC / MARKING
Way 2 Circuit protective conductor (L1)	Single phase	2/CPC	Green-and-yellow	2/L1/CPC
Way 2 Line conductor (L2)	Single phase	2/L2	Brown	2/L2
Way 2 Neutral conductor (L2)	Single phase	2/N	Blue	2/L2/N
Way 2 Circuit protective conductor (L2)	Single phase	2/CPC	Green-and-yellow	2/L2/CPC

Where two or three-core cables (6242* and 6243* flat twin / triple and earth cables) are used for switch wires, intermediate and two-way switch wires, they shall be marked / sleeved as follows: -

FUNCTION	COLOUR	ALPHANUMERIC / MARKING OR SLEEVING
Switch wires – two-core cabling		
Line conductor	Brown[1)]	–
Line conductor	Brown[1)]	–
Intermediate and two-way switch wires – three-core cabling		
Line conductor	Brown	–
Line conductor	Black	L or Brown
Line conductor	Grey	L or Brown
[1)] 6242* Twin and earth cabling shall have two brown cores when used for switching circuits, blue cores with brown sleeving or the cable marker 'L' may be used as an alternative.		

2E-11-8 IDENTIFICATION OF NEW CABLING (HARMONIZED COLOURS) INTERFACED WITH OLD CABLING (NON-HARMONIZED CABLE COLOURS)

Where there is an addition or alteration to an existing single phase installation and new cabling (to the harmonized colours) is interfaced with old cabling (non-harmonized colours), identification and marking is not required at the interface provided that: -

1) Old cable colours are red for line and black for neutral.

2) New cable colours are brown for line and blue for neutral.

However, where there is an addition or alteration to an existing two or three-phase installation or a DC installation, and new cabling (to the harmonized colours) is interfaced with old cabling (non-harmonized colours), the conductor markings in the table below are required at the interface location: -

CONDUCTOR FUNCTION	NEW CONDUCTOR		OLD CONDUCTOR	
	MARKING	COLOUR	MARKING	COLOUR
Protective conductors	–	Green-and-yellow	–	Green-and-yellow
AC power circuit[1)]				
Line 1 of three-phase AC circuit	L1	Brown[2)]	L1	Red
Line 2 of three-phase AC circuit	L2	Black[2)]	L2	Yellow
Line 3 of three-phase AC circuit	L3	Grey[2)]	L3	Blue

CONDUCTOR FUNCTION	NEW CONDUCTOR		OLD CONDUCTOR	
	MARKING	COLOUR	MARKING	COLOUR
Neutral of single- or three-phase circuit	N	Blue	N	Black

[1] Power circuits include lighting circuits.

[2] Three single-core cables with insulation of the same colour may be used if identified at the terminations.

2E-11-9 TECHNICAL SUBMISSIONS

Prior to installation on-site the Contractor shall provide technical submissions for the following: -

1) A schedule of all identification, notices, labels (including safety signage) and cable identification labels / markers along with a physical sample of each label type.

The time allowed for comment shall be as detailed within section 1B of this specification.

2E-12 EXISTING SUPERVISORY / END-USER MANAGEMENT SOFTWARE

Where electrical installation works is undertaken that requires the integration of electrical systems into existing site supervisory / end-user management software (e.g. fire / voice alarm systems, emergency voice communication systems, disabled persons call systems, emergency lighting systems, security systems etc.) the Contractor shall employ the relevant specialist(s) to: -

1) Update the software so that electrical systems within refurbished, remodelled and new build areas / buildings are fully integrated into the existing software.
2) Incorporate room numbers / names co-ordinated with the architectural drawings and the site room referencing system.
3) Upload and integrate into the existing software the latest floor plans where used as part of an end-user GUI.

2E-13 SELECTION & ERECTION OF WIRING SYSTEMS TO MINIMISE THE SPREAD OF FIRE

To minimise the risk of spread of fire appropriate materials and erection methods shall be selected in strict accordance with The Building Regulations – Approved Document B, BS 9999, BS 7671 and all supporting IET documentation.

2E-13-1 PRECAUTIONS WITHIN A FIRE SEGREGATED COMPARTMENT

The general building structural performance / fire safety shall not be reduced by the installation of wiring systems.

All fixed wiring power, control and communication cables shall meet the flame propagation requirements of: -

1) BS EN 60332-1-2.
2) BS EN 60332-3-24 (where required by cable manufacturing standards – see below).

Note: IET Wiring Regulations requires cables to meet the flame propagation requirements of the BS EN 60332-3 series when installed within 'fire-segregated compartments that provide a means of escape in an emergency'.

However only XLPE/SWA/LSZH armoured, XLPE/LSZH softskin 'fire rated' and XLPE/SWA/LSZH armoured 'fire rated' cabling is tested to meet these requirements, and this is currently under review by the IET.

Therefore, cabling need only meet the requirements of BS EN 60332-1-2 where its manufacturing standard does not require testing to the BS EN 60332-3 series.

Where cables do not comply with the flame propagation requirements of BS EN 60332-1-2 and the BS EN 60332-3 series (where possible), they shall be limited to short lengths for connection of appliances to the permanent wiring system e.g. flexible connections. They shall not pass between fire segregated compartments.

Note: Protected escape routes have additional requirements to those detailed above.

2E-13-2 PROTECTED ESCAPE ROUTES

Cabling and other electrical equipment shall not be installed within a protected escape route unless they are for: -

1) An essential fire safety or related safety system e.g. fire alarm system.

2) Local lighting and emergency lighting.

3) Local socket-outlets provided for cleaning or maintenance.

Other cabling such as primary distribution or final circuits feeding other areas (e.g. sub-mains distribution, voice and data cabling, other ELV signalling cabling etc.) must not be routed through or above protected escape routes.

Cabling within protective escape routes must be LSOH / LSZH / OHLS – Low smoke zero halogen (BS EN 61034-2 and BS EN 50267-2-1 respectively), and meet the flame propagation requirements of: -

1) BS EN 60332-3 series, or

2) BS EN 60332-2-1 when installed within metallic cable trunking / conduit to BS EN 50085 and BS EN 61386.

XLPE/SWA/LSZH armoured, XLPE softskin 'fire-rated' and XLPE/SWA/LSZH armoured 'fire rated cabling' are tested to meet the requirements of the BS EN 60332-3 series and must be installed upon metallic cable tray / cable ladder systems classified as non-flame propagating to BS EN 61537 within protected escape routes.

LSZH single core and XLPE/LSZH flat twin and earth cabling are tested to meet the requirements of BS EN 60332-2-1 and must be installed within metallic cable trunking / conduit systems classified as non-flame propagating to BS EN 50085 and BS EN 61386 respectively, within protected escape routes.

LSZH flat twin and earth (T&E) cabling must not be installed on metallic cable basket / conduit when installed within a protected escape route, as cable basket is not deemed to meet the flame propagation requirements of BS 7671.

PVC cabling shall not be installed within a protected escape routes under any circumstances, as it does not meet the requirements for flame propagation or halogen / smoke emissions.

Switchgear and controlgear within protected escape routes shall be: -

1) Accessible only to authorized persons.

2) Enclosed in a cabinet or an enclosure constructed of non-combustible or not readily combustible material.

Note: This does not apply to items installed to facilitate evacuation e.g. fire alarm manual call points.

Protected escape routes must be defined by Building Control / Fire Advisor.

The above cabling and containment requirements shall also be applied to the following locations where a particular risk of fire exists: -

1) Locations with risks of fire due to the nature of processed or stored materials.

2) Combustible construction materials.

3) Fire propagating structures.

4) Selection and erection of installations in locations of national, commercial, industrial or public significance.

Locations must be defined by Building Control / Fire Advisor and it shall be noted the above locations have other additional/different requirements to those for protected escape routes.

2E-13-3 SEALING OF WIRING SYSTEM PENETRATIONS

The sealing of wiring system penetrations shall be as follows: -

1) Where wiring systems pass through floors, walls, roofs, ceilings, partitions, cavity barriers and other elements of the building construction, the penetrations through the building fabric shall be suitably sealed (e.g. fire barriers / stopping) to provide the level of fire resistance and acoustic properties required by the building element that has been penetrated.

2) Manufacturers' proprietary cable transit systems and sleeves shall be utilised which have been tested in strict accordance with BS EN 1366-3. Other systems may be considered if based on sample construction details and written approval by Building Control and appropriate Fire Advisors.

3) Under no circumstances shall expandable foam be used.

4) Cable ducting, cable trunking, conduit and busbar systems etc. shall also be internally sealed to provide the level of fire resistance required by the building element that has been penetrated.

5) Where the wiring system / products are classified as non-flame propagating according to the relevant product standard, internal sealing is not required provided that: -

a) The wiring system has a maximum internal cross-sectional area of 710mm^2 e.g. 32mm diameter conduit or smaller, or 25 x 25mm trunking.

b) (However, they may require sealing for other reasons, such as to prevent condensation, in classified hazardous areas etc.).

c) The system has the degree of protection of IP33 to BS EN 60529.

d) Any termination of the system in one of the compartments, separated by the building construction being penetrated, has the degree of protection of IP33 to BS EN 60529.

6) Temporary fire stopping arrangements shall be provided if required during the installation works. Existing fire stopping that is disturbed during alteration works shall be reinstated as soon as practical.

7) The fire sealing must also resist external influences to the same degree as the wiring system e.g. resistance to combustion, ingress protection from water, be from compatible material, permit thermal movement and have adequate mechanical stability.

8) Cable cleats and supports for cable management systems shall be provided within 750mm of all fire barrier / stopping seals and shall be able to withstand the mechanical load induced by the collapse of wiring systems on the fire side of the seal, to prevent strain and damage to the fire seal. This is not required if the seal itself is able to provide adequate support under such conditions.

9) Intumescent gaskets and covers shall be provided where electrical equipment or accessories are installed within ceilings or walls whose fire integrity has been compromised by their installation e.g. recessed luminaires in ceilings to maintain the ceilings fire integrity, accessory boxes in thin skinned walls that form part of a fire compartment etc.

10) Gaskets and covers shall be provided where electrical equipment or accessories are installed within ceilings or walls whose acoustic properties have been compromised by their installation e.g. recessed luminaires, accessory boxes in thin skinned walls etc.

11) Labelling shall be provided at each penetration location and shall have a designated unique reference, include the installation date and details of the specialist installer.

12) On completion of the fire barriers / stopping works fully detailed completion / compliance certification shall be provided along with record drawings that detail all fire barrier / stopping locations.

Fire sealing shall be provided in strict accordance with Appendix 13 of BS 7671.

Technical specifications for all manufacturers' proprietary fire stopping systems and materials (e.g. cable transit systems and sleeves) shall be agreed with Building Control / Fire Advisor and the Architect.

2E-14 PROXIMITY OF WIRING SYSTEMS & ELECTROMAGNETIC DISTURBANCES

This section of the specification details the general requirements for the proximity of wiring systems and measures against electromagnetic disturbances.

2E-14-1 PROXIMITY & SEGREGATION OF WIRING SYSTEMS

GENERAL

Electrical services cabling shall be segregated in strict accordance with BS 5266, BS 5839, BS 6701, BS EN 50174, BS EN 62305, NJUG Guidelines, BS 8519, BS 7594, BS 7671 and all supporting IET documentation.

Voltage Band I and Voltage Band II circuits must not be contained in the same wiring system as a circuit of nominal voltage exceeding that of low voltage.

LIGHTNING PROTECTION SYSTEMS

Adequate separation shall be provided between conductors of a lightning protection system and other electrical wiring systems, including extra-low voltage systems. The minimum separation distances shall be calculated by the lightning protection specialist in accordance with BS EN 62305-3.

EMERGENCY LIGHTING SYSTEM WIRING

Emergency lighting system wiring from a central battery system shall be segregated from all other electrical circuits and wiring systems to avoid the risk of mechanical damage, in strict accordance with BS 5266-1.

FIRE ALARM SYSTEM, VOICE ALARM SYSTEM & EMERGENCY VOICE COMMUNICATION SYSTEM WIRING

Fire alarm system and emergency voice communication system (disabled refuge) wiring shall be segregated from all other electrical circuits and wiring systems in strict accordance with BS 5839-1, BS 5839-8 and BS 5839-9.

Fire alarm system, voice alarm system and emergency voice communication system (disable refuge) wiring may be installed together within the same cable support / containment system, as permitted by BS 5839.

OTHER LIFE SAFETY / FIRE-FIGHTING WIRING

All other life safety / fire-fighting system wiring systems shall be segregated from each other and all other electrical circuits and wiring systems. Primary and secondary power supplies shall be adequately separated from each other so that a failure in a cable or equipment (e.g. mechanical breakdown, damage by fire etc.), in either supply does not affect the other supply.

Where more onerous requirements are detailed within standards, documents or manufacturers' literature relating to life safety / fire-fighting systems, these requirements must be adhered to (e.g. diverse routing of primary and secondary power supplies to fire-fighting lifts, evacuation lifts, smoke ventilation systems etc.).

AUDIO FREQUENCY INDUCTION LOOP SYSTEMS (AFILS)

Loop conductor(s), microphone and other signal cables shall be segregated from all other electrical circuits and wiring systems in strict accordance with BS 7594.

1) Loop cabling shall be installed at least 600mm from low voltage (general power wiring) and extra low voltage systems (fire alarm, security, telecommunications and data wiring etc.). However, the loop cabling shall be installed at least 1000mm from all other audio wiring systems. These requirements shall be verified with the AFILS equipment manufacturers.
2) Line and neutral conductors or switch feeds and switch wires (e.g. conventional two-way switching) must be grouped / run together in areas where AFILS have been installed.
3) Adjacent loops shall be adequately separated from each other dependent upon their classification / type e.g. A1, A2, A3, A4 etc. as required by BS 7594.

INFORMATION TECHNOLOGY & TELECOMMUNICATIONS WIRING

Information technology (e.g. data cabling) and telecommunications wiring systems shall be segregated from all other electrical circuits and wiring systems. This shall include any building services systems that may utilise the information technology / telecommunications wiring e.g. access control, CCTV, BMS etc.

External and internal telecommunication wiring systems by utility service providers e.g. BT, Virgin Media, Hyperoptic etc. shall be segregated from each other in strict accordance with the associated providers guidance e.g. developer guides, design guides etc.

Where underground telecommunications cables and underground power cables cross or are in close proximity a minimum clearance of 100mm shall be maintained unless one of the methods is adopted from BS 7671.

These methods are as follows: -

1) The provision of a fire retardant partition shall be provided between the underground telecommunication and power cables.

   e.g. bricks, clay / concrete cable protection caps, concrete shaped blocks, protective cable conduit or troughs made of fire retardant materials.

   Or,

2) Where underground telecommunication cables and power cables cross, mechanical protection between the cables shall be provided.

   e.g. cable conduit, concrete cable protection caps or concrete shaped blocks.

OTHER WIRING

The following wiring systems shall be fully segregated from each other and all other electrical circuits and wiring systems: -

1) Security systems.
2) BMS.
3) ELV mechanical services controls.

GENERAL INSTALLATION REQUIREMENTS

The general installation requirements are as follows: -

1) Wiring systems that require segregation shall be installed in their own dedicated cable management systems or in common cable management systems that are provided with individual dedicated compartments.

   Where dividers / partitions are installed on-site they must be from the same manufacturer as the cable management system and the manufacturer's proprietary fixings shall be used.

   The compartment walls or dividers / partitions within the common cable management system shall be: -

   a) Securely fixed and manufactured from the same material as the cable management system.

   b) Mechanically strong and continuous throughout the cable management system.

   c) The same height as the sides of the common cable management system and without perforations.

   d) Equipotential bonded to the cable management system.

2) Signalling and data cabling shall not be installed within a common cable management system that contains low voltage wiring unless the dividers / partitions are manufactured from steel with a minimum thickness of 1.5mm.

3) All wiring systems shall have its own cable conduits and shall not be installed in the same conduits as the cables of other wiring systems.

4) Under no circumstances shall any wiring be strapped or fixed to the outside of cable management systems.

5) Underground electrical wiring systems shall be separated as detailed by the NJUG National Joint Utilities Group or as shown on the drawings. All buried wiring systems shall be installed within their own dedicated cable ducting systems unless specifically shown otherwise.

2E-14-2 PROXIMITY OF WIRING SYSTEMS TO NON-ELECTRICAL SERVICES

Wiring systems shall not be located in close proximity to non-electrical services that produce heat (e.g. hot pipework), smoke or fumes, or below services that may cause condensation (e.g. water, steam, gas services), unless adequate precautions are taken to prevent harmful effects to the wiring.

Mechanical / thermal shielding or suitable spacing shall be provided between electrical and non-electrical services to prevent the operation of one service affecting another.

Under no circumstances shall wet services be installed within LV switch rooms and rooms containing standby battery systems.

Low pressure gas systems shall be separated from electrical equipment in accordance with BS 6891: -

1) Gas pipework shall be at least 150mm from low voltage equipment such as metering, DNO cut-outs / isolators, distribution boards and consumer units.

2) Gas pipework shall be at least 25mm from switches, sockets and low voltage cabling.

The guidance outlined in IGEM/GM/6 shall also be followed: -

1) Gas metering shall not be installed within rooms that are intended for electricity metering and electrical switchgear.

2) Gas metering shall be located away from electricity metering and electrical switchgear and under no circumstances within 150mm.

The only wiring systems that shall be installed within lift or hoist wells shall be those that form part of the lift installation as defined by the BS EN 81 series.

2E-14-3 MEASURES AGAINST ELECTROMAGNETIC DISTURBANCES

To avoid and reduce electromagnetic disturbances the electrical installation works shall also be undertaken in strict accordance with the following standards: -

REFERENCE STANDARDS / DOCUMENTS	
BS 6701	Telecommunications equipment and telecommunications cabling – Specification for installation, operation and maintenance

REFERENCE STANDARDS / DOCUMENTS	
BS EN 50310	Telecommunications bonding networks for buildings and other structures
BS EN 50174	Information technology – Cabling installation
BS IEC 61000-5-2	Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthing and cabling

Where referenced within this section of the specification data and signalling cabling shall include the following non-exhaustive systems: -

1) Information and communication systems.
2) All life safety / fire-fighting systems.
3) Security systems.
4) AV/TV/integrated reception systems.
5) BMS systems.
6) ELV mechanical services controls.
7) Nurses call systems.
8) Any other systems that utilise ELV signalling wiring.

Reference shall be made to BS EN 50174-2 for the minimum separation distances from data / signalling cabling to sources of electromagnetic interference (e.g. fluorescent / neon / mercury vapour / high-intensity discharge lamps, arc welders, frequency induction heating, hospital equipment, radio / television transmitters and radars).

As a minimum the following measures must be adopted to avoid and reduce electromagnetic disturbances: -

1) Signalling cabling shall be adequately screened
2) All circuit conductors of low voltage cabling shall be run together in close proximity utilising the same cable support / containment system (e.g. line, neutral and protective earth conductors).
3) Adequate separation and segregation of power (e.g. low voltage) and signalling cables shall be provided.
4) All cable support and containment systems shall be equipotential bonded as detailed within the Earthing and Bonding section within this section of the specification.

Where more onerous measures (e.g. surge protection and/or filters, EMC equipotential bonding networks etc.) are required these shall be detailed elsewhere within this specification.

It shall be assumed, unless unambiguously stated otherwise, that the minimum separation distances given in BS 7671 apply, as summarised below: -

INSTALLATION METHOD (ALL CABLE SUPPORT & CONTAINMENT SYSTEMS ARE STEEL)		SEPARATION DISTANCE
DATA / SIGNALLING CABLING	LOW VOLTAGE CABLING	
Dedicated cable basket or tray	Free air, cable tray or basket	200mm
Dedicated cable basket or tray	Cable trunking	150mm
Dedicated cable trunking	Cable tray or basket	150mm
Dedicated cable trunking	Dedicated cable trunking	0mm

Notes: -

1) The minimum separation distances shall apply in three dimensions.
2) Signalling and data cabling shall not be installed within a common cable management system that contains low voltage wiring unless the dividers / partitions are manufactured from steel with a minimum thickness of 1.5mm.

INSTALLATION METHOD (ALL CABLE SUPPORT & CONTAINMENT SYSTEMS ARE STEEL)		SEPARATION DISTANCE
DATA / SIGNALLING CABLING	LOW VOLTAGE CABLING	
3) Where signalling / data cabling and power cabling are required to cross each other and the minimum separation distances cannot be maintained, they must cross each other at 90 degrees for at least the minimum separation distance either side of the crossing.		

Electrical safety and measures to avoid / reduce electromagnetic disturbances may produce different segregation or separation requirements; the electrical installation shall meet both requirements.

2E-15 EARTHING & BONDING

This shall be provided in accordance with BS EN 50310, BS EN 50174, BS 7430, BS 7671 and all supporting IET documentation.

The following definitions apply: -

1) Supply system earthing – Where a connection is provided between the source of energy (e.g. generator winding) and the general mass of earth via a source electrode.
2) Electrical installation earthing – Where the exposed-conductive-parts of an installation are connected to an appropriate means of earthing at the origin of the installation e.g. MET.

