

KINGS ACADEMY

**MECHANICAL AND ELECTRICAL
ENGINEERING SERVICES**

PERFORMANCE SPECIFICATION

KINGS ACADEMY**MECHANICAL AND ELECTRICAL
ENGINEERING SERVICES****PERFORMANCE SPECIFICATION**

Client Name: Kings Academy
Reference: BSD11120 -100
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Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS and BS EN ISO 9001:2008

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SPECIFICATION EXPERT - INTRODUCTION

This document has been compiled using Specification Expert, which is joint copyright Barbour Index Limited and National Engineering Specification Limited.

The content incorporates that of the National Engineering Specification (NES).

NOTES FOR TENDERERS

Dependant on the nature of the works specified within this document, the specification shall contain some or all of the items below:-

1. PRELIMINARIES

The Preliminary clauses ('A' sections) included are those that relate to the Engineering Works in particular and must be read in conjunction with the "Preliminaries" of the "Main Contract".

2. SYSTEM SPECIFICATIONS

The system specifications are sub-divided into four parts:-

Part 1 System objectives:

The system objectives are clauses giving details of design information, system performance and description, together with lists of the system schematics and drawings.

Part 2 Selection schedules for the reference specifications:

These selection schedules specify items in the system that are contained in the Reference Specifications (Y group). Required Y group clauses are invoked by reference.

Part 3 Clauses specific to the system:

These specification clauses are specific to the system concerned and in general make no reference to the Y group clauses.

BS Appendix

The BS Appendix contains a list of all the British and European Standards referred to in the particular system specification.

3. APPENDICES

The appendices shall consist of some or all of the following:-

Tender Summary

A pricing schedule for the system specifications.

Equipment Schedules

Schedules for the equipment specified within the document.

Reference Specifications (Clauses from the Y Group)

All the reference specifications relevant to all the systems for the job. Required clauses are invoked in Part 2 (Selection schedules for the reference specifications) for each system.

4. NON-SPECIFICATION CLAUSES

User created, non Specification Expert, clauses may appear within the specification.

SECTION A - INDEX

A1.0 GENERAL CLAUSES

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- A1.3 Tender**
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- A1.11 Responsibilities (Services Co-Ordination)**
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- A1.27 Disagreement**

A1.0 GENERAL CLAUSES

THIS SECTION “GENERAL CLAUSES” IS TO BE READ IN CONJUNCTION WITH THE MAIN CONTRACT PRELIMINARIES. WHERE ANY CONFLICT OCCURS THE MAIN CONTRACT PRELIMINARIES SHALL TAKE PRECEDENCE.

A1.1 Project Particulars

A1.1.1 The Site

The project title and postal address is:

Kings Academy
Hillock Lane,
Woolston

A1.1.2 Parties

The names, postal address and telephone numbers of parties involved in the construction of the project and its administration are as detailed in the main contract preliminaries.

A1.2 Definition

The term "Supervising Officer" has been used throughout these documents and shall mean the person or persons whom the employer has appointed to act as his representative for the execution of the project.

The Supervising Officer shall be the Project Manager, unless stated otherwise.

A1.3 Tender

A1.3.1 Tender Returns

Tenders for the Contract Works shall be submitted in accordance with the main contract preliminaries and on the Tender Forms accompanying this Specification.

Tenders received after the time stated may be rejected.

Tenders qualified in any way may be rejected.

No payment will be made for Tenders.

The employer does not bind himself to accept the lowest or any Tender.

A1.3.2 Tender for the Complete Installation

The works covered by this tender are the design, design development, calculations, detailing, manufacturing, works testing, supplying and delivering to site, erecting, connecting up, testing, commissioning, demonstrating, performance testing and handing over in working order the complete engineering services installations described in the Tender Documents.

The Tender shall be for complete installations and not only the major items of plant and equipment contained within the Tender Documentation but also all incidental sundry components necessary for the complete execution of the work including for the supply and installation of all steelwork required to support the

services within his works package. The Tender shall include the proper commissioning, performance testing and operation of the installation and notwithstanding the obligation of the Contractor to produce co-ordination and installation drawings and the like based on the Contract Drawings, no additional cost will be allowed for want of knowledge in this respect.

The Contractor shall, when submitting his Tender clearly describe any excluded work which of necessity he requires to be executed and paid for by others. Any such work not specially stated and described shall be deemed to have been included in the Tender.

A1.3.3 Pricing of Preliminary Items

A full breakdown of preliminary clause pricing is to be provided with the submission of the Tender return and shall be detailed in the appropriate section of the pricing schedule.

A1.3.4 Schedule of Rates

The Tenderer shall provide with their tender submission, a fully priced out Schedule of Rates with each item priced and totalled to agree with the sub-totals and final total of the Tender. These prices shall be the basis for the valuation of any variance of the Sub Contract Works.

The priced Schedule of Rates shall be deemed to include for all items, whether mentioned in the Schedule or not, for this sub contract. Detailed rates are also required for all Sub Traders' work included in the Sub Contract.

Ancillary items not shown separately in the schedule will be assumed to be included in the general rates stated.

A1.3.5 Warranty to be Given by the Contractor Employed by the Contractor

Prior to appointment the Tenderer shall provide the employer with the warranties as detailed in the Main Contract preliminaries. Failure to comply with this clause will invalidate this tender.

A1.3.6 Mid Tender Meetings

The Supervising Officer may require an interview during the tender period to ensure that Tenderers are aware of all of the requirements of the Works and to review progress.

A1.3.7 Post Tender Meeting

The Tenderer may be called to a meeting following tender submission to present his proposals to the Project Team in order to clarify any ambiguities which may exist and to provide any additional information which may be required. The Tenderer's proposed management team will be required to attend this