For intakes at LV, the DNO is normally responsible for supply system earthing and the provision of a connection for the MET.

All earthing and bonding cabling shall be LSZH (LSOH, OHLS) with emissions of hydrogen chloride gas < 0.5%.

2E-15-1 EARTHING ARRANGEMENTS

Dependent on the installation earthing arrangements, METs shall be connected to earth by one of the following methods as required by BS 7671:

1) TN-S, to the earthed point of the source of energy, my partly be formed by the DNO's lines and equipment.
2) TN-C-S, where protective multiple earthing is provided, by the DNO to the neutral of the source of energy.
3) TT and IT, via an earthing conductor to an earth electrode.

Earth electrodes shall be provided in accordance with BS 7671 and shall be from the following types: -

1) Earth rods or pipes.
2) Earth tapes or wire.
3) Earth plates.
4) Underground structural metalwork embedded in foundations (e.g. piling) or other metalwork installed in the foundations.
5) Welded metal reinforcement of concrete (except pre-stressed concrete) embedded in the ground.
6) Lead sheaths and other metal coverings of cables (existing installations only).
7) Other suitable underground metalwork.

The following shall not be used as an earth electrode: -

1) Metallic pipework for gases or flammable liquids.
2) Metallic pipework of a water utility supply.

Metal objects immersed into water shall not be used as earth electrodes.

2E-15-2 PROTECTIVE CONDUCTORS

The term protective conductor applies to the following: -

1) Earthing conductors.
2) Protective equipotential bonding conductors.
3) Supplementary protective equipotential bonding conductors.
4) Circuit protective conductors.

The following shall not be used as protective conductors: -

1) Gas pipes.
2) Oil pipes.
3) Flexible or pliable conduits.
4) Support wires or other flexible metallic parts.
5) Constructional parts subject to mechanical stress in normal service.

Although permissible by BS 7671 the metal enclosures or frames of low voltage switch panels, control gear assemblies and busbar trunking systems shall not be used as protective conductors.

2E-15-3 EARTHING CONDUCTORS

Earthing conductors and connections shall be suitably protected against mechanical damage and corrosion and be suitably labelled.

2E-15-4 MAIN EARTH TERMINALS (MET)

An MET shall be provided to all electrical installations for connection of the following to the main earthing conductor: -

1) Circuit protective conductors.
2) Main protective bonding conductors.
3) Functional earthing conductors (if required).
4) Lightning protection system bonding conductors (if any).
5) Metallic sheath of incoming telecommunications cables (where agreed).
6) Telecommunications bonding conductors from telecommunications PBB (if required).

Main protective equipotential bonding conductors shall be provided from the following metallic extraneous-conductive-parts to the MET: -

1) Water installation pipes.
2) Gas installation pipes.
3) Fuel oil pipes.
4) District heating pipes.
5) Steam pipes.
6) Laboratory and medical gases.
7) Mechanical service installation pipework and ducting (e.g. ventilation, heating, chilled water etc.)
8) Central heating and air conditioning systems.
9) Exposed metallic structural parts of the building.

The above shall be applied to each building where the electrical installation serves more than one building.

Where agreed with the service provider / owner, the metallic sheath of incoming telecommunications cables shall also be equipotential bonded to the MET.

Where the service provider / owner will not give permission for equipotential bonding to be undertaken this must be recorded within the description section of the appropriate electrical installation certificates.

Lightning protection systems shall also be connected to the MET.

Disconnection of the main earthing conductor shall be provided to facilitate measurement of the earthing arrangements. This may be provided as part of the main earthing terminal (MET) in the form of a bolted disconnection test link. It shall only be possible to remove disconnection joints / links by means of a tool.

Where non-metallic pipes (e.g. plastic) enter the building and are then connected to metallic pipes within the building(s) the metallic pipes within the building will not normally require protective equipotential bonding as they are unlikely to be extraneous conductive parts, the Contractor shall confirm this requirement.

2E-15-5 TELECOMMUNICATION PRIMARY BONDING BUSBARS (PBB)

Each building / installation shall be provided with a PBB which shall be connected to the electrical installation main MET as part of a dedicated telecommunications bonding network.

2E-15-6 TELECOMMUNICATION SECONDARY BONDING BUSBARS (SBB)

Each telecommunications, server, equipment, communications room (e.g. main equipment rooms (MER's) and secondary equipment rooms (SER's) shall be provided with an SBB as part of the dedicated telecommunications bonding network.

2E-15-7 PROTECTIVE EQUIPOTENTIAL BONDING CONDUCTORS

Main protective equipotential bonding conductors shall be provided from extraneous-conductive-parts to the MET, as detailed above in the section Main Earthing Terminals.

Generally protective equipotential bonding conductors shall be installed on cable support and containment systems, however where they are fixed to the building structure / fabric they shall be supported at spacing's as detailed within IET Guidance Note 8 – Earthing and Bonding.

SIZING OF MAIN PROTECTIVE BONDING CONDUCTORS – WHERE PME CONDITIONS DO NOT APPLY

Where PME conditions do not apply the minimum cross sectional area of main protective bonding conductors shall be in relation to the size of the line and earthing conductors, as detailed in the table below: -

WHERE PME CONDITIONS DO NOT APPLY		
LINE CONDUCTOR CROSS SECTIONAL AREA	EARTHING CONDUCTOR CROSS SECTIONAL AREA	MAIN PROTECTIVE BONDING CONDUCTOR CROSS SECTIONAL AREA
4mm^2 to 10mm^2	4mm^2 to 10mm^2	6mm^2
16mm^2 to 35mm^2	16mm^2	10mm^2
50mm^2	25mm^2	16mm^2
70mm^2 to 400mm^2	35mm^2 to 240mm^2	25mm^2

Notes:

1) Assumes all conductors are copper.
2) Where an installation serves more than one building, a main protective bonding conductor shall be selected in accordance with the characteristics of the distribution circuit protective conductor for that particular building.

SIZING OF MAIN PROTECTIVE BONDING CONDUCTORS – WHERE PME CONDITIONS APPLY

Where PME conditions apply the minimum cross-sectional area of main protective bonding conductors shall be in relation to the size of the supply neutral conductor, as detailed in the table below: -

SUPPLY NEUTRAL CONDUCTOR CROSS SECTIONAL AREA	MAIN PROTECTIVE BONDING CONDUCTOR CROSS SECTIONAL AREA
35mm^2 or less	10 mm^2
50mm^2	16 mm^2
70mm^2 to 95mm^2	25 mm^2
120mm^2 to 150mm^2	35 mm^2
Over 150mm^2	50 mm^2

Notes: -

1) Assumes all conductors are copper.

SUPPLY NEUTRAL CONDUCTOR CROSS SECTIONAL AREA	MAIN PROTECTIVE BONDING CONDUCTOR CROSS SECTIONAL AREA
2) DNO conditions may require larger main protective bonding conductors and this should be verified with the DNO.	

METALLIC PIPEWORK

The main bonding connections to water, gas or other services shall be made as near as practicable to the point of entry of that service into the building.

Where there is a meter, isolation point or union the connection shall be made: -

1) To the hard metal pipework and before any branch pipework.
2) Where the meter is within the building – Where practicable within 600mm of the meter outlet union when the meter is installed within the building
3) Where the meter is outside of the building – where the service enters the building.

If an insulating section has been provided to prevent galvanic corrosion the bonding connection shall be to the building side only.

Bonding clamps that comply with BS 951 shall be used to make main bonding connections to metal pipework and shall be selected to suit the environment in which they are installed. Where bonding clamps cannot be used due to the size of the pipework other suitable means of connection shall be provided.

STRUCTURAL STEELWORK

The structural steelwork shall be equipotential bonded using proprietary clamps at regular intervals with final connection to the MET by means of a bolted lug type connection.

TELECOMMUNICATIONS PRIMARY BONDING BUSBARS (PBB)

Telecommunications PBB shall: -

1) Be connected to MET using suitably a sized TBC. TBC shall be sized in strict accordance with BS EN 50310, shall have a minimum cross-sectional area of 16mm^2 and shall be pink in colour as required by BS 7671.
2) Provide a central connection point for the building / installation TBB.

SECONDARY BONDING BUSBARS (SBB)

SBBs and RBBs shall be provided as follows: -

1) Each SBB shall be connected to the building / installation telecommunications PBB using a suitably sized TBB / BBC. TBB / BBC shall be sized in strict accordance with BS EN 50310 and shall have a minimum cross-sectional area of 16mm^2.
2) Each server, equipment, communications rack or cabinet shall have an integral proprietary RBB (vertical and / or horizontal as required) and shall be equipotential bonded in strict accordance with BS EN 50310 and BS EN 50174.
3) Cabinet, frame or rack mounted equipment (passive or active) shall be equipotential bonded to the horizontal or vertical rack RBB within in each rack using suitably sized UBC. UBC shall be sized in strict accordance with BS EN 50310 and shall have a minimum cross-sectional area of 4mm^2.
4) All parts of racks including doors, blank panels, gland plates, and any equipment that is provided with earth studs, shall be equipotential bonded individually to the RBB within each rack.
5) Each RBB shall be connected to the SBB within the same room using suitably sized RBC. RBC shall be sized in strict accordance with BS EN 50310 and shall have a minimum cross-sectional area of 4mm^2 for a cabinet, frame or rack of ≤ 21U and 16mm^2 for a cabinet, frame of rack of > 21U.

PHOTOVOLTAIC SYSTEMS

Earthing and bonding (if required) for the DC side of the PV system shall be provided in strict accordance with BS IEC 62548, BS 7671 and the MCS & ECA – Guide to the Installation of Photovoltaic Systems.

Earthing and bonding to the AC side of the PV system installation shall be provided in strict accordance with BS 7671.

METALLIC CABLE LADDER RACK, CABLE TRAY & CABLE BASKET

All cable ladder rack, cable tray and cable basket / wire mesh systems shall have adequate electrical continuity characteristics as defined in BS EN 61537. A protective bonding conductor shall connect cable ladder rack or cable tray to the main earth terminal (MET) or the equipotential bonding network (for equipotential bonding networks).

The electrical continuity of the cable ladder rack, cable tray and/or basket shall be tested in accordance with BS EN 61537.

METALLIC CABLE TRUNKING

All cable trunking shall: -

1) Be equipotential bonded using the manufacturer's proprietary components and fixings in strict accordance with the manufacturer's recommendations and with due allowance made for thermal expansion / contraction.
2) Have adequate electrical continuity characteristics as defined in BS EN 50085. A protective bonding conductor shall connect the cable trunking systems to the MET or the equipotential bonding network (for equipotential bonding networks).

The electrical continuity of the cable trunking shall be tested in accordance with BS EN 50085.

METALLIC CONDUIT & FITTINGS

Metallic cable conduit and fittings shall have adequate electrical continuity as defined in BS EN 61386 when connected to cable tray, cable basket and cable trunking. The metallic cable conduit shall be connected to the main earth terminal (MET) via the primary containment systems.

The electrical continuity of the cable conduit shall be tested in accordance with BS EN 61386.

ELECTRICAL EQUIPMENT & WIRING ACCESSORIES

A separate protective conductor shall be run between the earthing terminal within an accessory / equipment and the earthing terminal in the associated back box / enclosure. Notwithstanding Guidance Note 8, a single fixed lug shall not be relied upon as the sole means of continuity.

EMC BONDING NETWORKS

Where EMC equipotential bonding networks are required to avoid / reduce electromagnetic disturbances they shall be detailed elsewhere within this specification.

2E-15-8 SUPPLEMENTARY PROTECTIVE EQUIPOTENTIAL BONDING CONDUCTORS

Supplementary protective equipotential bonding conductors shall be installed between simultaneous accessible exposed-conductive-parts and extraneous-conductive parts, including where practical, the main metallic reinforcement of constructional reinforced concrete.

The equipotential bonding system shall be connected to the protective conductors of all equipment within the area requiring supplementary protective equipotential bonding (including those of socket outlets).

Supplementary protective equipotential bonding shall be provided where additional protection is necessary within special locations as required by Part 7 of BS 7671.

The cross-sectional area of copper supplementary protective equipotential bonding conductors shall be determined from BS 7671, which can be summarised as follows: -

CABLE TYPE / INSTALLATION	SUPPLEMENTARY PROTECTIVE EQUIPOTENTIAL BONDING CONDUCTOR CONNECTION TYPE AND REQUIRED CABLE SIZE		
	TWO EXPOSED-CONDUCTIVE-PARTS	AN EXPOSED-CONDUCTIVE-PART AND AN EXTRANEOUS-CONDUCTIVE-PART	TWO EXTRANEOUS-CONDUCTIVE-PARTS
Sheathed or mechanically protected	Greater than or equal to the cross-sectional area of the circuit protective conductor	Greater than or equal to the cross-sectional area of the circuit protective conductor	Greater than or equal to 2.5mm^2
Non-sheathed single core cabling	Greater than or equal to 4.0mm^2	Greater than or equal to 4.0mm^2	Greater than or equal to 4.0mm^2

Generally metallic ceilings and ceiling grids shall not be supplementary protective equipotential bonded unless detailed elsewhere within this specification.

Where supplementary protective equipotential bonding conductors are fixed to the building structure / fabric they shall be supported at spacing's as detailed within IET Guidance Note 8 – Earthing and Bonding.

2E-15-9 CIRCUIT PROTECTIVE CONDUCTORS

Circuit protective conductors shall only be: -

1) Single core insulated cables (e.g. installed within cable trunking or separate CPC's for armoured cables).
2) Bare conductor within a multi-core cable (e.g. flat twin and earth).
3) Insulated conductor within a multi-core cable (e.g. armoured cable).
4) Metallic sheath, screen or armouring of a cable.

Under no circumstances shall cable support and containment systems be used as circuit protective conductors, however they shall be equipotential bonded, have adequate electrical continuity characteristics in accordance with their respective standards.

Where cable containment systems are required to satisfy the requirements for protection against impact, this shall be independent of other CPCs provided.

Circuit protective conductors provided as per items 1 to 3 above shall be suitably terminated into the electrical switchgear or equipment to which their corresponding final circuit relates.

Where the armouring of a cable is to be used as a circuit protective conductor the armouring shall be suitably connected to electrical switchgear, gland plates or trunking using a brass compression cable gland, gland earth tag washer / ring and gland lock nut. The gland earth tag washer / ring shall be fixed using a suitable stud and shall also be connected with a copper protective conductor and cable lug to the switchgear or equipment earth terminal.

2E-15-10 TELECOMMUNICATION BONDING CONDUCTORS (TBC)

Telecommunication bonding conductors (functional earthing conductors) shall be provided in strict accordance with BS EN 50310 and shall be pink in colour as required by BS 7671.

2E-15-11 HIGH INTEGRITY EARTHING

All sockets outlet final circuits shall be provided with high integrity protective conductor connections: -

1) Ring final circuits shall be provided with ring protective conductors.
2) Radial final circuits shall be provided with dual protective conductors effectively wired in a ring configuration.

All socket outlets (single and twin) shall be provided with dual earth terminals for the separate termination of these.

2E-16 DEFAULT CABLING & CABLE SUPPORT / CONTAINMENT SYSTEMS

The tables below detail the default cabling and support / containment systems that shall be used: -

INTERNAL / EXTERNAL POWER DISTRIBUTION SYSTEMS					
CABLE TYPE & CABLE SUPPORT / CONTAINMENT	**HV 11kV**	**LV TAILS (SEE NOTE 3)**	**LV TAILS (SEE NOTE 4)**	**LV MAINS & SUB-MAINS**	**LV FINAL CIRCUIT**
XLPE/SWA multicore armoured cables to BS 6622 / BS 7835 on cable ladder rack	✓	X	X	X	X
XLPE/SWA multicore armoured cables (Aluminium conductors) to BS 6622 / BS 7835 on cable ladder rack	O	X	X	X	X
XLPE/SWA multicore armoured cables to BS 6724 on cable ladder rack	X	O	X	O	X
XLPE/AWA single core armoured cables to BS 6724 on cable ladder rack	X	✓	X	O	X
XLPE/SWA multicore armoured cables to BS 6724 on cable tray	X	O	X	✓	O
XLPE/AWA single core armoured cables to BS 6724 on cable tray	X	O	X	O	X
XLPE split concentric cables to BS 7870-3 on cable tray	X	X	X	O	X
XLPE single core insulated and sheathed cables to BS 7211 on cable tray or in cable trunking	X	X	✓	X	X
6491* single core insulated non-sheathed cables to BS 7211 in metallic cable trunking / metallic conduit / dado with metallic dividers	X	X	X	O	✓
As above however with uPVC conduit replacing metallic conduit	X	X	X	O	O
6242* & 6243* XLPE flat multicore insulated sheathed cables (T&E) to BS 7211/BS 6004 in cable basket / metallic conduit / dado with metallic dividers (see Note 2 below)	X	X	X	X	O
As above however with uPVC conduit replacing metallic conduit	X	X	X	X	O
6242* & 6243* XLPE flat multicore insulated sheathed cables (T&E) to BS 7211/BS 6004 clipped / fixed direct to the building fabric / capping	X	X	X	X	O

Notes:

1) The specification of the Cable Support and Containment Systems is given in a later clause.

2) When installed within a protected escape route, LSZH flat twin and earth (T&E) cabling must be installed within metallic cable trunking / metallic conduit (and not within metallic cable basket / metallic conduit) to comply with the flame propagation requirements of BS 7671.

INTERNAL / EXTERNAL POWER DISTRIBUTION SYSTEMS					
CABLE TYPE & CABLE SUPPORT / CONTAINMENT	**HV 11kV**	**LV TAILS (SEE NOTE 3)**	**LV TAILS (SEE NOTE 4)**	**LV MAINS & SUB-MAINS**	**LV FINAL CIRCUIT**
3) LV tails that connect a transformer to the main LV panel.					
4) LV tails that connect the DNO LV cut-out to the main LV panel.					

BELOW GROUND POWER DISTRIBUTION SYSTEMS					
CABLE TYPE & CABLE SUPPORT / CONTAINMENT	**HV 11kV**	**LV TAILS (NOTE 3)**	**LV TAILS (NOTE 4)**	**LV MAINS OR SUB-MAINS**	**LV FINAL CIRCUIT**
XLPE/SWA multicore armoured cables to BS 6622 / BS 7835 buried direct below soft dig/paving in uPVC ducts.	✓	X	X	X	X
XLPE/SWA multicore armoured cables (Aluminium conductors) to BS 6622 / BS 7835 buried direct below soft dig / paving in uPVC ducts.	O	X	X	X	X
XLPE/SWA multicore armoured cables to BS 6724 (suitably approved by the manufacturer for being buried direct in the ground or in ducts) for buried direct below soft dig / paving and in uPVC ducts.	X	O	X	✓	✓
XLPE/SWA multicore armoured cables to BS 5467 buried direct below soft dig / paving and in uPVC ducts.	X	O	X	O	O
XLPE/AWA single core armoured cables to BS 6724 buried direct below soft dig / paving and in uPVC ducts.	X	✓	X	O	X
As above but ducted throughout their length.	O	O	X	O	O

Notes:

1) The specification of the Cable Support and Containment Systems is given in a later clause
2) Earthenware ducts are required for contaminated ground conditions
3) LV tails that connect a transformer to the main LV panel.
4) LV tails that connect the DNO LV cut-out to the main LV panel.
5) XLPE/SWA/PVC multicore armoured cables must run within the ground for their entire length and terminate into switchgear / equipment at the point of entry into the building. Under no circumstances shall they be run within buildings.

LIFE SAFETY, FIRE-FIGHTING & COMMUNICATION SYSTEMS					
CABLE TYPE AND CABLE SUPPORT / CONTAINMENT	**FIRE & SMOKE SYSTEMS**	**GENERAL ELV**	**VOICE / DATA**	**SECURITY SYSTEMS**	**BMS / CONTROLS**
XLPE/LSZH enhanced fire resistant multicore sheathed cables to BS 7629-1 (classification PH120) on cable tray / metallic conduit.	✓	X	X	X	X
LSZH single core cables to BS 7211 in metal trunking/conduit or dado with metal dividers.	X	✓	X	O	O
LSZH multicore cables on cable tray/metal conduit or in cable basket/metal conduit.	X	O	X	✓	✓
LSZH backbone fibre and copper (Cat 6 etc.) data cables in cable basket / metallic conduit / dado with metallic dividers.	X	X	✓	O	O
Mineral insulated (MICC) cables shall be manufactured to BS EN 60702.	O	X	X	X	X

Notes:

1) Voice alarms, central battery emergency lighting and other life safety / firefighting shall be as fire alarm & EVCS.
2) Disabled persons call system remote combined overdoor lamp / sounder units, remote control panels or when integrated into an EVCS system shall be as fire alarm & EVCS.
3) BMS cabling operating at LV shall be wired as LV final circuits.
4) When buried underground the above wiring systems shall be ducted throughout their entire length.
5) Standard fire-resistant cables with PH30 classification shall not be used for fire-fighting / life safety systems.

✓	Default cabling / cable support and containment system, shall be included at Tender and used for installation.
O	May only be used when detailed in a subsequent section of this specification and / or on the drawings.
X	Shall not be used.

2E-17 CABLE SUPPORT & CONTAINMENT SYSTEMS

This section of the specification details the general requirements for cable support and containment systems.

2E-17-1 SPARE CAPACITY WITHIN CABLE SUPPORT & CONTAINMENT SYSTEMS

Cable support and containment systems shall be provided with 30% spare capacity and also an additional 30% allowance shall be added to the calculated safe working load (SWL) for supports, for the provision of future cabling.

Where spare capacity is provided to cable ladder rack and cable tray, this shall be a dedicated section of the system and shall not be above or between installed cabling.

2E-17-2 GENERAL REQUIREMENTS FOR CABLE SUPPORT & CONTAINMENT SYSTEMS

All cable support and containment systems shall be provided as follows: -

1) They must be fully continuous throughout and utilise (where applicable) couplers, joint strips, connectors, brackets, bends, gussets, clips, clamps, risers, angles, tees, cross pieces, reducers, bell mouths, end caps, conduit boxes, adaptable boxes, conduit take-off plates and fixing components etc. from the same manufacturer.
2) Where visible, uPVC systems shall be from the same manufacturer so that variations in colour are avoided. uPVC systems shall not be used within environments that have extreme low or high temperatures.
3) Angles, bends, etc. shall be sized to accommodate the minimum bending radius of the largest cabling to be installed, based on the IET On-Site Guide, IET Guidance Note 1 and cabling manufacturer's recommendations.
4) Where possible cabling shall retain its position through all bends, tees, cross pieces etc. so that cross overs are minimised.
5) All fasteners, screws, bolts, washers, nuts, etc. clips shall be the proprietary type from the same material and manufacturer as the system. These shall not create snags that may cause damage to the cabling.
6) Where covers and partitions are specified, they must be from the same material and manufacturer as the system.
7) Covers / lids and dividers / partitions shall be fully continuous throughout the entire system. All covers / lids and dividers / partitions shall be fixed using the manufacturers proprietary screw fixings and self-tapping screws shall not be used.
8) Covers / lids shall be removable. However, where systems pass through the building fabric the covers / lids shall be cut to project 75mm on either side, remaining fixed when the structure is made good.
9) Printed labels shall be fixed at 10m intervals to denote the use of the system. These shall be external to single use systems and attached to partitions on multiple use systems.
10) Where galvanised steel systems, fittings or accessories are cut, all burrs must be removed and edges suitably painted with cold galvanise zinc-rich paint before erection. All cuts shall be straight and squared off. Any damage to the galvanised shall be similarly treated.
11) Where uPVC systems are cut all burrs must be removed and all cuts shall be straight and squared off where required.
12) Proprietary cutters / croppers shall be used in accordance with the manufacturer's recommendations.
13) Adequate allowance shall be made for thermal expansion and contraction. Expansion as opposed to rigid couplers shall also be used across expansion joints of the building structure. Connections that provide electrical continuity shall also allow for thermal expansion / contraction.
14) Calculations for flexible couplers shall be in accordance with the manufacturer's recommendations.
15) Where systems pass through the building(s) suitable measures shall be undertaken to prevent thermal bridging.
16) Non-metallic systems shall not be installed external to the building(s) e.g. uPVC conduit and fittings.
17) Under no circumstances shall slab fixed cable tie support systems be used.

2E-17-3 METAL CHANNEL CABLE SUPPORT SYSTEMS & OTHER ASSOCIATED SUPPORTS

Metal channel (e.g. Unistrut) and/or manufacturer's proprietary systems shall be used to support all cable management systems. The former shall comply with BS 6946. The latter shall be provided in strict accordance with the manufacturer's recommendations.

These systems shall be provided as follows: -

1) All components shall be formed from steel compliant with BS 1449-1 and shall be hot dip galvanised after manufacture to the requirements of BS EN ISO 1461.

2) Supports shall be provided at intervals to prevent excessive deflection of the cable management systems in strict accordance with the manufacturer's recommendations, subject to a minimum interval of 2000mm.

3) Supports shall be provided within 300mm of couplers, brackets, bends, risers, tees, crosspieces, reducers and all other fittings. Vertical cable management systems shall be fixed to metal channel at 1500mm centres.

4) All cut ends of metal channel shall be painted with cold galvanise zinc-rich paint and be fitted with plastic protective caps.

5) Threaded drop rods (minimum 8mm diameter) shall be secured to brackets or supports by vibration proof lock-nuts. All drop rods shall be straight and vertical. Manufacturers' proprietary angle brackets shall be used where necessary. Any projections shall be shortened to within 10mm and fitted with plastic end caps.

6) Supports shall not be shared between services unless designed specifically with this in mind.

7) Wire suspension systems shall not be used to support primary cable support and containment systems without written authorisation from the Engineer.

2E-17-4 FIRE RESISTANCE OF CABLE SUPPORT & CONTAINMENT SYSTEMS

The fire resistance of cable support and containment systems shall be as follows: -

1) All wiring systems shall be adequately supported to prevent premature collapse under fire conditions in strict accordance with BS 7671. Steel cable support and containment systems are deemed to meet this requirement.

   Under no circumstances shall: -

   a) Non-metallic cable clips or cables ties be used as the sole means of support for cables.

   b) Non-metallic cable trunking be used as the sole means of support of the cables therein.

   c) Non-metallic cable trunking systems pass through walls, floors or fire compartments.

2) All fixing anchors supporting cables or containment systems shall provide equivalent fire resistance. This precludes the use of plastic plugs or similar – all metal fixing anchors shall be used.

3) Containment, supports and clips/cleats/ties shall have the same fire survival time as any fire-fighting / life safety cabling that is being supported, in strict accordance with BS 8519 and BS 5839.

4) For life safety / fire-fighting cabling they shall be fully continuous throughout from source to destination and shall be formed from steel that has been hot dip galvanised after manufacture to the requirements of BS EN ISO 1461.

5) All components shall be sized and selected with consideration for the reduced tensile strength of steel in a fire situation and shall be in accordance with manufacturers' literature.

6) The cross sectional area of drops rods shall be calculated in accordance with BS 8519 and manufacturers' literature.

7) Cable cleats and supports for cable management systems shall be provided within 750mm of all fire barrier / stopping seals and shall be able to withstand the mechanical load induced by the collapse of wiring systems on the fire side of the seal, to prevent strain and damage to the seal, as required by BS 7671. This is not required if the seal itself is able to provide adequate support under such conditions.

8) Internal fire barriers shall be provided where metallic cable trunking systems pass through walls, floors or fire compartments, these fire barriers shall be rated in accordance with the fire compartmentation. Internal fire barriers shall also be installed within vertical cable trunking systems greater than 5m in height.

9) Fully continuous metallic systems that meet the necessary flame propagation requirements (as specified within their respective standards) shall be utilised as opposed to fire-rated clipping, unless agreed with the Engineer via the Contract Administrator.

2E-17-5 CABLE CLEATS & STRAPPING

Cable cleats and strapping shall comply with BS EN IEC 61914 and BS EN IEC 62275, be suitable for the environment in which they are installed, be adequately sized to suit the cable and installed at intervals recommended by the manufacturer. They shall be provided before and after all direction changes.

Where multiple cables share a route they shall run in an orderly manner and retain their positions through direction changes to minimise cross overs.

Cables up to 40mm diameter shall be supported at spacings detailed within the IET On-Site Guide and IET Guidance Note 1. Larger cables shall be supported at spacings as recommended by the manufacturer.

Cable cleats and strapping shall be provided as follows:

CABLING TYPE / SIZE	CABLE CLEAT / STRAPPING TYPE	FIXING METHOD
Single Core Cables	Aluminium alloy or nylon (LSZH) trefoil cable cleats – suitable for clamping three cables together	Two bolt fixings shall be used for vertical cable runs
Multi-Core Cables up to and including 25mm diameter	Perforated / pre-drilled galvanised steel / aluminium cable strapping (all round banding), where coated (LSZH)	Single bolt fixings to both sides of the cables
Multi-Core Cables greater than 25mm diameter	Aluminium alloy or nylon (LSZH) claw type cable cleats	Two bolt fixings shall be used for vertical cable runs

2E-17-6 CABLE LADDER RACK SYSTEMS

Cable ladder rack systems, including all fittings and components, shall: -

1) Comply with BS EN 61537 and be Extra Heavy-Duty type.
2) Be supported on heavy duty trapeze hangers where space allows.
3) Be formed from steel sheet compliant with BS 1449-1 and hot dip galvanised after manufacture to the requirements of BS EN ISO 1461. Deep galvanised, pre-galvanised, stainless steel, powder coated and non-metallic systems shall not be used unless specified elsewhere within this specification.
4) Have a free base area to Classification Z as detailed within BS EN 61537.

Cabling shall be fixed to the rack using straps, saddles or cleats depending upon the diameter of the cabling to be installed.

2E-17-7 CABLE TRAY SYSTEMS

Cable tray systems, including all fittings and components shall: -

1) Comply with BS EN 61537 and by heavy duty, return flange type (medium duty for fire alarm, EVCS or similar.)
2) Be supported from heavy duty trapeze hangers where space allows
3) Be formed from steel sheet compliant with BS 1449-1 and be hot dip galvanised after manufacture to the requirements of BS EN ISO 1461. Deep galvanised, pre-galvanised, stainless steel, powder coated and non-metallic systems shall not be used unless specified elsewhere within this specification.
4) Be perforated to Classification D as detailed within BS EN 61537.

   Cabling shall be fixed to the tray using straps, saddles or cleats depending upon the diameter of the cabling to be installed.
5) Conduit take-off plates, shall be utilised to connect conduit to the system.

The cable tray and conduit shall form a fully continuous system throughout from source to destination terminations.

2E-17-8 CABLE BASKET / WIRE MESH TRAY SYSTEMS

Cable basket / wire mesh tray systems shall comply with BS EN 61537 and shall be supported by metal channel and/or manufacturer's proprietary components e.g. cantilever arms, central hangers, suspension hangers, etc.

Where the term cable basket system is used within this specification it also refers to wire mesh cable tray systems.

Cable basket / wire mesh tray systems, including all fittings and components, shall: -

1) Comply with BS EN 61537
2) Be formed from steel wire welded into a mesh pattern and electro-galvanised after manufacture (electroplated with zinc) to the requirements of BS EN 12329 / BS EN ISO 2081. Deep galvanised, hot dip galvanised, stainless steel, powder coated and non-metallic systems shall not be used unless specified elsewhere within this specification.

3) Include bends, risers, tees, cross pieces etc. that are cut / formed on site using proprietary cutters / croppers in strict accordance with the manufacturer's recommendations.
4) Include conduit take-off plates to connect conduit to the system, the basket and conduit forming a fully continuous wiring channel from cable source to destination terminations.

   Cabling shall be fixed to the basket using cable straps and ties as required.
5) Under no circumstances shall systems be used to support armoured cables or be installed external to the building(s).

2E-17-9 CABLE TRUNKING SYSTEMS

GENERAL REQUIREMENTS

Cable trunking systems shall: -

1) Be supported at spacings as detailed in the IET On-Site Guide, Guidance Note 1 and manufacturers' recommendations.
2) Be sized as detailed within the IET On-Site Guide and IET Guidance Note 1 – Selection & Erection.
3) Utilise proprietary multi-compartment bends, tees and cross overs to maintain full segregation throughout.
4) Include cable retainers at intervals of 600mm where lids are to the bottom or side of the system.
5) Include pin racks on vertical runs at 2m intervals.
6) Provide at least the degree of protection of IP4X or IPXXD to BS EN 60529 and require the use of a tool or deliberate action to secure or remove the trunking lid.
7) Not be installed external to the building(s).

METALLIC CABLE TRUNKING SYSTEMS

This section of the specification does not apply to metallic dado trunking systems.

Metallic cable trunking systems, including all fittings and accessories, shall: -

1) Comply with BS EN 50085
2) Be formed from steel sheet and shall be pre-galvanised before manufacture to the requirements of BS EN 10346. Deep galvanised, hot dip galvanised, stainless steel, powder coated and non-metallic systems shall not be used unless specified elsewhere within this specification.
3) Include circular conduit boxes or couplings, brass male bushes and serrated washers to connect conduit to the system, the trunking and conduit forming a fully continuous containment system from cable source to destination terminations.
4) Not contain conduits passing through compartments to reach the destination compartment
5) Not be used as a circuit protective conductor (CPC) for final circuit wiring, (although shall satisfy the requirements of a CPC where used to provide protection against impact).

uPVC CABLE TRUNKING SYSTEMS

This section of the specification does not apply to non-metallic dado trunking systems.

Non-metallic cable trunking systems, including all fittings and components, shall: -

1) Comply with BS EN 50085 and BS 4678.
2) Be fixed and supported in accordance with manufacturers' recommendation
3) Be heavy gauge white uPVC with the following properties: -
   a) Corrosion resistance.
   b) High impact resistance.
   c) Non-flame propagating.
   d) Self-extinguishing.
4) Not be used unless specified elsewhere within this specification and never in conjunction with metal conduit.
5) Include manufacturer's proprietary couplers, bends, tees, cross overs, end caps etc. and NOT trunking lengths cut on site to form components.

6) Include conduit boxes or couplings / male bushes to connect conduit to the system, the trunking and conduit forming a fully continuous containment system to IP4X or IPXXD from cable source to destination terminations.

2E-17-10 DADO, SKIRTING & BENCH TRUNKING SYSTEMS

GENERAL REQUIREMENTS

1) Where applicable the general requirements for cable trunking systems shall also apply.
2) Systems shall comply with BS EN 50085 and BS 4678.
3) Systems shall be fixed and supported in accordance with manufacturer's recommendations.
4) Systems shall be suitable for all the types of cabling to be installed, including the category of data cabling (e.g. Cat 6A) and shall not impair the performance of the cabling.
5) Systems shall have a minimum of two compartments and it shall be possible to install manufacturer's proprietary 45mm deep back boxes. (35mm in bench trunking.).
6) Signalling and data cabling shall be installed within a separate compartment to LV wiring and steel screening dividers having a minimum thickness of 1.5mm shall be provided.
7) Dado and skirting trunking shall include cable retainers at intervals of 600mm.
8) Dado and skirting trunking systems shall generally include vertical sections linking to primary containment in the ceiling void. However, where conduit drops are used, these shall be concealed (flush) and connect to the trunking via recessed circular conduit boxes located immediately behind the destination compartment. The number of conduit drops shall be such that 100% spare capacity remains once the specified cables have been installed.

METALLIC DADO, SKIRTING & BENCH TRUNKING SYSTEMS

Metallic dado, skirting and bench trunking systems, including all fittings and components, shall: -

1) Be formed from steel sheet and shall be pre-galvanised before manufacture to the requirements of BS EN 10346 (unless Aluminium systems are specified elsewhere in this specification).
2) Have a white powder coat finish to RAL 9010 or RAL 9003.
3) Include proprietary components selected to suit either dado trunking, skirting or bench trunking systems.

uPVC DADO, SKIRTING & BENCH TRUNKING SYSTEMS

Non-metallic dado, skirting and bench trunking systems shall comply with the requirement given earlier for general uPVC trunking systems and shall include proprietary components selected to suit dado trunking, skirting trunking or bench trunking.

2E-17-11 CONDUIT & FITTINGS

GENERAL REQUIREMENTS

1) Conduit sizes and support spacings shall be as detailed within the IET On-Site Guide and IET Guidance Note 1.
2) Conduit systems shall include spare capacity so that 30% more cable/s of a similar size and type can be installed.
3) Conduits shall be dedicated to a single system/service.
4) The conduit system shall include sufficient accessible draw points to facilitate re-wiring or installation of additional cables in the future. Conduit behind inaccessible ceilings shall be configured as a loop-in system.
5) Conduits less than 20mm diameter shall not be used.
6) Surface conduits shall also be supported within 300mm of floors, ceilings, boxes and at each side of every bend.
7) Fixing of conduits shall be as follows: -
    a) Wall chases or floor screed – Crampets or ordinary saddles.
    b) Ceiling, roof or floor voids – Spacer bar saddles.
    c) Surface mounted on ceiling – Spacer bar saddles.

d) Surface mounted on walls – Distance saddles.

8) Bends, elbows, tees or u-bends shall not be used. Bends for metallic conduit shall be formed on a proprietary bending machine. uPVC bends shall be formed using a suitably sized spring and by the application of heat.

9) Where conduits are installed for use by third parties, draw wires shall be provided to facilitate the installation of cabling.

10) All conduit boxes and adaptable boxes shall be filled with moisture repelling compound or have drains where there is a risk of condensation and within plantrooms / external locations all box lids shall be fitted with gaskets. In damp environments conduits shall enter wiring accessories from the bottom to prevent the build-up of moisture.

11) Chasing of walls must be carried out in accordance with the Structural Engineer's recommendations. Horizontal chases exceeding 500mm in length or Back to back chasing is not permitted.

12) Conduit shall not be installed within floor screeds or cast-in unless detailed elsewhere within this specification.

METALLIC CONDUIT & FITTINGS

Metallic cable conduit shall comply with BS EN 61386 with resistance to corrosion classification of 'Class 4' and shall: -

1) Comply with BS EN 61386 and have resistance to corrosion classification 'Class 4'.

2) Be formed from heavy gauge steel and hot dip galvanised after manufacture to the requirements of BS EN ISO 1461.

3) Connect to accessory boxes on a concealed installation with couplings, brass male bushes and serrated washers. For surfaces installation, flanged couplers with lead washers shall be used.

4) Be threaded to butt closely together in couplings and sockets.

5) Avoid exposed threads, except at running couplings, where they shall be cleaned, primed and painted with cold galvanise zinc-rich paint after installation.

6) NOT include pressed steel accessories and all conduit boxes, adaptor boxes and accessories shall be formed from malleable cast iron.

7) NOT be used as a circuit protective conductor (CPC) for final circuit wiring, (although shall satisfy the requirements for a CPC where providing protection against impact).

8) NOT include push-fit / quick-fit conduits – all conduit joints shall be threaded.

uPVC CONDUIT & FITTINGS

uPVC conduit and fittings shall be provided as follows: -

1) It shall comply with BS EN 61386 and shall be heavy gauge white or black uPVC and have the following properties: -
   a) Corrosion resistance.
   b) High impact resistance.
   c) Non-flame propagating.
   d) Self-extinguishing.

2) It shall not be used unless specified elsewhere within this specification.

3) Connections to accessory boxes shall be with couplings / male bushes and care must be taken to ensure that all joints are glued correctly.

4) In extremely cold weather the cable conduit shall be slightly warmed before use in accordance with the manufacturer's recommendations.

5) Proprietary steel or brass insert clips shall be fitted where luminaires are suspended from circular boxes to ensure that the weight of the luminaries is carried by the structure rather than the conduit box.

FLEXIBLE & PLIABLE CONDUIT

Flexible and pliable conduit shall comply with BS EN 61386 and be provided as follows: -

1) Metallic flexible conduit shall be formed from helical coiled steel with an overall waterproof sheath.

2) Non-metallic flexible conduit shall be heavy duty, corrosion resistant and non-flame propagating.
3) Non-metallic flexible conduit shall not be used unless specified elsewhere within this specification.
4) Generally it shall be used for the final connection to the following: -
   a) Equipment that is required for ducting, pipework etc. such as control sensors, motorised valves etc.
   b) Equipment subject to vibration e.g. motors, pumps etc.
   c) Equipment where movement may be required for maintenance / access.
5) It shall be connected to conduit boxes and equipment termination boxes using compression glands.
6) The length of flexible conduit shall not exceed 1000mm.
7) Non-metallic flexible conduit shall not be used in environments where heat may be detrimental to its material properties or where additional mechanical protection may be required.

2E-17-12 BELOW GROUND CABLING

DEPTH REQUIREMENTS

Cabling and ducting shall be buried at the following depths unless detailed elsewhere within this specification and/or drawings. These depths are from final finished ground level and care shall be taken to ensure that this is checked prior to installation.

CABLING TYPE / SIZE	MINIMUM DEPTH OF LAYING
High Voltage – 11kV	800mm
Low Voltage	600mm
Communications	450mm
BT Openreach	450mm

All buried cabling and ducting shall also be provided in accordance with NJUG National Joint Utilities Group guidelines.

EXCAVATION

Excavation shall be provided as follows: -

1) All trenches for cables must be straight between points where there are no changes in direction. Trenches must not have step changes in level but be gradual where needed.
2) The bottom of trenches must be smooth and free from stones.
3) Where excavations reveal unsuitable ground containing rocks or ashes with a predominant or unusual chemical content, or any conditions liable to affect the life or performance of the cable, it must be brought to the attention of the Engineer.
4) Means are to be proposed and agreed via the Contract Administrator to minimise the effects on works traffic due to required excavations.
5) Where trench depths exceed 1.2m, trench boarding must be provided.
6) Where other services are encountered, during excavation, adequate support and protection must be provided particularly when digging, backfilling and cable pulling.
7) In conditions which may result in trenches flooding, the provision of pumping equipment must be allowed for. The method of disposing of pumped liquid must be approved.

CABLING IN TRENCHES

Cabling in trenches shall be provided as follows: -

1) Cables must be laid in the trenches using roller, or other approved devices, to prevent dragging, and consequent abrasion.
2) A minimum horizontal space of 300mm must exist between adjacent cables of differing service unless otherwise specified.

3) Cables must be laid on a bed of not less than 100mm of soft sand and covered with a further 150mm of hand compacted soft sand. Sifted soil may be used as an alternative, subject to approval via the Contract Administrator.

4) Earthenware or Stokbord, concrete/polypropylene interlocking cover tiles must be laid on the sand/earth directly above and 75mm from the cables, to provide covering at least 50mm wider than the space occupied by the installed cables. The cable tiles must be covered with 75mm of hand compacted, excavated material free from stones or other sharp objects.

5) Backfilling must be compacted in layers not deeper than 250mm and the final surface reinstated so that after settlement it must be consistent with the surrounding surface level. Surplus material must be disposed of.

6) The excavation must be inspected 12 weeks after the ground finish has been completed, and any hollows must be filled using approved materials and methods.

7) Plastic cable marking tape shall be laid at a depth of 200mm, using multiple runs as necessary to cover the width occupied by the cables. The tape must be yellow with black text "CAUTION ELECTRIC CABLE BELOW" printed along its length.

8) Where cables are laid along routes on which the ground will not immediately be made up to its final level, the routes must be marked by temporary notices indicating the danger present, over the total length of the route involved.

9) All temporary markers must be of a durable weatherproof nature and be approved.

10) The ground finish on completion must be similar to that in the immediate area.

CABLE DUCTS

Cable ducts shall be provided as follows: -

1) They must be of reputable manufacture, made from uPVC unless otherwise specified and of minimum 150mm diameter.

2) Earthenware cable ducts shall be used where there are contaminated ground conditions.

3) The ducts must be laid and bedded in such a way as to prevent damage from rocks etc.

4) Where cables pass under areas of hard standing or through foundations etc, they must be enclosed in pipe ducts or sleeves. Protection of ducts running under roads etc. shall be by concrete haunchings or other approved suitable means.

5) The provision of cable draw pits at points of route deviation, and the transition from open ground to ducts must be agreed via the Contract Administrator. Draw pits shall be suitably sized taking into account the number, type and size of cables to be installed. Deep draw pits must be of a sufficient size to allow access to the lowest ducts.

6) High voltage cables must be run in separate ducts to any low voltage cables.

7) Where new ducts clusters are being installed, 25% of the total ways available must be spare, with a minimum of two, unless single way ducts are specified. All spare ducts must be sealed against ingress of water and or vermin, with proprietary products approved by both the duct and cable manufacturer.

8) Cable ducts shall be laid at a gradient away from building entries.

9) A nylon draw cord must be left in each spare duct for its entire length and in any used ducts with spare capacity.

10) Before cables are drawn into any ducts, new or existing, the ducts must be swabbed to ensure that it is free of debris.

11) Before cables are drawn into ducts the entry points must be protected by temporary bellmouths to ensure that there is no damage to the outer serving of the cable during the pulling operation.

12) Following the drawings in of the cable, the duct must be sealed using materials or devices authorised to provide protection against water, vermin, passage of gases, fire etc. These shall be a proprietary product from a specialist manufacturer such as CSD Sealing Systems Ltd.

2E-17-13 SURFACE / EXPOSED CABLE SUPPORT & CONTAINMENT SYSTEMS

Where surface/exposed primary (e.g. cable ladder, tray and trunking) and secondary (e.g. final conduit runs) containment is acceptable, the location and routing of these systems must be agreed with the Engineer/Contract Administrator prior to installation.

2E-17-14 DESIGN REQUIREMENTS

The Contractor shall assume design responsibility for those aspects of the Electrical installation detailed in Section 1B.

2E-18 CABLING & WIRING SYSTEMS

This section of the specification details the general requirements for cabling and wiring systems.

2E-18-1 DEFINITION OF TERMS

Key definitions applicable to this section of the specification:

ABBREVIATION / MEANING			
AWA	Aluminium wire armour	CSP	Chlorosulphonated polyethylene
CY	Multi-core insulated and sheathed PVC or LSOH cables with internal copper wire braiding	EPR	Ethylene propylene rubber
GSWB	Galvanised steel wire braid	HOFR	Heat oil resistant, flame retardant
LSF	Low smoke and fume	LSOH LSZH OHLS	Low smoke zero halogen – Emissions of hydrogen chloride gas < 0.5%
MI	Mineral insulated	PILC	Paper insulated lead covered cables
PVC	Polyvinyl chloride	SWA	Steel wire armour
SY	Multi-core insulated and sheathed PVC or LSOH cables with external steel wire braiding and outer transparent sheathing	TRS	Tough rubber sheath
XLPE	Cross-linked polyethylene	YY	Multi-core insulated and sheathed PVC or LSOH cables

2E-18-2 GENERAL REQUIREMENTS

All fixed wiring power, control and communication cables shall: -

1) Meet the flame propagation requirements of BS EN 60332-1-2 and the BS EN 60332-3 series (where possible).
2) Satisfy the requirements of the Construction Products Regulation in respect of their reaction to fire by being provided in strict accordance with their respective European and British.
3) Be LSZH (LSOH, OHLS) with emissions of hydrogen chloride gas < 0.5%. (Note: General 'LSF' cabling does not comply).

2E-18-3 MANUFACTURERS' IDENTIFICATION OF CABLES

All cables shall have manufacturers' identification, date of manufacture and a specification reference / standard number printed on the sheath to enable testing, if necessary, and traceability.

2E-18-4 GENERAL LV INSTALLATION CABLES

CABLE TYPE	CABLE SPECIFICATION
Single core armoured cables	694*B XLPE/AWA/LSZH single core armoured cables shall be manufactured to BS 6724.

CABLE TYPE	CABLE SPECIFICATION
Multicore armoured cables	694*B XLPE/SWA/LSZH multicore armoured cables shall be manufactured to BS 6724.
Split concentric cables	XLPE/LSZH split concentric cables shall be manufactured to BS 7870-3.
Single core insulated non-sheathed cables	6491B LSZH single core insulated non-sheathed cables shall be manufactured to BS 7211.
Single core insulated sheathed cables	6181B XLPE/LSZH single core insulated sheathed cables shall be manufactured to BS 7211.
Flat insulated sheathed cables – Flat twin and earth cables	6242B & 6243B XLPE/LSZH flat multicore insulated sheathed cables shall be manufactured to BS 7211.
Mineral insulated (MICC) cables	Mineral insulated (MICC) cables shall be manufactured to BS EN 60702.
Flexible plastic cables and cords	LSZH/LSZH flexible plastic cables shall be manufactured to BS EN 50525.
Flexible rubber cables and cords	EPR/HOFR flexible rubber cables and cords shall be manufactured to BS EN 50525. EPR or VIR/TRS flexible rubber cables and cords shall be manufactured to BS EN 50525.
* Denotes the number of cores in a multicore armoured cable and can be 2, 3, 4 or 5 cores.	

2E-18-5 INSTALLATION & USE OF 'NON-STANDARD' CABLES OR CABLES TO BS 8436

Cables for low voltage installation shall be selected from table above. Under no circumstances shall the following cables be used.

1) SY cables – LSZH/GSWB/LSZH or PVC/GSWB/PVC – Steel braided, translucent sheath, insulated flexible conductors.
2) YY cables – LSZH/LSZH or PVC/PVC – Usually grey sheath, insulated flexible conductors.
3) CY cables – LSZH/LSZH or PVC/PVC – Tinned copper wire braid, usually grey sheath, insulated flexible conductors.

   Where, S = steel braid, Y = LSZH or PVC, C = copper braid.

SY, CY and YY cables that comply with relevant parts of BS EN 50525 and have LSZH sheaths may be used for ELV controls wiring. However, they must not pass from one fire segregated compartment to another unless they comply with the flame propagation requirements of BS EN 60332-1-2 and the BS EN 60332-3 series (where possible).

2E-18-6 FIRE RESISTANT CABLES FOR LIFE SAFETY & FIRE-FIGHTING APPLICATIONS

Cabling to life safety and fire-fighting equipment shall comply with BS 8519 and all supporting standards / documents, the relevant code of practice(s) appropriate to the application and shall be installed in such a manner that circuit integrity will not be impaired during a fire.

Where primary and secondary power supplies are required, they shall: -

1) Both have the same fire survival times
2) Each run back to their respective sources using appropriately fire rated cables at every intermediate level of distribution.
3) Be suitably separated from each other and have diverse cabling routes.

Cable support and containment systems shall have the same fire survival time as the cabling that is being supported.

All life safety and fire-fighting cabling shall be: -

CABLE TYPE	CABLE SPECIFICATION
Soft skin cables	XLPE/LSZH enhanced fire resistant cables manufactured to BS 7629-1. Classification PH120 when tested in accordance with BS EN 50200. Resistance to integrated water spray and mechanical shock test to BS 8434-2 (60 mins – fire and mechanical impact, followed by 60 mins – fire, mechanical impact and water). e.g. Draka FT120, Prysmian FP Plus or similar.
Multicore armoured cables	XLPE/SWA/LSZH enhanced fire resistant armoured power cables manufactured to BS 7846. Classified Category F120 – Resistance to fire with direct mechanical impact and water jet assessed in combination, when tested in accordance with BS 8491 for 120 mins. e.g. Draka FTP120, Prysmian FP600S or similar.
Notes: 1) All life safety / fire-fighting network cabling (e.g. fire alarm, EVCS etc.) shall be soft skin cabling as above. 2) Standard fire resistant cables with PH30 classification shall not be used.	

The above cables shall be used for power and control cabling associated with all life safety and fire-fighting applications, including: -

1) Fire and smoke alarm systems,
2) Emergency evacuation systems, (including central battery emergency lighting),
3) Emergency communications systems (including disable refuge alarms).
4) Smoke extract or clearance systems (including associated ventilation opening e.g. sliding doors).
5) Smoke control systems (including pressurisation systems and zone controlled smoke dampers).
6) Automatic fire suppression systems (e.g. water spray, water mist, gas, powder etc.).
7) Non-automatic fire suppression systems (pumped wet riser).
8) Domestic sprinkler system (including booster sets serving both sprinklers and potable water.
9) Automatic fire or smoke barriers (unless these fail safe).

2E-18-7 FIRE PERFORMANCE OF TELECOMMUNICATIONS (VOICE / DATA) CABLING

Telecommunication cables shall satisfy CPR in terms of reaction to fire by being provided in accordance with BS 6701: -

1) All internal cabling shall meet the requirements of: -
   a) EuroClass C_{ca} –s1b, d2, a2 in accordance with BS EN 13501-6.
   b) BS EN 60332-1-2.
   c) BS EN 60332-3-24 (where possible).

   (This shall include cabling run externally where it enters and runs through buildings to equipment locations but does not apply to cabling run externally which terminates into equipment at the point of entry into a building).
2) All other telecommunications cabling shall meet the requirements of:
   a) EuroClass E_{ca} in accordance with BS EN 13501-6; or
   b) BS EN 60332-1-2.

2E-18-8 CABLE GLANDS

Cable glands shall be manufactured to BS 6121 and BS EN 62444, and shall be provided as detailed below: -

TECHNICAL DETAILS	CABLE TYPE		
	STEEL WIRE ARMOUR (SWA) CABLES	ALUMINIUM WIRE ARMOUR (AWA) CABLES	WIRE BRAID ARMOUR (GSWB) CY & SY CABLES
Gland type	CW Brass Gland	CW Aluminium Gland	RXT Brass Gland
Ingress protection	IP66 to BS EN 60529	IP66 to BS EN 60529	IP66 to BS EN 60529
Temperature	-20°C to 90°C	-20°C to 90°C	-20°C to 90°C
Gland material	Brass to BS 2874	Aluminium	Brass to BS 2874
Seal material	LSZH silicone	LSZH silicone	LSZH silicone
Shroud material	LSZH silicone	LSZH silicone	LSZH silicone
Shroud colour	Black	Black	Black

Notes:

1) To achieve the IP66 rating a sealing washer must be provided between the gland and the housing.
2) An earth tag washer / ring must be provided.

Glands for single core AWA cables shall be installed into non-ferromagnetic metal gland plates (e.g. aluminium / brass).

Cable glands for life safety / fire-fighting cabling shall have the same fire survival time as the life safety / fire-fighting cabling being installed. The cable gland shroud shall be the same colour as the life safety / fire-fighting cabling to be installed.

Cable glands for hazardous areas (ATEX and explosive atmospheres) shall be suitably certified for use in that environment.

In other instances, cable glands may be manufactured from durable nylon, however they must provide adequate mechanical protection and be suitably IP rated to suit the environment in which they are installed.

All non-metallic parts to cable glands shall be low smoke zero halogen (LSZH) and shall not be low smoke and fume (LSF).

2E-18-9 TECHNICAL SUBMISSIONS

Prior to installation on-site the Contractor shall provide technical submissions for all cabling and wiring systems to be installed.

The time allowed for comment shall be as detailed within section 1B of this specification.

2E-19 INSTALLATION OF FLAT INSULATED SHEATHED CABLES (FLAT TWIN & EARTH)

This section of the specification details the installation requirements for 6242B and 6243B XLPE/LSZH flat insulated sheathed cables (twin / triple and earth) manufactured to BS 7211 and for 6242Y and 6243Y XLPE/PVC to BS 6004. These clauses only apply if twin and earth is the specified wiring system.

GENERAL REQUIREMENTS

1) Twin and earth cabling shall be installed within cable basket and conduit throughout its length.
2) If specifically allowed elsewhere within this specification it may be clipped direct.
3) Regardless of the above installation methods:
   a) Cables that are concealed within walls or partitions at a depth of less than 50mm shall be installed within the prescribed zones detailed within BS 7671 and additional protection shall be provided by RCD's
   b) Cables installed in a wall or partition with an internal construction which includes metallic parts other than just metallic fixings (e.g. metal stud partitions) shall have additional protection provided by RCD's

4) Requirements to provide adequate supports to prevent premature collapse under fire conditions as detailed earlier in this section apply equally to twin and earth cabling.
5) The exposed circuit protective conductor core shall be provided with green and yellow sleeving to the point of termination which shall be secured in place by means of insulation tape or heat shrink.
6) Under no circumstances shall twin and earth cabling be laid on suspended ceilings.

Note: When installed within a protected escape route, LSZH flat twin and earth (T&E) cabling must be installed within metallic cable trunking / metallic conduit (and not within metallic cable basket / metallic conduit) to comply with the flame propagation requirements of BS 7671.

CABLE BASKET & CONDUIT INSTALLATION

The basket and conduit installation given earlier in this section fully applies when it is used for twin and earth cabling.

CLIPPED / FIXED DIRECT INSTALLATION

When twin and earth cabling is clipped / fixed directly to the building fabric the following shall apply: -

1) It shall be recessed within the building fabric and shall be adequately supported along its entire length.
2) Proprietary LSZH cable clips shall be used.
3) Clips shall be provided at no less than 250mm spacing's when horizontal and 400mm spacing's when vertical. Cable clips shall also be provided where the cable bends.
4) Under no circumstances shall joists be notched or sawn. Where there are concerns over structural integrity this shall be brought to the attention of the Engineer and Contract Administrator.
5) Where a minimum installation depth of 50mm cannot be achieved in joists / battens in ceilings and floors, twin and earth cables must be installed within metallic conduit and must be equipotential bonded.
6) All holes in boxes and accessories shall have suitably sized rubber grommets.
7) The outer sheath of twin and earth cabling must project at least 10mm into boxes and accessories.
8) Cables shall run in continuous lengths between wiring points i.e. without joints or junction boxes.
9) When installed within partition walls cables shall be drawn through suitably sized holes in noggins / vertical studs at the centre line of the partition construction.

2E-20 WIRING ACCESSORIES

Wiring accessories shall comply with BS 8300, The Building Regulations – Approved Document M and BS 7671. They shall be IP rated to suit their environment (or maintain IP rating of equipment) and installed in accordance with manufacturers' recommendations.

All flush accessories shall be from a common manufacturer and range to achieve a neat and homogenous appearance. This includes audio visual and voice/data system outlets.

Under no circumstances shall screw less, clip-on accessories be used.

A difference of 30 points in Light Reflectance Value (LRV) shall be provided between wiring accessories and their surroundings.

Unless otherwise specified in the system specific sections, wiring accessories shall be dark grey with white rockers on light coloured surrounds.

The appearance and colour shall be agreed in writing with the Engineer, Architect and Contract Administrator prior to installation.

2E-20-1 TECHNICAL SUBMISSIONS

Prior to installation on-site the Contractor shall provide technical submissions for the following: -

1) A schedule (including images) and technical specifications for all wiring accessories, along with a physical sample of each wiring accessory type.
2) A physical sample of coloured surrounds / side wings (where called upon elsewhere within this specification).

The time allowed for comment by the Engineer shall be as detailed within section 1B of this specification.

2E-21 POSITIONING & MOUNTING HEIGHTS OF ELECTRICAL SERVICES

Electrical services shall be positioned in accordance with relevant British Standards and in particular BS 8300, and The Building Regulations – Approved Documents M & P.

Compliance with these standards allows a range of mounting heights as shown in the table below, with the preferred height shown underlined. These shall be used as the default heights unless indicated otherwise in system specific sections of this document and the associated drawings, or on architect's room elevation drawings.

All outlet locations shall be marked up on site and agreed with the Engineer/Architect prior to installation.

EQUIPMENT / ACCESSORY	MOUNTING HEIGHT AFFL TO THE CENTRE	NOTES
Metering:		
Metering	1200 –1400mm	Readings shall be visible to a person standing or sitting. Prepay meters shall be protected to prevent child tamper.
Lighting:		
Lighting switches and controls	1000 – 1200mm	Horizontally aligned with door handles (TBC).
Lighting switches for public use	900 – 1100mm	Horizontally aligned with door handles (TBC).
Lighting pull cords	1000 – 1200mm	Bottom of the pull cord to be located within this range.
Outlets:		
13A socket or data/voice outlets	450 – 1000mm	Or 150mm above desks/worktops (1050mm max)
Shaver socket outlets	800 – 1000mm	Generally, to one side of a mirror.
Bathrooms for wheelchair uses:		
Switches, sockets, stopcocks and controls	700 – 1000mm	Outlets switches and controls shall be a minimum of 300mm from the corners of the room.
General:		
Isolators, switches and controls	1200mm	Dependent on equipment being supplied.
Domestic consumer units	1350 – 1450mm	To centre of isolator/lowest row of protective devices
Cooker control units	750 – 1200mm	At least 100mm from the edge of the cooker hob.
Clocks	2500mm	Or 150mm from the top of the clock to the ceiling
Fire alarm:		
Fire alarm control panels	1200mm	At main entrance agreed central control point.
Manual call points	1200mm	
Visual alarm devices	Not less than 2100mm	Dependent on manufacturer to achieve compliance.
Optical beam detectors	Not less than 2700mm	

EQUIPMENT / ACCESSORY	MOUNTING HEIGHT AFFL TO THE CENTRE	NOTES
Door entry and access control:		
Proximity reader (card / fob) / release push button / activation pad	900 – 1100mm	Preferably adjacent to the door handle and within 200mm of the door frame.
Swipe insertion-type reader	900 – 1000mm	As above.
Green emergency break glass	1000 – 1200mm	To align with other door access devices.
Emergency assistance alarm systems:		
Emergency assistance pull cord	800 – 1000mm & 100mm	Two red bangles, one at each of the heights given.
Emergency assistance reset button	800 – 1000mm	
Emergency voice communication systems (EVCS) – Disabled refuge systems:		
Main station / control panels	1200mm	Generally adjacent to the fire alarm panel
Outstations	1200mm	
Fire-fighting:		
Fire-fighters switches	1200mm when internal 2750mm when external	Adjacent to fire alarm panel (where internal)
Intruder alarm:		
Intruder alarm control panels and keypads	1200mm	
Electric vehicle charging systems:		
Socket outlets	750 – 1200mm	
Equipment with visual displays, however no controls, switches or pushbuttons:		
Equipment with visual displays	1200 – 1400mm	
Emergency lighting:		
Emergency lighting luminaires	Not less than 2000mm	
Mechanical services controls:		
Heating and ventilation controls	750 – 1000mm	See also Controls section of this specification.

Notes:

1) Outlets and controls shall be a minimum of 350mm from the corners of a room or area, unless otherwise stated.
2) Electrical equipment / accessories of the same type shall be mounted at the same height throughout the building.
3) The mounting heights for fire alarm and EVCS control panels may be increased based on agreement of the personnel responsible for their management if ratified by the local fire authority / building control.

2E-22 ENGINEERS & ARCHITECTS DRAWINGS

All visible elements of the electrical installation shall be set out as detailed on agreed Architect's/Specialist's elevation drawings. In the absence of these the Contractor shall produce elevation drawings for approval.

Any discrepancies between the elevation drawings and this specification (e.g. mounting heights) this shall be brought to the attention of the Contract Administrator for further guidance/instruction.

The symbols used on the Engineer's drawings are not to scale so allowance shall be made for locating any item within a 1000mm radius of the indicated position at no further cost.

The above submissions and liaison shall take place in a timely manner to suit the construction programme.

2E-23 FIXINGS TO THE BUILDING STRUCTURE / FABRIC

These shall comply with BS 5080, BS 8000, BS 8539, BS 7671 and all supporting IET documentation.

Fixings shall not compromise the structural, acoustic or fire performance of the building. The following fixing methods are likely to be acceptable: -

FIXING APPLICATIONS / BASE MATERIALS	FIXING TYPE
Building structural steelwork	Clamp-on bracketry e.g. flange clamps
Heavy loads to concrete, blockwork and brickwork	Proprietary fixings such as metallic expansion anchors / bolts
Light loads to concrete, blockwork and brickwork	Proprietary fixings such as metallic expansion anchors/bolts, plugs/screws
Plasterboard	Wooden patresses, noggins and battens with wood screws Proprietary fixings such as expansion plugs / screws, self-drive fixings, plastic toggles, spring toggles, etc.
Wood	Screws

The following fixing methods are <u>not</u> acceptable: -

FIXING APPLICATIONS / BASE MATERIALS	FIXING TYPE
Building structural steelwork	Cutting and drilling of the buildings structural steelwork
Building structural steelwork	Welding to the buildings structural steelwork
Blockwork and brickwork	Fixings to blockwork and brickwork in the mortar joint.

All fixing anchors supporting cables shall provide fire resistance so as to prevent their premature collapse during a fire as detailed earlier.

2E-24 ROOM DATA SHEETS (WHERE PROVIDED)

Power supplies, electrical equipment, wiring accessories etc. shall be provided as detailed on the room data sheets.

Any discrepancies between the rooms data sheets and the Architect's / Engineer's drawings / specifications shall be brought to the attention of the Contract Administrator and written confirmation obtained prior to submission of tender costs to clarify the requirements, and in the absence of such the more onerous requirements shall be included.

2E-25 ELECTRICAL EQUIPMENT AND SPECIALISTS SCHEDULES

The appendices to subsequent sections of this specification include Electrical Equipment & Specialists Schedules which detail specialists, manufacturers, product ranges and materials (where applicable) that shall be included in the tender submission.

Where possible a number of suppliers have been provided for items of equipment to give a reasonable choice to the Contractor.

Where more than one specialist, manufacturer, product range or material is specified, this may be due to: -

1) Alternatives not being available which are equivalent.
2) To match existing site installations or site standards.
3) Specification by the Employer.

Reference shall be made to Section 1B with regards to the proposal of alternative equipment.

Section 2F

Electrical Inspection and Testing

Contents

2F-1 GENERAL DESCRIPTION

This section details the inspection and testing requirements for new installation work (including alterations and additions to existing installations) and the replacement of electrical switchgear).

These requirements shall be followed unless there are explicit instructions to the contrary in a subsequent section of this specification (e.g. site specific witnessing requirements). Where such instructions are unclear or only inferred, written confirmation from the Engineer shall be obtained prior to submission of tender costs to clarify the requirements, and in the absence of such the more onerous requirements shall be included.

Throughout this section references are made to requirements and recommendations detailed within several statutory and non-statutory standards / documents. It shall be noted the information presented herein is in no way intended to replace the detailed information provided within these documents which must be fully adhered to where applicable.

This section does not cover the testing of specialist systems e.g. lighting controls, fire-fighting and life safety systems, security systems, communication systems etc. Requirements for these systems are detailed in the relevant section dealing with that system.

2F-2 DEFINITIONS

Refer to Section 2E / Section 1B of this specification and Part 2 of BS 7671 – IET Wiring Regulations – Requirements for Electrical Installations for further details regarding definitions, symbols and abbreviations.

Additional definitions specifically associated with inspection and testing are as follows:-

Departure – Deliberate decision not to comply fully with the requirements of BS 7671 for which the designer must declare that the resultant degree of safety is not less than that achievable by full compliance.

EIC – Electrical Installation Certificate.

EICR – Electrical Installation Condition Report (formerly known as Periodic Inspection Report).

Inspector – Refers to the person(s) employed by the Contractor responsible for undertaking the inspection and testing works.

Qualified Supervisor – Refers to the person employed by the Contractor responsible for overseeing the inspection and testing works. They shall also be responsible for the review and verification of the certification and/or reports.

The Inspector may also be the Qualified Supervisor.

Non-compliance – A non-conformity that may give rise to danger.

New Installation Works – Refers to new installation work, and for alterations or additions to existing installations where new circuits have been introduced. This includes the replacement of existing electrical switchgear such as low voltage switch panels, MCCB panel boards, MCB distribution boards, consumer units etc.

Where referenced within this documentation Electrical Installation Condition Reports (EICR) shall mean the same as Periodic Inspection Reports (PIR), which is an obsolete term still commonly used.

2F-3 STANDARDS APPLICABLE

Works shall be completed in accordance with all applicable industry standards. Some of the most relevant standards associated with this section are scheduled below:

STANDARDS AND DOCUMENTS	
BS 7671	IET Wiring Regulations – Requirements for Electrical Installations – Part 6 Inspection and Testing
IET On-Site Guide – BS 7671 – IET Wiring Regulations – Requirements for Electrical Installations – Section 9 Inspection and testing and Section 10 Guidance on initial testing of installations and Section 11 Operation of RCDs	
IET Guidance Note 3 – Inspection & Testing	
BS 5458	Specification for safety requirements for indicating and recording electrical measuring instruments and their accessories (Superseded / withdrawn and replaced by BS EN 61010,

STANDARDS AND DOCUMENTS	
	this is the standard to which some older instruments that are still in use should have been manufactured)
BS EN 61010	Safety requirements for electrical equipment for measurement, control, and laboratory use
BS EN 61243	Live working – Voltage detectors
BS EN 61557	Electrical safety equipment in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. –Equipment for testing; measuring or monitoring of protective measures
HSE (Health and Safety Executive) – Guidance Note GS38 – Electrical test equipment for use on low voltage electrical systems	
HSE (Health and Safety Executive) – The Electricity at Work Regulations – Guidance on regulations – HSR25	
HSE (Health and Safety Executive) – Electricity at Work – Safe working practices – HSG85	
Electrical Safety First – Best Practice Guide 2 – Guidance on the management of electrical safety and safe isolation procedures for low voltage installations	
Electrical Safety First – Best Practice Guide 7 – Test instruments for electrical installations: Accuracy and consistency	
NICEIC / ECA / ELECSA – Inspection, Testing and Certification including Periodic Reporting – Practical advice and guidance	
All standards, guidance and statutory regulations detailed within Section 2E-3	

Where the above standards refer to supporting documentation and standards these shall be fully complied with in all respects.

Where discrepancy is found between this specification and the relevant standards, the Contractor shall obtain written clarification from the Engineer prior to submission of the tender. Where a discrepancy has not been clarified prior to tender submission, the Contractor shall include the most onerous requirements.

2F-4 STATUTORY REGULATIONS AND BS 7671 IET WIRING REGULATIONS

All persons undertaking the inspection and testing of electrical installations shall comply with relevant requirements of The Electricity at Work Regulations, where particular attention shall be paid to Regulation 12 "Means for cutting off the supply and for isolation' and Regulation 14 'Work on or near live conductors' and the guidance provided by the HSE (Health and Safety Executive) – Memorandum of guidance on the Electricity at Work Regulations 1989 – Guidance on regulations – HSR25.

The electrical inspection and testing shall be undertaken in accordance with the latest version of BS 7671 IET Wiring Regulations – Requirements for Electrical Installations and all supporting IET documentation.

The Contractor shall be fully responsible for the inspection and testing of the electrical installation, which shall only be undertaken by one or more skilled persons (electrically) as defined in BS 7671 that are competent to undertake the works in such an installation.

Precautions shall be taken to ensure that the inspection and testing of the electrical installation shall not cause danger to persons or livestock and shall not cause damage to property and equipment even if a circuit is defective.

2F-5 ELECTRICAL CONTRACTING CERTIFICATION SCHEMES

The Contractor shall undertake all inspection and testing in accordance with industry best practice and must be registered with an appropriate certification scheme as detailed in Section 2E of this specification. The inspection and testing of the electrical installation shall only be undertaken by persons who meet the minimum requirements to undertake the works as defined by their Electrical Contracting Certification Scheme.

This shall be the National Inspection Council for Electrical Installation Contracting (NICEIC) / ELECSA – Platinum Promise registration scheme, or equivalent.

The Contractor shall directly employ a Qualified Supervisor / Inspector on a full time basis as required by their Electrical Contracting Certification Scheme. The Qualified Supervisor / Inspector shall also meet the minimum requirements as defined by their Electrical Contracting Certification Scheme e.g. relevant education and experience, hold a recognised inspection and testing qualification etc.

The Qualified Supervisor shall oversee the testing and inspection works and shall ensure that the results of inspection and testing are recorded correctly on the appropriate certificates and/or reports. The Qualified Supervisor shall also be responsible for the review, verification, signing and dating of the certification and/or reports.

The person(s) undertaking the inspection and testing works (Inspector) may also be the Qualified Supervisor.

All due allowances shall be made within the tender submission for the Qualified Supervisor and the person(s) undertaking the inspection / testing works (Inspector) to meet on-site when requested by the Engineer at a mutually agreeable time.

2F-6 CERTIFICATION AND REPORTS

Dependent upon the type of works undertaken, certification and reports shall be provided as required by BS 7671 and Electrical Contracting Certification Schemes.

The certification and reports shall be selected from below as required: -

ELECTRICAL INSTALLATION CERTIFICATES

The EIC shall be used for all new installation work, and for all alterations or additions to existing installations where new circuits have been introduced including the replacement of existing main electrical switchgear such as low voltage switch panels, MCCB panel boards, MCB distribution boards, consumer units etc.

The EIC shall include: -

1) Front matter.
2) Schedule of items inspected.
3) Schedule of additional records (these shall be defined and allocated page numbers within the certification e.g. fire alarm system, emergency lighting etc.).
4) Schedule of circuit details.
5) Schedule of test results for every circuit.

It shall not be used for the inspection and testing of an existing electrical installation, where an EICR shall be used.

DOMESTIC ELECTRICAL INSTALLATION CERTIFICATES

The Domestic Electrical Installation Certificate shall be used for all new electrical installation work, and for all alterations or additions to existing installations where new circuits have been introduced including the replacement of existing main electrical switchgear such as MCB distribution boards, consumer units etc.

The certificate shall only be used for new installation work where all of the following conditions apply: -

1) The electrical installation work relates to a single dwelling (house or individual flat).
2) The design, the construction, and the inspection and testing of the electrical installation work are the responsibility of one Contractor with approval by an Electrical Contracting Certification Scheme.
3) The installation forms part of a TT, TN-S or TN-C-S (PME) system.
4) The protective measure for fault protection is provided primarily by Automatic Disconnection of Supply.

The Domestic Electrical Installation Certificate shall include: -

1) Front matter.
2) Schedule of items inspected.
3) Schedule of circuit details.
4) Schedule of test results for every circuit.

It shall not be used for single dwellings where the Engineer is responsible for the design, as the Domestic Electrical Installation Certificate does not include a separate 'DESIGN' section. An EIC shall be used instead.

MINOR ELECTRICAL INSTALLATION WORKS CERTIFICATES

The Minor Electrical Installation Works Certificate shall be used for any alteration or addition to an existing circuit such as: -

1) Addition of a socket-outlet to a ring or radial circuit.
2) Additional of a lighting point.
3) Alterations to lighting switching such as relocation of light switches.
4) Replacement of an accessory or luminaire (not switchgear such as DB's etc.).

It shall not be used for new circuits or the replacement of existing main electrical switchgear e.g. MCB distribution boards, consumer units etc. Further reference shall be made to Electrical Contracting Certification Schemes to clarify the acceptable and non-acceptable works associated with Minor Electrical Installation Certificates.

ELECTRICAL INSTALLATION CONDITION REPORTS (FORMERLY PERIODIC INSPECTION REPORTS)

The EICR shall only be used for reporting on the condition of an existing installation.

The EICR shall include: -

1) Front matter.
2) Schedule of observations and recommendations for actions to be taken.
3) Inspection schedule for distribution boards and circuits.
4) Schedule of test results for every circuit (unless defined sample rates have been provided).

It shall not be used for new installation work.

The agreed extent of the installation covered by the periodic inspection and testing along with any agreed limitations shall be clearly defined and recorded within the EICR. Where agreed periodic inspection and testing sample rates have been applied these shall be clearly defined and recorded within the EICR.

These should be recorded within the 'Extent of the Installation and Limitations on the Inspection and Testing' within the EICR.

GENERAL REQUIREMENTS FOR CERTIFICATION AND REPORTS

The general requirements for certification and reports are as follows: -

1) For new installation work, any defect or omission revealed during the inspection and testing shall be corrected before the certification is issued.
2) For any alterations and/or additions to an electrical installation, any defect or omission that will affect the safety of the alteration or addition that is revealed during inspection and testing shall be corrected before the certification is issued.

   The Contractor responsible for the alteration or addition shall record on the certification any other defects observed during the course of the works that may give rise to danger.
3) For all new installation work, and for all alterations or additions to existing installations where new circuits have been introduced, the certification shall include a recommendation for the interval between initial verification and the first periodic inspection e.g. 'NEXT INSPECTION' entry box.
4) Where parts of an existing installation are not required to be inspected and tested (i.e. do not form part of the works) any observed departures or non-compliances shall be recorded within the 'COMMENTS ON THE EXISTING INSTALLATION' section of the certification.
5) Where existing circuits have not been modified but have been disconnected and re-terminated (e.g. existing final circuits into new or existing MCB distribution boards etc.) they shall be fully inspected and tested as required by BS 7671.
6) They must be completed in accordance with BS 7671, IET Guidance Note 3 and Electrical Contracting Certification Schemes.
7) All entry boxes must be completed and contain accurate information. Where an entry box is not applicable to the works that have been undertaken 'N/A' shall be used.
8) When incomplete they are deemed to be invalid by Electrical Contracting Certification Schemes.

9) All switchgear / equipment reference numbers, circuit references and final circuit references shall be coordinated throughout and be the same as those used in the specification schedules / drawings.

10) Where a location is to be defined it shall be co-ordinated with the architectural drawings and the site room referencing system.

11) Where a documented risk assessment has determined that RCDs are not required as additional protection for socket outlets with a rated current not exceeding 32A, this shall be noted within the 'DESIGN' section and the documented risk assessment shall be appended.

12) 'Schedules of additional records' relating to the electrical installation shall be included and their respective page numbers shall be identified (e.g. fire alarm system, emergency lighting etc.). The requirements for these are detailed in subsequent sections of this specification.

13) The 'Circuit line and number' included within the 'Schedule of test results' shall be co-ordinated with the 'Schedule of circuit details'. The 'Schedule of test results' shall include test results for every circuit tested.

14) The Contractor / Qualified Supervisor shall be responsible for the review, verification, signing and dating of the certification and/or reports. This shall take into account their respective responsibilities e.g. 'CONSTRUCTION', 'INSPECTION AND TESTING', 'DESIGN, CONSTRUCTION, INSPECTION AND TESTING' entry boxes as necessary.

15) On completion they shall be issued to the Engineer for comment. When responsible for the design of the electrical installation the Engineer shall sign and date the 'DESIGN' entry box.

16) They shall be provided as part of the Operation and Maintenance Manual and Health and Safety File as required by the Construction (Design and Management) Regulations.

17) Schedules / charts shall be provided to all: -

    a) Low voltage switch panels.

    b) MCCB panel boards.

    c) MCB distribution boards.

    d) Consumer units.

As detailed within Section 2E of this specification.

2F-7 INSPECTION

The electrical installation shall be inspected to ensure all electrical equipment and materials are of the correct type and comply with the appropriate British or Harmonised Standard, or International (IEC) Standard.

The inspection shall verify that the electrical installation: -

1) Has been correctly selected and erected in accordance with BS 7671, all supporting IET documentation and manufacturers' instructions.

2) Is not visibly damaged or defective or has deteriorated (existing installations) so as to impair safety.

3) Is ready and safe to be used.

The electrical installation shall be inspected throughout the installation period with particular attention paid to any electrical services that may become inaccessible upon completion e.g. concealed cable support and containments systems, cabling, accessories, busbar trunking and power track systems etc. etc.

On completion of the electrical installation works a further inspection shall be undertaken prior to any electrical testing (dead or live testing) taking place.

Appendix I of this section provides an Electrical Installation Certificate checklist of some of the principal items that shall be inspected as a minimum. However, it shall be noted that the checklist is not exhaustive and is provided as a guide. The items included within the schedule shall form the Schedule of Inspections to be included with the certification / reports.

The inspection guidance provided in IET Guidance Note 3 Inspection and Testing shall also be followed:

1) Section 2.5.2 Comments on individual items to be inspected.

2) Section 2.5.3 Inspection checklist.

All items shall also be inspected that are included on the 'Schedules of Items Inspected' list that form part of the certification required by Electrical Contracting Certification Schemes. All entry boxes on the schedules must be completed:

- '✓' shall indicate that an inspection was undertaken, and the result was satisfactory.
- 'N/A' shall indicate that an inspection was not applicable to the installation.

Joint formal inspections shall be undertaken at a mutually agreeable time by the Qualifying Manager, the person(s) undertaking the inspection / testing works and the Engineer.

Any departures from or non-compliances with the requirements of this specification and BS 7671 as a result of inspection(s) must be rectified at no additional cost and in a timely manner to suit the construction programme.

2F-8 TEST EQUIPMENT

Test instruments shall be selected in strict accordance with the performance standards detailed in BS EN 61557 and the safety requirements of BS EN 61010. Test instruments shall also be selected to meet the instrument accuracy and performance criteria detailed within IET Guidance Note 3 Inspection and Testing.

A system shall be in place to ensure the accuracy of test instruments as required by Electrical Contracting Certification Schemes.

As a minimum the accuracy of test instruments shall be confirmed by formal calibration / re-calibration at intervals recommended by the manufacturer and shall be supported by calibration certificates provided by laboratories accredited by the United Kingdom Accreditation Service (UKAS).

More frequent re-calibrations may be required if test instruments are exposed to changes in temperature / humidity and also if they are roughly handled and regularly transported / stored in vehicles. It shall be the Contractor's responsibility to ensure that the test instruments meet the required accuracy and performance criteria prior to testing.

The model and serial number for each test instrument shall be recorded on the certification, reports and schedules. A copy of the calibration certificate for each test instrument shall be provided as part of the Operation and Maintenance Manual.

Voltage indicators, test probes, clips and leads shall be selected and used in accordance with the guidance outlined in HSE – Guidance Note GS38.

2F-9 ISOLATION

Inspection and dead testing shall be undertaken with the appropriate part of the installation disconnected from the electrical supply by some form of isolation. The isolation of the electrical supply shall be undertaken in accordance with the guidance outlined in HSE – Electricity at Work – Safe working practices – HSG85.

As a minimum the isolation of the electrical supply shall be verified by the following safe working procedure: -

1) Step 1 – Open the means of isolation and secure the isolation device.
2) Step 2 – Prove the correct operation of the voltage detector / indicator to be used against a known source such as a voltage proving unit.
3) Step 3 – Test all conductors (including protective conductors in case there is a wiring fault) to verify that no dangerous voltage is present and the circuit(s) is safe to be worked upon.
4) Step 4 – Prove the correct operation of the voltage detector / indicator to verify that it was functioning correctly when the circuit(s) where tested.

Inspection and testing shall be undertaken in such a way as to minimise disturbance of the installation and inconvenience to the user.

Where it is necessary to disconnect part or the whole of the installation in order to carry out a test, the disconnection should be made at a time agreed with the Client and for the minimum period needed to carry out the test. Where more than one test necessitates a disconnection, where possible they should be made during one disconnection period.

All shutdowns and disconnections must be agreed with the Client prior to works commencing.

2F-10 TESTING SEQUENCE

The sequence of testing and test methods shall be undertaken in strict accordance with BS 7671, IET Guidance Note 3 Inspection and Testing and the NICEIC / ECA / ELECSA – Inspection, Testing and Certification including Periodic Reporting – Practical advice and guidance.

For new installation works the sequence of initial testing shall be as detailed below (where applicable): -

DEAD TESTING

Before the supply is connected, or with the supply disconnected as appropriate: -

1) Continuity of protective conductors, including main and supplementary equipotential bonding.
2) Continuity of ring final conductors (where present).
3) Insulation resistance.
4) Protection by SELV, PELV or by electrical separation.
5) Basic protection provided by a barrier or an enclosure provided during erection.
6) Insulation resistance / impedance of floors and walls.
7) Polarity.
8) Earth electrode resistance (dependent upon the test method used this may be a live test).

LIVE TESTING

With the supply connected: -

1) Protection by automatic disconnection of supply.
2) Earth fault loop impedance.
3) Prospective fault current.
4) Check of phase sequence.
5) Operation of residual current devices (the test to be independent of any test facility incorporated in the device).
6) Functional testing of residual current devices (RCDs).
7) Functional testing of arc fault detection devices (AFDDs).
8) Other functional testing e.g. functional testing of switchgear and control gear assemblies, drives, controls, interlocks etc.

2F-11 TESTING PROCEDURES

An overview of the testing procedures is provided below:

CONTINUITY OF PROTECTIVE CONDUCTORS, INCLUDING MAIN AND SUPPLEMENTARY EQUIPOTENTIAL BONDING

This is the measurement of one of the following to verify the continuity of the circuit protective conductors:

- Resistance of $R_1 + R_2$ (Test method 1 of BS 7671 – $R_1 + R_2$ method).
- R_2 (Test method 2 of BS 7671 – Wander lead method).

The measurements are to be made by using a low-resistance ohmmeter or by selecting the appropriate range on a multi-function tester. The measurement at the extremity of the circuit (furthest point) for $R_1 + R_2$ in Ω (ohms) shall be recorded on the Schedule of Test Results. The measurements shall verify that electrical continuity has been achieved and confirm correct polarity (✓) for the circuit.

Testing shall also be undertaken to verify the electrical continuity of all bonding conductors and earthing conductors.

All metallic cable support and containment systems shall be equipotential bonded for protective earthing and to avoid / reduce electromagnetic disturbances as detailed within Section 2E of this specification. Test method 2 shall be used to measure the resistance across all joints to verify electrical continuity. The measured resistance across joints shall not exceed 0.05 Ω.

The electrical continuity of cable support and containment systems shall also be verified in accordance with their respective standards, as detailed later within this section of the specification.

Test method 2 shall also be used to verify there is a bonding connection between extraneous conductive parts where it is not possible to see the bonding connection (e.g. where bonding clamps are 'built in' to metallic pipework). The measured resistance shall not exceed 0.05 Ω.

CONTINUITY OF RING FINAL CIRCUIT CONDUCTORS

This is the measurement of:

1) Step 1:- The resistance of r1, r2 and rn to verify the continuity of all conductors.
2) Step 2:- Having made the L-N cross connection, the resistance between line and neutral conductors at each outlet to verify the resistance is substantially the same at each outlet and equates to (r1 + rn) / 4, (subject to outlets wired as spurs from the ring final circuit).
3) Step 3:- Having made the L-E cross connection, the resistance between line and earth at each outlet to verify the resistance is substantially the same at each outlet and equates for (r1 + r2) / 4, (subject to outlets wired as spurs from the ring final circuit).

The measurements are to be made by using a low-resistance ohmmeter or by selecting the appropriate range on a multi-function tester. The measurements for r1, r2 and rn in Ω (ohms) shall be recorded on the Schedule of Test Results. The highest value of resistance recorded from Step 3 is also to be recorded on the Schedule of Test Results as the $R_1 + R_2$ measurement.

The measurements shall verify that electrical continuity has been achieved and confirm correct polarity (✓) for the circuit.

INSULATION RESISTANCE

This is the measurement of the insulation resistance between all of the live conductors and between each live conductor and the protective conductor, to verify that the insulation of conductors provides adequate electrical insulation, is not damaged and that live conductors or protective conductors are not short-circuited.

The measurements are to be made by applying an appropriate test voltage as indicated below, using an insulation resistance tester or by selecting the appropriate range on a multi-function tester: -

CIRCUIT NOMINAL VOLTAGE (V)	TEST VOLTAGE D.C. (V)	MINIMUM INSULATION RESISTANCE VALUE (MΩ)
SELV and PELV	250	0.5
Up to and including 500 V with the exception of SELV and PELV but including FELV	500	1.0
Above 500 V	1000	1.0

The resistance measurements in MΩ (e.g. >200 MΩ) shall be recorded on the Schedule of Test Results for: -

1) Line / Line.
2) Line / Neutral.
3) Line / Earth
4) Neutral / Earth.

The measurements shall be verified against the minimum acceptable insulation resistance values required by BS 7671 which are also detailed in the above table. For new installation works the following are to be brought to the attention of the Engineer immediately in writing: -

1) Any values recorded below 20 MΩ (which are above the minimum requirements outlined in BS 7671).
2) Where measured values show evident differences between similar circuits.

It is also recommended that insulation resistance testing is undertaken at various stages during the installation works to prove the integrity of the cables and to prevent remedial works towards the end of the contract.

Voltage sensitive electronic equipment (e.g. RCBOs, surge protective devices, dimmer switches, touch switches, timers, controllers or similar) shall be temporarily disconnected prior to applying a test voltage of 500 V d.c. and the recorded measurements shall not be less than 1.0 MΩ.

Following the connection of the sensitive equipment, measurements shall be made by applying a test voltage of 250 V d.c. and the recorded measurements shall not be less than 1.0 MΩ.

Important Note: Some manufacturers may recommend equipment is not exposed to 250 V d.c. testing.

Insulation resistance testing of socket outlets with integral USB (Universal Serial Bus) charging ports shall be undertaken in accordance with manufacturers' recommendations. Generally, the measurements shall be made by applying a test voltage of 250 V d.c.

The measurements shall not be less than 1.0 MΩ (as opposed to 0.5 MΩ for SELV and PELV circuits) which is the minimum acceptable insulation resistance value required by BS 7671 where it is not reasonably practical to disconnect the socket outlets.

PROTECTION BY SELV, PELV OR BY ELECTRICAL SEPARATION

1) Protection by SELV, where SELV is used as a protective measure and insulation testing is required.
   a) Basic insulation test

      This is the measurement of the insulation resistance between line conductors and all other circuits including other SELV, PELV and low voltage circuits.
   b) Line to Earth insulation test:

      This is the measurement of the insulation resistance between all SELV line parts and earth.

The measurements are to be made by applying a test voltage of 250 V d.c. using an insulation resistance tester or by selecting the appropriate range on a multi-function tester. The measurements shall not be less than 0.5 MΩ which is the minimum acceptable insulation resistance value required by BS 7671.

2) Protection by PELV, where PELV is used as a protective measure and insulation testing is required.
   a) Basic insulation test: -

      This is the measurement of the insulation resistance between line conductors and all other circuits including other SELV, PELV and low voltage circuits.

The measurements are to be made by applying a test voltage of 250 V d.c. using an insulation resistance tester or by selecting the appropriate range on a multi-function tester. The measurements shall not be less than 0.5 MΩ which is the minimum acceptable insulation resistance value required by BS 7671.

3) Protection by electrical separation.
   a) Basic insulation test: -

      This is the measurement of the insulation resistance between the electrically separated live conductors and the transformer secondary live conductors.
   b) Basic insulation of the separated conductors: -

      This is the measurement of the insulation resistance between the electrically separated live conductors and their corresponding exposed-conductive-parts.
   c) Basic insulation of any exposed-conductive-parts associated with separated conductors: -

      This is the measurement of the insulation resistance between the any exposed-conductive-parts associated with the electrically separated circuits and any protective conductor, other exposed-conductive-parts or Earth.

The measurements are to be made by applying a test voltage of 500 V d.c. using an insulation resistance tester or by selecting the appropriate range on a multi-function tester. The measurements shall not be less than 1 MΩ which is the minimum acceptable insulation resistance value required by BS 7671.

Additional inspections and tests shall also be undertaken for separated circuits supplying more than one item of current using equipment as required by IET Guidance Note 3 Inspection and Testing. This is to verify that two coincidental faults with negligible impedance will disconnect one of the faulty circuits within the disconnection time required by BS 7671.

BASIC PROTECTION BY A BARRIER OR AN ENCLOSURE PROVIDED DURING ERECTION

These tests only apply to barriers or enclosures constructed on-site during the installation works and do not apply to the barriers or enclosures of factory-built equipment.

Barriers and/or enclosures shall be provided to prevent contact with live parts and shall provide at least the degree of protection (IP code) of IPXXB or IP2X. However, a horizontal or top surface of a barrier or enclosure which is readily accessible shall provide at least the degree of protection (IP code) of IPXXD or IP4X.

This is to verify that each barrier / enclosure gives adequate protection against the risk of electric shock through contact with live parts by fingers or foreign objects (e.g. conductive tools).

These degrees of protection shall be tested as follows: -

1) IP2X is defined in BS EN 60529 as protection against the entry of 'Fingers or similar objects not exceeding 80mm in length. Solid objects not exceeding12.5mm in diameter': -

   The test is made with a metallic standard test finger (test finger 1 to BS EN 61032).

2) IP4X is defined in BS EN 60529 as protection against the entry of 'Wires or strips of thickness greater than 1.0mm, and solid objects of 1.0mm diameter or greater': -

The test is made with a straight rigid steel wire of 1.0mm diameter applied with a force of 1 N ± 10 per cent.

INSULATION RESISTANCE / IMPEDANCE OF FLOORS AND WALLS

These tests are not required for standard electrical installations however if required reference shall be made to IET Guidance Note 3 Inspection and Testing.

POLARITY

Polarity testing shall verify: -

1) The polarity of the supply shall at the origin of the installation before the installation is energized.
2) That where single-pole switching devices are not permitted in the neutral conductor the devices are connected in the line conductor(s) only.
3) The wiring has been correctly connected throughout the installation.

Polarity of circuits shall be verified by the visual inspection of all termination points (by checking the core colours) or the measurement of the resistance of $R_1 + R_2$.

Polarity may be verified during the process of testing by:

1) Continuity of protective conductors – Test method 1 ($R_1 + R_2$ method).
2) Continuity of ring final circuit conductors.

Where polarity is verified during the process of testing the measurements are to be made by using a low-resistance ohmmeter or by selecting the appropriate range on a multi-function tester. Upon verification a '✓' shall be recorded on the Schedule of Test Results.

EARTH ELECTRODE RESISTANCE

This is the measurement of the resistance of earth electrodes to verify the resistance is low enough to assist with disconnection times.

One of the following test methods shall be used: -

1) Test method E1: Measurement using dedicated earth electrode tester (fall of potential, three- or four-terminal type)

   The entire installation must be isolated from the supply before the means of earthing is disconnected to perform this test. On completion of testing all bonding and protective conductors must be reconnected prior to the installation being energised (or re-energised).

2) Test method E2: Measurement using dedicated stakeless or clamp-based earth electrode tester.

   The earth electrode under test does not need to be disconnected for this method.

3) Test method E3: Measurement using an earth fault loop impedance tester.

   (Effectively the same method used for testing external earth fault loop impedance Ze).

   The entire installation must be isolated from the supply before the means of earthing is disconnected to perform this test. It shall be noted this method is a live test and the supply shall be re-energised to perform the testing. On completion of testing the supply shall be isolated and all bonding and protective conductors must be reconnected prior to the installation being re-energised.

Generally, the measurement shall verify that the earth electrode resistance is less than 200 Ω, however the required automatic disconnection times of RCDs shall also be verified for TT systems. Earth electrode resistance values above 200 Ω may not be stable due to ground conditions.

The measurement of earth electrode resistance R_A shall be recorded in the Supply Characteristics and Earthing Arrangements section of the certification / report. Also, the earth electrode type, location and the method of measurement shall be recorded.

PROTECTION BY AUTOMATIC DISCONNECTION OF SUPPLY

The effectiveness of measures for fault protection by automatic disconnection of supply shall be verified for TN systems as follows: -

1) Measurement of earth fault impedance.
2) Visual inspection to confirm that protective devices are suitable.

   (e.g. correct setting, type and ratings for circuit breakers and correct type and ratings for fuses).
3) Where used, RCD testing to confirm disconnection times are achieved.

For TT and IT systems reference shall be made to BS 7671 and IET Guidance Note 3 Inspection and Testing.

EARTH FAULT LOOP IMPEDANCE

Electrically continuity testing (as detailed earlier) must have been undertaken prior to the commenced of any earth fault loop impedance measurements.

This is the measurement of earth fault loop impedance (Z_S) to verify that when an earth fault occurs the resistance of the earth fault loop ($Z_s = R_1 + R_2 + Z_e$) shall be low enough for a large fault current to flow and operate a protective device in the required disconnection time, therefore achieving automatic disconnection of the circuit line conductor.

Note: Z_e may be substituted with Z_{db} when testing at a downstream distribution board or similar as the value measured is not external to the installation.

One of the following test methods shall be used: -

1) Measurement of total earth fault loop impedance (Z_S) using an earth fault loop impedance tester or by selecting the appropriate range on a multi-function tester. It shall be noted that the measured Z_S may be less than $R_1 + R_2 + Z_e$ due to parallel earth return paths.
2) Measurement of ($R_1 + R_2$) during continuity testing using a low-resistance ohmmeter and addition to the measured external fault loop impedance (Z_e) of the same circuit, using an earth fault loop impedance tester.

The latter method is preferred when determining Z_S for final circuits and distribution circuits.

The measurement at the extremity of the circuit (furthest point) for Z_S in Ω (ohms) shall be recorded on the Schedule of Test Results. For ring final circuits the earth fault impedance (Z_S) shall be measured at every outlet / point and the highest value measured shall be recorded on the Schedule of Test Results.

The measurements shall be verified against the maximum earth fault loop impedance (Z_S) values required by BS 7671 which must be adjusted for temperature by applying a factor of 0.8 (80%).

e.g. for a 20A Type B circuit breaker to BS EN 60898, BS 7671 provides a maximum earth fault loop impedance of 2.19 Ω. However, this is at operating temperature, so the maximum acceptable measured value shall be 2.19 x 0.8 = 1.752 Ω.

It shall be noted that adjusted for the industry recognised 0.8 'rule of thumb' are contained within the IET On-Site Guide / IET Guidance Note 3 and can also be obtained from Electrical Contracting Certification Schemes, which can then be used for verification of measurements.

Under no circumstances shall the measurements be verified against the maximum earth fault loop impedance (Z_s) contained within BS 7671 with no adjustment for temperature.

The maximum permitted earth fault loop impedance (Z_s) values included within the 'Maximum Z_s permitted by BS 7671' column of the 'Schedule of circuit details' shall include the Z_s values from BS 7671 which have not been adjusted for temperature.

Where supplementary protective equipotential bonding has been provided to satisfy the measured earth fault loop impedance requirements of BS 7671, the effectiveness of the bonding shall be verified.

The external fault loop impedance (Z_e) shall also be measured to verify there is an earth connection and to determine the external earth fault loop impedance (Z_e) which is part of the earth fault loop (Z_s).

The external fault loop impedance (Z_e) shall be measured at:-

1) The origin of the installation.

   The measurement for Z_e in Ω (ohms) shall be recorded in the Supply Characteristics and Earthing Arrangements section of the certification / report.

2) At each item of switchgear within the installation (e.g. LV switch panels, MCCB panel boards, MCB distribution boards, consumer units etc. etc.)

   The measurement for Z_s (sometimes known as Z_s, Z_{db} or similar) in Ω (ohms) shall be recorded on the Schedule of Test Results (top section) for the item of switchgear.

The measurements are to be made by using an earth fault loop impedance tester or by selecting the appropriate range on a multi-function tester.

PROSPECTIVE FAULT CURRENT

This is the measurement of prospective fault current (I_{pf}) under both short-circuit and earth fault conditions to verify that the rated short-circuit breaking capacities of protective devices are greater than the prospective fault current (I_{pf}).

The prospective short circuit current and prospective earth fault current shall be measured at every relevant point of the installation which includes: -

1) The origin of the installation.

   The measurement for I_{pf} in kA shall be recorded in the Supply Characteristics and Earthing Arrangements section of the certification / report.

2) At each item of switchgear within the installation where a protective device is required to operate under fault conditions.

   The measurement for Ipf in kA shall be recorded on the Schedule of Test Results (top section) for the item of switchgear.

The measurements are to be made by using the prospective fault current range of a suitable earth fault loop impedance tester or by selecting the appropriate range on a multi-function tester. Whichever is the greater measurement of prospective short circuit current (PSCC) and prospective earth fault current (PEFC) shall be recorded.

For three phase supplies where a 230V test instrument is used the prospective fault current line to line can be taken as twice that of the prospective fault current line to neutral.

e.g. line to neutral measurement of 4.6 kA x 2 = 9.2 kA (I_{pf}).

The measurements shall be verified by comparing the measured prospective fault current (I_{pf}) at the terminals of protective devices with their rated short-circuit breaking capacities. The rated short-circuit breaking capacities of protective devices must be greater than the prospective fault current (I_{pf}).

CHECK OF PHASE SEQUENCE

Generally, this is verified by checking the polarity and connections at all relevant points throughout the installation. However, the phase sequence of all three-phase equipment such as rotating machines (e.g. motors) shall be verified to ensure correct rotation. This shall be verified by using a phase rotation tester or by selecting the appropriate range on a multi-function tester.

ADDITIONAL PROTECTION – OPERATION OF RESIDUAL CURRENT DEVICES

This is the measurement of RCD (RCCB or RCBO) operating times to verify the correct operation and required disconnection times are achieved. The measurements are to be made by using an RCD tester or by selecting the appropriate range on a multi-function tester. Loads shall be disconnected during testing. All residual current devices shall be tested at: -

1) 50% of the rated operating (tripping) current and shall not operate / open.
2) 100% of the rated operating (tripping) current (IΔn) and shall operate / open.

   The measured operating time in ms shall be recorded (where applicable) in the:

   a) Particulars of Installation at the Origin section of the certification / report. If the residual current device has a rated time delay this shall also be included.
   b) Schedule of Test Results (top section) for the item of switchgear.
   c) Schedule of Test Results for a circuit.

The residual current devices shall have an operating time not exceeding that required by their respective product standards at a residual current of IΔn.

Regardless of RCD type, effectiveness is deemed to have been verified where an RCD disconnects within the time stated below with an alternating current test rated residual current (IΔn): -

1) For general non-delay type, 300ms maximum.
2) For 'S' type RCD, between 130ms minimum and 500ms maximum.

RCDs used for additional protection shall have an operating time not exceeding 300ms at a residual current of IΔn.

Measurements shall be taken on both positive and negative half cycles of the supply waveform and the longer operating time shall be recorded.

ADDITIONAL PROTECTION – SUPPLEMENTARY PROTECTIVE EQUIPOTENTIAL BONDING

Where supplementary protective equipotential bonding has been provided for additional protection the effectiveness of the bonding shall be verified.

FUNCTIONAL TESTING OF RESIDUAL CURRENT DEVICES

Functional testing shall be undertaken on all residual current devices. The integral test device shall be operated by pressing the button marked 'T' or 'Test', during testing the residual current devices must be energised.

Upon verification a '✓' shall be recorded on the Schedule of Test Results.

FUNCTIONAL TESTING OF ARC FAULT DETECTION DEVICES (AFDDs)

Functional testing shall be undertaken on arc fault detection devices (AFDDs) when they are provided with a manually operated test facility, in strict accordance with the manufacturers' recommendations.

Upon verification a '✓' shall be recorded on the Schedule of Test Results.

AFDDs that do not have a manually operated test facility cannot be tested for functionality.

OTHER FUNCTIONAL TESTING

All equipment that forms part of the electrical installation shall be subjected to functional testing to verify that it functions correctly and has been properly mounted, adjusted, and installed in accordance with BS 7671.

This shall include:

1) All electrical switchgear used for isolation e.g. main switches, isolators, protective devices etc.
2) All luminaires, switching and control devices, interlocks, adjustable relays, socket-outlets etc.
3) Motors, motor controls and starters, including correct rotation.

It shall be noted the above list is not exhaustive and functional testing must be undertaken on all equipment that forms part of the electrical installation.

2F-12 DEPARTURES FROM AND NON-COMPLIANCES WITH BS 7671

Any departures from or non-compliances with BS 7671 resulting from the inspection and testing of the electrical installation shall be brought to the attention of the Engineer immediately in writing.

2F-13 INSPECTION AND TESTING OF MEDICAL INSTALLATIONS

This section of the specification details the general inspection and testing requirements that shall also apply to medical installations. However, it shall be noted that medical installations will have additional inspection, testing and commissioning requirements, for example (but not limited to):

1) Inspection and functional tests of medical IT systems.
2) Measurement of the leakage current for the output circuit and the enclosure of medical IT system isolating transformers.
3) Measurement of the resistance of protective conductors between the earth terminals of any socket outlet (or fixed equipment) and any extraneous conductive parts (e.g. not exceeding 0.2 Ω for Group 1 and 2 locations etc.).

Medical IT systems are also known as medical isolated power supply systems.

Where required the inspection and testing requirements of medical installation shall be detailed within a subsequent section of this specification.

2F-14 CONTINUITY OF CABLE SUPPORT AND CONTAINMENT SYSTEMS

All metallic cable support and containment systems shall be equipotential bonded for protective earthing and to avoid / reduce electromagnetic disturbances as detailed within Section 2E of this specification.

The electrical continuity of cable support and containment systems shall be tested as follows: -

1) Cable ladder rack, cable tray and cable basket shall be tested in accordance with the relevant clauses of BS EN 61537.
2) Cable trunking shall be tested in accordance with the relevant clauses of BS EN 50085.
3) Cable conduit shall be tested in accordance with the relevant clauses BS EN 61386.

It shall also be verified that all connections between cable conduit (e.g. conduit take-off plates, conduit boxes) and cable tray / basket / tray have adequate electrical continuity.

The Contractor shall provide written clarification that the cable support and containment systems have electrical continuity characteristics as defined in the above standards.

2F-15 FIRE BARRIERS / STOPPING

On completion of the fire barriers / stopping works fully detailed completion / compliance certification shall be provided along with record drawings that detail all fire barrier / stopping locations.

2F-16 FACTORY BUILT ASSEMBLIES

The Engineer shall be afforded the opportunity to inspect and formally witness the testing of all bespoke factory built assemblies (e.g. LV switch panels, switchgear etc.) before they are dispatched to site. The required period of notice to attend shall normally be 10 days, but shall be variable at the discretion of the Engineer.

The Engineer shall be provided with a copy of the appropriate inspection and testing certification for each factory built assembly which shall also be included within the Operation and Maintenance Manual.

2F-17 THERMOGRAPHIC SURVEYS

Any requirement for undertaking thermographic surveys shall be detailed within a subsequent section of this specification. The guidelines on thermographic equipment shall be followed within IET Guidance Note 3.

2F-18 FORMAL WITNESSING OF TESTING

The Qualified Supervisor and the person(s) undertaking the inspection / testing works shall give reasonable notice of all tests to permit them to be witnessed by the Engineer. The required period of notice shall normally be 10 days, but shall be variable at the discretion of the Engineer.

Preliminary testing shall be undertaken prior to any formal witnessing by the Engineer. The preliminary test results shall be provided to the Engineer in draft certificates before inviting the Engineer to attend formal witnessing. The Engineer will then witness the formal tests in full or selectively as deemed necessary to verify the draft test results.

The proportion of tests to be witnessed by the Engineer will be 20%, though this could be reduced to 10% at the discretion of the Engineer on very large systems. The Engineer has the right to ask for a higher proportion of witnessing should the verification or witnessing exercise be unsuccessful e.g. the test readings cannot be repeated within a reasonable degree of accuracy. In this instance the Electrical Contractor shall bear all costs associated with this additional work.

APPENDIX I – SCHEDULE OF INSPECTIONS (CHECKLIST)

SCHEDULE OF INSPECTIONS (FOR INITIAL INSPECTION AND TESTING)			
1.0	**CONDITION OF ELECTRICAL INTAKE EQUIPMENT (the Distributor should be notified of any unsatisfactory equipment)**		
1.1	Service cable		
1.2	Service head		
1.3	Earthing arrangement		
1.4	Meter tails – Distributor / Consumer		
1.5	Metering equipment		
1.6	Isolator		
2.0	**PARALLEL OR SWITCHED ALTERNATIVE SOURCES OF SUPPLY**		
2.1	Presence of adequate arrangements where generator to operate as a switched alternative		
	a)	Dedicated earthing arrangement independent of that of the public supply	
2.2	Presence of adequate arrangements where generator to operate in parallel with public supply system		
	a)	Correct connection of generator in parallel	
	b)	Compatibility of characteristics of means of generation	
	c)	Means to provide automatic disconnection of generator in the event of loss of public supply system or voltage or frequency deviation beyond declared values	
	d)	Means to prevent connection of generator in the event of loss of public supply system or voltage or frequency deviation beyond declared values	
	e)	Means to isolate generator from the public supply system	
2.3	Presence of alternative / additional supply warning notices at:		
	a)	The origin	
	b)	The meter position, if remote from the origin	
	c)	The consumer unit / distribution board to which the alternative / additional sources are connected	
	d)	All points of isolation of ALL sources of supply	
3.0	**AUTOMATIC DISCONNECTION OF SUPPLY**		
3.1	Presence and adequacy of protective earthing / bonding arrangements as follows:		
	a)	Distributor's earthing arrangement	
	b)	Installation earth electrode (where applicable)	
	c)	Earthing conductor and connections	
	d)	Main protective bonding conductors and connections	
	e)	Earthing / bonding labels at all appropriate locations	
	f)	RCD(s) provided for fault protection	

SCHEDULE OF INSPECTIONS (FOR INITIAL INSPECTION AND TESTING)			
3.2	Accessibility of:		
	a) Earthing conductor connections		
	b) All protective bonding conductors		
3.3	FELV – requirements satisfied		
3.4	Reduced low voltage – requirements satisfied		
4.0	**BASIC PROTECTION**		
4.1	Presence and adequacy of protective measures to provide basic protection		
	a) Insulation of live parts		
	b) Barriers or enclosures		
	c) Obstacles*		
	d) Placing out of reach*		
5.0	**ADDITIONAL PROTECTION**		
5.1	The presence and effectiveness of additional protection methods used, as follows:		
	a) RCDs not exceeding 30 mA operating current		
	b) Supplementary bonding		
6.0	**OTHER METHODS OF PROTECTION (insert location in box provided)**		
The presence and effectiveness of other methods of protection against electric shock where used, as follows:			
6.1	Basic and fault protection		**LOCATION**
	a) SELV		
	b) PELV		
	c) Double insulation / Reinforced installation		
	d) Electrical separation for one item of equipment		
6.2	Fault protection		**LOCATION**
	a) Non-conducting location / Earth-free local equipotential bonding*		
	b) Electrical separation for more than one item of equipment*		
7.0	**DISTRIBUTION EQUIPMENT**		
7.1	Adequacy of working space / accessibility		
7.2	Security of fixing		
7.3	Insulation of live parts not damaged during erection		
7.4	Adequacy / security of barriers		
7.5	Suitability of enclosures for IP and fire ratings		

SCHEDULE OF INSPECTIONS (FOR INITIAL INSPECTION AND TESTING)		
7.6	Enclosures not damaged during installation	
7.7	Presence and effectiveness of obstacles	
7.8	Presence of main switch(es), linked where required	
7.9	Operation of main switch(es) (functional check)	
7.10	Operation of circuit-breakers and RCDs to prove functionality	
7.11	RCD(s) provided for fault protection, where specified	
7.12	RCD(s) provided for protection against fire	
7.13	RCD(s) provided for additional protection, where specified	
7.14	Confirmation overvoltage protection (SPDs) provided where specified	
7.15	Confirmation of indication that SPD is functional	
7.16	Presence of RCD six-monthly test notice where required	
7.17	Presence of AFDD six-monthly test notice where required	
7.18	Presence of diagrams, charts or schedules at or near each switchgear, where required	
7.19	Presence of non-standard (mixed) cable colour warning notice at or near the appropriate distribution board, where required	
7.20	Presence of next inspection recommendation label	
7.21	Presence of other required labelling	
7.22	Selection of protective device(s) and base(s); correct type and rating	
7.23	Single-pole protective devices in line conductor only	
7.24	Protection against mechanical damage where cables enter equipment	
7.25	Protection against electromagnetic effects where cables enter ferromagnetic enclosures.	
7.26	Confirmation that ALL conductor connections, including connections to busbars are correctly located in terminals and are tight and secure	
8.0	**CIRCUITS**	
8.1	Identification of conductors	
8.2	Cables correctly supported throughout their length	
8.3	Examination of cables for signs of mechanical damage during installation	
8.4	Examination of insulation of live parts, not damaged during erection	
8.5	Non-sheathed cables protected by enclosure in conduit, ducting or trunking	
8.6	Suitability of containment systems (including flexible conduit)	
8.7	Correct temperature rating of cable insulation	
8.8	Adequacy of cables for current-carrying capacity with regard to the type and nature of installation	
8.9	Adequacy of protective devices: type and rated current for fault protection	

SCHEDULE OF INSPECTIONS (FOR INITIAL INSPECTION AND TESTING)			
8.10	Presence and adequacy of circuit protective conductors		
8.11	Coordination between conductors and overload protective devices		
8.12	Wiring systems and cable installation methods / practices appropriate to the type and nature of installation and external influences		
8.13	Cables installed under floors, above ceilings, in walls / partitions, adequately protected against damage		
	a)	Installed in prescribed zones	
	b)	Incorporating earthed armour or sheath, or installed within earthed wiring system, or otherwise protected against mechanical damage by nails, screws and the like	
8.14	Provision of additional protection by RCDs having a rated residual operating current (IΔn) not exceeding 30mA:		
	a)	For mobile equipment with a current rating not exceeding 32 A for use outdoors	
	b)	For all socket-outlets of rating 32 A or less, unless exempt	
	c)	For cables installed walls / partitions at a depth of less than 50mm	
	d)	For cables installed in walls / partitions containing metal parts regardless of depth	
	e)	Final circuits supplying luminaires within (domestic) household premises	
8.15	Provision of fire barriers, sealing arrangements so as to minimize the spread of fire		
8.16	Band II cables segregated / separated from Band I circuits		
8.17	Cables segregated / separated from non-electrical services		
8.18	Termination of cables at enclosures		
	a)	Connection under no undue strain	
	b)	No basic insulation of a conductor visible outside enclosure	
	c)	Connections of live conductors adequately enclosed.	
	d)	Adequately connected at point of entry to enclosure (glands, bushes etc.)	
8.19	Suitability of circuit accessories for external influences		
8.20	Circuit accessories not damaged during erection		
8.21	Single-pole devices for switching in the line conductor only		
8.22	Adequacy of connections, including cpcs, within accessories and at fixed and stationary equipment		
9.1	Isolators		
	a)	Presence and location of appropriate devices	
	b)	Capable of being secured in the OFF position	
	c)	Correct operation verified (functional check)	
	d)	The installation, circuit or part thereof that will be isolated is clearly identified by location and / or durable marking	

SCHEDULE OF INSPECTIONS (FOR INITIAL INSPECTION AND TESTING)			
	e)	Warning label posted in situations where live parts cannot be isolated be isolated by the operation of a single device.	
9.2	Switching off for mechanical maintenance		
	a)	Presence of appropriate devices	
	b)	Acceptable location (state if local or remote)	
	c)	Capable of being secured in the OFF position	
	d)	Correct operation verified (functional check)	
	e)	The circuit or part thereof to be disconnected clearly identified by location and / or durable marking	
9.3	Emergency switching / stopping		
	a)	Presence of appropriate devices	
	b)	Readily accessible for operation where danger might occur	
	c)	Correct operation verified (functional check)	
	d)	The installation, circuit or part thereof to be disconnected, clearly identified by location and / or marking	
9.4	Functional switching		
	a)	Presence of appropriate devices	
	b)	Correct operation verified (functional check)	
10.0	**CURRENT USING EQUIPMENT (PERMANENTLY CONNECTED)**		
10.1	Suitability of equipment in terms of IP and fire ratings		
10.2	Enclosure not damaged / deteriorated during installation so as to impair safety		
10.3	Suitability for the environment and external influences		
10.4	Security of fixing		
10.5	Cable entry holes in ceilings above luminaires, sized or sealed so as to restrict the spread of fire		
10.6	Recessed luminaires (downlighters)		
	a)	Correct type of lamps fitted.	
	b)	Installed to minimise build-up of heat.	
10.7	Provision of under voltage protection, where specified		
10.8	Provision of overload protection, where specified		
10.9	Adequacy of working space / accessibility to equipment		
11.0	**SPECIAL INSTALLATIONS OR LOCATIONS**		
List below any Special Installations or Locations which are part of the installation to be verified and confirm that the additional requirements given in the respective section of Part 7 are fulfilled.			

SCHEDULE OF INSPECTIONS (FOR INITIAL INSPECTION AND TESTING)	
11.0 OTHER	
List below any electrical installation works not covered in the above checklist that has been inspected and verified.	

* For use in controlled supervised / conditions only.

NOTES

1) All entry boxes on the schedules must be completed.
2) '✓' indicates that an inspection was undertaken and the result was satisfactory.
3) 'N/A' indicates that an inspection was not applicable to the installation.

The above checklist need not be completed where all of the inspection items above are included on the 'Schedules of Items Inspected' schedules, which form part of the certification provided by Electrical Contracting Certification Schemes.

Appendix E

Pre-Construction Information Pack

STAR Academies

The Olive School, Hackney

Admin House Remodel

CDM REGULATIONS 2015

PROJECT PRE CONSTRUCTION INFORMATION PACK (PCIP)

Revision 1 – 13 December 2022

Revision 2 – 06 April 2023

PRE-CONSTRUCTION INFORMATION PACK

Document Ref: HBC.STH.2022.00255.001/01.1

CONSTRUCTION (DESIGN & MANAGEMENT) REGULATIONS 2015

PROJECT PRE CONSTRUCTION INFORMATION

This document forms part of the project's pre-construction information and should be read in conjunction with the project's other documents notably site reports and the design proposal

PROJECT TITLE

The Olive School, Hackney

Admin House Remodel

CLIENT

Star Academies
Shadsworth Road
Blackburn
BB1 2HT

Contact: Charles Greenall
Email: charles.greenall@staracademies.org
Tel: 0330 313 9167

Contract Administrator/Designer

AHR Building Consultancy Ltd
31-35 Kirby Street
London
EC1N 8TE

Contact: Isaac Berbiers
Email: isaac.berbiers@ahr.co.uk
Tel: 07729845996

MEP DESIGNER

Couch Perry Wilkes
20 Wine Street
Vintry Building
Bristol
BS1 2BD

Contact: Kamila Wiatr
Email: kamila.wiatr@cpwp.com
Tel: 07587 097416

PRINCIPAL DESIGNER

AHR Building Consultancy Ltd
31-35 Kirby Street
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Contact: Alan Blyth
Email: alan.blyth@ahr.co.uk
Tel: 07973 721 832

PRE-CONSTRUCTION INFORMATION PACK

Document Ref: HBC.STH.2022.00255.001/01.1

1. Nature of the Project

1.1 Name of Client

Star Academies

1.2 Location

The Olive School, Hackney
32 St John's Church Rd
London
E9 6EJ

1.3 Nature of construction work to be carried out:

The works comprise of the internal refurbishment of the ground floor of 32 St John's Church Road (Admin House). The refurbishment works include but are not limited to the remodel of the ground floor office/ reception area. Works will include the strip out of existing partition walls, erection of new walls to create a new layout, new doors installed, and M&E layout adapted to suit. A new bespoke reception hatch will be built with workstation/desks and shelving to be installed.

Externally, a new main entrance door set will be relocated on the inside face of the wall. A new wider door to match the existing is to be installed. First floor timber sash windows are to be replaced with new like for like windows with double glazed safety glazing. A new pathway is to be installed into the main entrance of Admin House to improve wheelchair access. New signage is to be installed on to the front elevation of both Admin House and 2-4 Clapton Road. Adjustments will also be made to an area of paving outside Admin house.

For project specific requirements, details, and materials, please refer to the designer's proposals, the preliminaries document, schedule of works, specifications, drawing details and notes.

1.4 Timescale for completion of the construction work:

6 weeks.

1.4.01 Date of possession:

24th July 2023.

1.4.02 Date for completion:

1st September 2023.

PRE-CONSTRUCTION INFORMATION PACK

Document Ref: HBC.STH.2022.00255.001/01.1

2. The existing environment

2.1 Surrounding land uses and related restrictions

St. John's Church Road is within the Homerton ward/electoral division within the constituency of Hackney South and Shoreditch. St John's Church Road is a cul-de-sac leading From Urswick Road, with residential properties on both sides for most of it's length, with the service entrance to Olive School to the North at its western end, and the grounds of Hackney Church to the West. Urswick Road, the A102, is relatively narrow two way traffic served by bus routes 425 and 488. St. John's Church Road has on-street parking, mostly Resident Permit parking both sides and is as a result narrow and restricted for construction traffic. A pedestrian-only footpath runs north to south along the boundary to Hackney Church grounds.

2.1.01 Adjacent and Local land uses include:

Buildings to the rear of the property are live school buildings The first and second floor of Admin House will also be live during the works and will share the stairwell and toilet facilities at the rear of the premises. To the front is a residential street.

2.1.02 Planning Restrictions which apply to the project:

At the time of writing a Planning Application will be submitted for external signage, new first floor windows and alterations to the main entrance.

2.2 Ground conditions

A ground condition survey has not been undertaken but areas to be re-levelled require relatively shallow excavations. Existing O&Ms should be consulted for any relevant records including below-ground services, and below ground services surveys/CAT scan should be undertaken before any reduced level digs take place.

2.2.01 Ground Investigation

A ground investigation has not been undertaken but areas to be re-levelled require relatively shallow excavations. Existing O&Ms should be consulted for any relevant records including below-ground services, and below ground services surveys/CAT scan should be undertaken before any reduced level digs take place.

2.2.02 Additional information relating to existing conditions

The building is occupied and in use, The office/reception for The Olive School occupies the ground floor of 32 St John's Church Road (Admin House) which is an end of terrace property. The building was refurbished and remodelled in 2019, and full Health and Safety information is available in the building's H&S file and O&M manuals, available for consultation from the Client.

2.2.03 Controlled Waste

The Principal Contractor shall describe in a Method Statement their proposals for disposal of controlled waste. This should make reference to disposal to a registered tip and the documentation required to comply with local bylaws and statutory requirements.

2.3 Asbestos

An Asbestos Register for the site is available from the Client. However, given the age of the building refurbishment when most internal fabric and services were renewed (completed in 2019), it is unlikely Asbestos Containing Materials are anticipated within the existing building or services. The client's central asbestos register must always be consulted to get the most up to date asbestos information. The contractor is to carry out a targeted R&D survey before any intrusive works or downtakings take place.

2.4 Existing services

The contractor will need to familiarise himself with the site and establish whether any services are impacted by the works. The scope of works includes working on and adjacent to live services in the existing building and adjacent areas, some of which are within the public domain.

2.4.01 Electrical Services:

Refer to the existing health and Safety File and Electrical Operation and Maintenance Manual for details of existing electrical services.

2.4.02 Lightning Protection:

Not applicable to the project scope.

2.4.03 Gas Services:

Refer to the existing Health and Safety File and Mechanical Operation and Maintenance Manual for details of existing gas services.

2.4.04 Water Services:

Refer to the existing Health and Safety File and Mechanical Operation and Maintenance Manual for details of existing water services.

2.4.05 Heating Distribution:

Refer to the existing Health and Safety File and Operation and Maintenance Manual for details of existing heating distribution services.

2.4.06 Drainage Services:

Refer to the existing Health and Safety File and Operation and Maintenance Manual for details of existing drainage services.

2.4.07 Fire Alarms:

Refer to the existing Health and Safety File and Operation and Maintenance Manual for details of existing fire alarm systems.

2.4.08 Security systems:

Refer to the existing Health and Safety File and Operation and Maintenance Manual for details of existing security systems.

2.4.09 Telephone Service:

Refer to the existing Health and Safety File and Operation and Maintenance Manual for details of existing telephone systems.

2.4.10 Communications Services:

Refer to the existing Health and Safety File and Operation and Maintenance Manual for details of existing communications systems.

2.4.11 Services Information

Refer to the existing Health and Safety File and Mechanical and Electrical Operation and Maintenance Manuals for details of existing services.

2.4.12 Maintaining Services in use

The Principal Contractor should take such steps as may be necessary to protect and/or maintain existing services in use.

2.5 Existing structures

Refer to the existing Health and Safety File and Operation and Maintenance Manual for details of existing structures.

2.5.01 Hazards may include

- Maintenance of Services at high level
- Working at height
- Electric Shock - Maintenance of electrical equipment must only be carried out by suitable qualified operatives in accordance with the IET Wiring Regulations Current Edition), BS 7671:2008 (2011) and in line with the requirements and guidance in the Electricity at Work Regulations (1989).
- Hazardous or deleterious materials or contamination.
- Working on and adjacent live services.
- Working adjacent and within occupied premises
- Cutting out existing plant and materials with potential Hot Works taking place.

2.6 Existing traffic systems and restrictions

Works are to be completed and planned so as not to impede normal operations for the school or access for emergency services at any time, and with minimal disruption to adjacent residential properties.

2.6.01 Parking restrictions to be observed

There is no space available for contractor's parking within the site. The contractor is to make use of local public parking facilities which include the nearby Church car park (using Just Park app).

2.6.02 Access restrictions along supply routes

No issues noted at this stage, other than restricted width roads leading to the site entrance.

2.7 Site conditions - e.g. exposure, theft, and vandalism etc.

The site is in a busy area, but with a cul-de-sac approach with pedestrian only routes at one end, contractors should remain vigilant in maintaining security of the site, any site compound and the existing buildings and service yards.

3. Existing Drawings

3.1 Available drawings of structure(s) to be demolished or incorporated in the proposed structure(s)

Refer to the existing Health and Safety File and Mechanical and Electrical Operation and Maintenance Manuals which include as-built record drawings.

3.1.1 Type of Structure

The building is a traditional masonry Georgian building which received a full refurbishment in 2019.

3.1.2 Existing Use

The existing building has been converted from its original residential use to offices for administrative use by the school.

3.1.3 Existing Drawings

Refer to the existing Health and Safety File and Mechanical and Electrical Operation and Maintenance Manuals which include as-built record drawings.

Note: The Principal Contractor is also advised that record drawings may not be entirely accurate or provide a complete record and the Principal Contractor should verify their accuracy in consultation with the Contract Administrator prior to commencing work.

4. The Design

4.1 Work in Existing Premises

The works will take place adjacent a live school buildings and existing residential properties, the access road to and from the site. Suitable segregation will therefore be required to complete the works safely.

4.2 The principles of the structural design and any precautions that might be needed or sequences of assembly that need to be followed during construction.

The scope of works are believed not to include the demolition of any loadbearing walls. A structural engineer should be consulted prior to demolishing or modifying any existing structural or loadbearing elements including installation of new fixings and any new service penetrations or BWIC.

4.3 Detailed reference to specific problems where contractors will be required to explain their proposals for managing these problems.

The list below identifies hazards where the Principal Contractor is required to provide a **Method Statement** describing their proposed procedure for safe construction.

4.3.1

HAZ. SHEET No.	CONSTRUCTION ELEMENT	OUTLINE DESCRIPTION OF HAZARD, SUGGESTED PROCEDURE AND SPECIFIC REQUIREMENTS ON PRINCIPAL CONTRACTOR	PERSONS AT RISK	CONTRACTOR'S METHOD STATEMENT No.
1	Deconstruction & Demolition	Method to isolate existing services and deconstruct and remove safely.	All	
2	Hot works	Method to avoid fire outbreak.	All	
3	Working at height	Method to mitigate risk of falls.	All	
4	Live services	Method to divert and work alongside Gas, HV and LV services	All	

4.3.2 Protection of People beside work area

The Principal Contractor is required to describe their proposed Method of Working for the protection of staff, students and visitors, residents and the public adjacent the site beside the work areas.

4.3.3 Heavy materials risks

Where construction materials, (e.g. timber, steel or masonry) exceeding 20kg in weight is required to be dismantled from or installed in the premises, the Principal Contractor shall

describe their method of dismantling/transporting/unloading/installing same paying due attention to the health and safety aspects associated with handling heavy materials.

5. Construction materials

5.1 Health hazards arising from construction materials where particular precautions are required either because of their nature or the manner of their intended use.

The list below identifies materials/activities which have been identified by the Designer as constituting a hazard to health. (Control Of Substances Hazardous to Health (COSHH) Assessments).

5.11

COSHH SHEET No.	MATERIAL/ CONSTRUCTION LIST	OUTLINE DESCRIPTION OF HAZARD	PERSONS AT RISK	CONTROL REQUIRED
1.	N/A	Only common materials used during construction have been identified.		
2				
3.				

Note Common materials used during construction may present health and safety hazards requiring the Principal Contractor to carry out COSHH or other risk assessments and to introduce control measures which should be included in the Health and safety File. They are deemed to be within the normal experience of a competent contractor and therefore have not been listed here.

5.1.2 Health and Safety Data Sheets

The Principal Contractor is requested to attach Safety Data Sheets as required under Regulation 6 of the Chemicals (Hazard Information and Packaging for Supply) Regulations to their Construction Phase Plan. These are to be included in the Health & Safety File.

6. Site wide elements

6.1 Positioning of site access and egress points (e.g. for deliveries and emergencies).

Access to the site is off St John's Church Road.

Deliveries - Before commencing work, the Principal Contractor is required to prepare a detailed Plan describing their delivery arrangements and when these will take place.

Site Arrangement - The Principal Contractor should include in their plan a layout drawing describing access/egress, pedestrian and vehicular controls, signage, loading/unloading and vehicle movements, site security arrangements, hoardings and lighting and the location of site accommodation and welfare facilities also the muster location(s).

Site signage. The Principal Contractor shall identify by clear signage any safety hazards. Reliance should not depend entirely on written warning signs where there is a possibility that some people, e.g. young children, may not be able to read them.

Waste Disposal – The Principal Contractor will be responsible for ensuring that all waste is disposed of appropriately and recycled as far as practical. The employer has zero facilities to handle waste on site.

6.2 Location of temporary site accommodation.

The Employer will provide welfare facilities for personnel which will comprise the following:-

i) Toilet facilities for operatives with washing facilities shared at the rear of the building with occupants of the first and second floors

ii) An area within the site for a site office

iii) Canteen facilities

iii) Storage areas are to be agreed at the pre-contract meeting

There is no space available for contractor's parking within the site. The contractor is to make use of local public parking facilities which include the nearby Church car park (using Just Park app).

Similarly there is no space available within the site for a skip, and the contractor should ensure any licences required for an on-street skip are obtained prior to commencement.

6.3 Location of unloading, layout, and storage areas.

Materials Storage- All materials shall be carefully stored prior to use in an area which can be maintained secure out of working hours.

Hazardous Materials Storage - The Principal Contractor shall describe their method of storing hazardous materials.

6.4 Traffic/pedestrian routes.

Access to the site will be from Urswick Road onto St John's Church Road, leading to the existing building front entrance.

Traffic and Pedestrian Routes - The Principal Contractor shall describe in their proposal's safe routes for third parties where they may come into contact with the site's operations.

Common Access - The Principal Contractor is to note that access to and around the premises must be retained for use by others, including the Fire Brigade, emergency, and local authority services.

Protection of the Works - Before commencing any section of the work, the Principal Contractor shall set out safe routes for all third parties, where they may come into contact with the construction work, using barriers where there is high risk of injury or flicker tape or similar where the risk of injury/interference with the works is low. The Principal Contractor shall describe their proposals in the CPP.

Vehicles to be safely loaded etc. - The Principal Contractor shall take such steps as may be necessary to ensure that vehicles leaving the site do not deposit materials on the campus roads or public roads system.

6.5 Health Hazards.

Noise and Vibration. The Principal Contractor should outline their proposals for noise and vibration control, both in respect of being a hazard to the health of site personnel, and as a potential public, or statutory, nuisance.

Waste removal - Risks to health. Skips are to be covered to protect against dust fallout.

Burning on site - No burning will be permitted.

Fire Prevention - The Principal Contractor shall take note of the advice given in Fire Prevention on Construction Sites - the Joint Code of Practice published by the Building Employers' Confederation, the Loss Prevention Council and the National Contractors' Group. To be incorporated within the CPP.

7. Site wide elements

7.1 Consideration of the health and safety issues which arise when the project is to be located in premises occupied or partially occupied by the client.

Emergency procedures - The Principal Contractor shall describe in their Construction Phase Plan their emergency procedures, including designated escape routes and gathering points, to deal with fire and personal injury. These procedures shall take account of the existing building Fire and Emergency procedures and take into account any other occupants.

Noise generation and vibration - The generation of noise that could cause hearing damage is to be kept to an absolute minimum to ensure that staff, students, residents or members of the public are disturbed as little as possible. The principal contractor will require to carry out their operations in conformity with BS 5228: Part 1 and 2: 2009 and any restrictions imposed by the Planning Authority.

Existing Services - Existing services serving the surrounding area must be maintained at all times.

8. Site rules

8.1 Specific site rules which the Client, CA or Principal Designer may wish to lay down as a result of points 2-7 above or for other reasons - e.g. specific permit to work rules, emergency procedures.

The following site rules are to be observed in the contractor's proposals:

The contractor is to follow the relevant requirements of Olive School including any Authorisation to Work procedures and related rules including the Safeguarding booklet is provided to all visitors and contractors.

8.1.1 Security of Premises occupied or partly occupied by Client

The Principal Contractor shall ensure that steps are taken to limit the number of people on site to those directly concerned with the construction work and to ensure that the security of the premises as a whole is maintained and that the security of the Client's undertaking is preserved. The Principal Contractor is required to discuss arrangements with the Client's representative before commencing work.

8.1.2 Site Lighting.

Temporary lighting is to be provided as required.

8.1.3 The Employer will only permit working between the following times:

Works are to be undertaken during normal working hours. This is deemed to be Monday to Friday from 8.30 until 17.30. The contractor can work these hours to suit in line with the programme.

Noisy works restrictions (although there will be some flexibility offered).

•Before 9am

•After 4pm

Site establishment, setting up and dismantling access equipment, must be undertaken out of hours. No equipment, plant and material are to be left within the surrounding areas where they may cause obstruction at any time.

8.1.4 Services Isolation

The Principal Contractor is required to obtain permission from the Site Representative before shutting off any services. As such any shutdowns required to complete the work must be agreed with the Client in advance.

8.1.5 Smoking on site.

Smoking is not permitted at the workplace.

8.1.6 Radios on site.

Radios, including earpiece type personal radios are not permitted at the workplace.

8.1.7 "Hot Work"

Where any hot works are required, the Contractor is to complete and submit record of their own hot works permit procedure. It is expected that the Principal Contractor shall identify arrangements to ensure no risk of fire prior to leaving site for the day. Evidence will need to be provided to demonstrate that a Hot Works Permit system is in operation and also evidence of periodic spot checks.

8.1.8 Plant.

All portable equipment not in use shall be isolated and carefully stored. Items of plant not in use shall be rendered safe and isolated.

8.1.9 Adjacent property

The Principal Contractor shall take such steps as necessary to protect adjacent properties from damage and to prevent their workforce from trespassing on them.

8.1.10 Personal protection -

Personal protective equipment must be provided by the Principal Contractor for any visitors to site and it is the Principal Contractor's duty to ensure that all site operatives have suitable personal protection.

8.1.11 Visitors

Before entering the site, the Principal Contractor shall advise visitors of any hazards on the site, whether in the area to be visited or not.

8.1.12 Stressing the structure

Contractor to ensure works do not stress any existing structures.

8.1.13 Tidy Site.

The Principal Contractor shall maintain the site in a tidy condition, especially along pedestrian and vehicular routes.

8.1.14 Contract Requirements.

The Principal Contractor is required to comply with the requirements of the Contract Preliminaries. Any area of conflict between the health and safety requirements and the Contract Documents shall be brought to the attention of the Contract Administrator and the Principal Designer.

8.1.15 Trained and experienced Personnel- Design

The Principal Contractor is required to ensure that any Designers responsible for any design work instigated by them are suitably trained and appropriately experienced in terms of the Construction (Design & Management Regulations).

The contractor will be responsible for completing the design of the visitor's reception desk/hatch.

The contractor will be responsible for completing the design of the 2no office desks.

8.1.16 Trained and experienced Personnel-Construction

The Principal Contractor is required to check the Training and experience of any domestic, named or nominated Contractor for the purposes of complying with the Construction (Design & Management) Regulations.

8.1.17 Contractors and Self-employed people

It is a requirement under the Construction (Design and Management) Regulations that the Principal Contractor ensures that contractors and self-employed people working on the site are made aware of the relevant portions of the CPP and the Health and safety file.

8.1.18 Statutory Instruments -

During the course of the works, Contractors shall pay attention to the relevant Statutory Instruments as updated.

8.1.19 HSE Information Sheets -

The Principal Contractor shall take due notice of the guidance given in HSE information sheets (Construction series), which covers ladders, scaffolds, work in confined spaces, excavations, welfare arrangements, work on roofs, chemical cleaners, cement, solvents, PPE, silica and handling building blocks. The Principal Contractor's attention is also drawn to the HSE publications - "5 Steps to Risk Assessment" and "Accidents to Children on Construction Sites".

9. Maintenance and provision of the CPP and CDM information, compliance and continued liaison

9.1 Preparation of the CPP, procedures for dealing with unforeseen eventualities during project execution resulting in substantial design change and which might affect resources. Provision of CDM information including the as built structure in-use.

The following site rules are to be observed in the contractor's proposals

9.1.1 Changes in design, or changes which negate primary assumptions made in the PCIP or Health and Safety File

Whether made by the Design Team or the Principal Contractor, and which may significantly affect the Health and Safety File, sequence of working or the resources necessary to comply with health and safety legislation, shall be referred to the Principal Designer and Contract Administrator and agreed by the Employer in writing before any change is implemented. This relates only to the Health and Safety aspects of the design and does not imply acceptance of the design by the Contract Administrator.

9.1.2 Provision and Maintenance of the Construction Phase Plan (CPP)

Before construction work commences the Principal Contractor must submit to the CA and the PDs their Construction Phase Plan, developed in sufficient detail to ensure that all construction work is carried out without risks to the health and safety of all working on and adjoining the site/workplace areas.

A copy of the CPP must be kept on site at all times. The Principal Contractor must also ensure that the Plan is updated at any time applicable, e.g. where there is a change in assumptions made or an update to any part of the project or scope.

9.1.3 The Health & Safety File

The Principal Contractor is also required to provide the Principal Designer with information to be included in the Health and Safety File as required under CDM Regulation 12. Outline requirements of the Health and Safety File set out in Appendix 2.

The Principal Contractor shall be responsible for the collation of all health and safety file information and submit it to the Principal Designer in advance of Practical Completion. The practicalities of ensuring that all relevant test and commissioning certificates are included, prior to practical completion is understood and it is accepted that a number of such certificates may not be available until the works are wholly complete. Under such circumstances the file information shall be submitted without such test and commissioning certificates. It is imperative however that the missing information is available prior to handover, otherwise Practical Completion will not be granted.

The Principal Contractor shall also ensure that the Operating and Maintenance Manuals are submitted to the relevant consultant and that approved manuals and relevant completion checklists are in place prior to Practical Completion. The Operating and Maintenance Manuals format is to follow the format set out in Appendix 2.

APPENDIX

Appendix 1	**Principal Contractor's Construction Phase Health & Safety Plan Requirements**
Appendix 2	**The Health & Safety File/Operating and Maintenance Manuals Requirements**

Appendix 1 **Principal Contractor's Construction Phase Health & Safety Plan Requirements**	
Description of the Project	(a) Project description and programme details (b) Details of client, Health & Safety Adviser, Principal Designer, designers, Principal Contractor, other consultants etc. (c) Extent and location of existing records and plans
Management of the Work	(c) Management structure and responsibilities (d) Health and safety goals for the project and arrangements for monitoring and review of health and safety performance (e) Arrangements for: i. Regular liaison between parties on site ii. Consultation of the workforce iii. The exchange of design information between the client, Principal Designers, Health & Safety Adviser and contractors on site. iv. The selection and control of contractors v. The exchange of health and safety information between contractors vi. Security vii. Site induction viii. On-site training ix. Welfare facilities and first aid x. The reporting and investigation of accidents, incidents including near misses xi. The production and approval of risk assessments and method statements xii. Site rules (including drug and alcohol policy) xiii. Fire and emergency evacuation procedures

Arrangements for controlling significant risks on site	Safety risks (a) Delivery and removal of materials (including waste) and work equipment (b) Dealing with services (water, gas etc.) (c) Accommodating adjacent land use (d) Stability of structures including temporary structures and unstable structures (e) Preventing falls (f) Work with or near fragile materials (g) Control of lifting operations (h) Maintenance of plant and equipment (i) Work on excavations and work where there are poor ground conditions (j) Work on or near water where there is a risk of drowning (k) Traffic routes and segregation of vehicles and pedestrians (l) Storage of materials (particularly hazardous materials) and work equipment (m) Other significant safety risks Health risks (a) Removal of asbestos (b) Dealing with contaminated land (c) Manual handling (d) Use of hazardous substances (e) Reducing noise and vibration (f) Other significant health risks
The Health and Safety File	(a) Arrangements for collection and gathering information

Appendix 2 The Health & Safety File Requirements	
Section 1	**Introduction** (a) Introduction (b) Description & Timescales of the Works (c) Location of the Works (d) Project Team Directory
Section 2	**Health & Safety Implications** (a) Details of Risks / Hazards not Designed Out (b) Key Structural Principals (c) Hazards Associated with Materials Used (d) Safe Access Routes
Section 3	**Asbestos & Other Hazardous Substances** (a) Asbestos Register (b) Asbestos Removal Certificates (c) Hazardous Waste Notices
Section 4	**Details of Materials & Products Used** (a) Manufacturer's Literature for Proprietary Items (b) Data Sheets (c) Finishes / Colour Schedule (d) Guarantee's (e) Warranties
Section 5	**Maintenance & Cleaning Procedures** (a) Maintenance Procedures / Schedule (b) Cleaning Procedures / Schedule (c) COSHH Assessments (d) Unusual Construction Methods / Details (e) Access Procedures / Routes (f) Plant & Equipment
Section 6	**Certificates** (a) Planning Approvals (b) Building Control Approvals (c) Mechanical Installations (d) Electrical Installations
Section 7	**Final Record Drawings** (a) Building Fabric Drawings (b) Structural Drawings, including Calculations
Section 8	**Operation & Maintenance Manuals** (a) Mechanical Manual (b) Electrical Manual

Section 9	**Fire Safety** (a) Fire Strategy Drawings (b) Fire Risk Assessments

Appendix E

Designer Risk Assessment

Project Delivery System
Hazard identification register

Covering significant design-related Safety, Health and Environmental hazards

Click here for link to guidance :

Project no :
BC.SOUTH.2022.00255.001

Project description :
The Olive School - Office Remodel

Original prepared by :
Isaac Berbiers

Prepared date :
06.12.2022

Brief project overview :
The works include for the remodel of the ground floor office/ reception area. Works will include the strip out of existing partition walls, erection of new walls to create a new layout, new doors installed, and M&E layout adapted to suit. A new bespoke reception hatch will be built with workstation/desks and shelving to be installed. External works include new signage is to be installed in various locations and adjustments made to the curb stones outside of the property.

Item Ref	Date added or amended	Foreseeable potential hazards identified (Those with the potential to cause significant harm to people, other living species or the environment, or which AHR is able to positively influence)	Affected party / Sensitive receptor	Comments or specific sensitivities (eg. specific party, named watercourse, species etc)	Period(s) when may apply	Is AHR able to influence risk reduction?	If 'Yes' to previous, enter current status	Ownership (Responsibility for further investigation and/or actions)	Specify how AHR can influence risk reduction or provide relevant information to those with ownership for risk (ERIC) (Provide as text or link / reference to documents containing such)
	05 December 2022	Asbestos removal or disturbance	Workers	Exposure to asbestos	Demolition	No	Open	Contractor	Contractor to carry out Refurbishment and Demolition Survey prior to any demolition works taking place.
	05 December 2022	Fall from height	Workers	Contractors should observe safe use of all access equipment used.	Various (specify in comments)	No	Open	Contractor	Safe use of ladders and appropriate access equipment in installation and maintenance of signage and works to ceilings.
	05 December 2022	Slips or trips (during construction or in use activities)	Various (specify in comments)	Workers to keep site clean and tidy at all times.	Cleaning	No	Open	Contractor	Regular site visits to ensure working enviornment is kept tidy.
	05 December 2022	Fume, gas or odour emissions (created by construction or in use activities)	Various (specify in comments)	Use of solvents within paints	Construction	No	Open	Contractor	Contractor to ensure correct measures are in place such as appropraite PPE and that spaces are ventilated when paints containing solvents are used.
	05 December 2022	Dust or grit emissions	Various (specify in comments)	Dust emmisions generally to the public, school staff and students. Specifically when undertaking hard landscaping works.	Construction	No	Open	Contractor	Foreman to ensure correct use of PPE.The contractor is to take necessary precautions to protect the existing building in all aspects when carrying out proposed works. The contractor is to contain all dust/ dirt debris arising as part of the works and fully clean all areas where works are undertaken. Contractor to provide full sealed polythene sheeting to any internal working areas areas to inhibit the spread of dust particles.
	05 December 2022	Interface with public and pedestrians	Workers	Occupied site	Construction	No	Open	Contractor	Contractor to keep clean and tidy site and act in a professional manner and ensure segregation from staff / students.
	05 December 2022	Litter nuisance from site (during construction or in use activities)	Local community	Good waste management and regular removal of waste from site.	Construction	No	Open	Contractor	Contractor to ensure waste from construction is managed , stored and removed appropriately.
	05 December 2022	Noise (during construction or in use activities)	Local community	Noisy works undertaken at unsocial hours.	Construction	No	Open	Contractor	Ensure no noisy works carried out at unreasonable hours.
	05 December 2022	Nuisance or danger from delivery/waste carrier vehicle movements (during construction or in use activities)	Various (specify in comments)	Risk of collision with pedestrians due to site layout and restricted visibility.	Construction	No	Open	Contractor	Use of banksman to ensure area is clear and pedestrians at minimal risk of injury.
	05 December 2022	Site appearance / aesthetics (during construction or in use activities)	Local community	Waste and site management	Construction	No	Open	Contractor	Good site and waste management to minimise levels of waste and debris on site.
	05 December 2022	Work with or near live services	Workers	Works on / near live services within ceiling void.	Construction	No	Open	Contractor	Contractor to ensure workers are competant and qualified before undertaking works in these areas. Contractor to carry out all necessary investigations to establish live services.

	05 December 2022	Disruption e.g. traffic, parking issues etc. (specify type)	Various (specify in comments)	Limited available space and occupied premises.	Construction	No	Open	Contractor	Time deliveries, and minimise no. of contractor vehicles on site.

Appendix F

CPW Risk Assessment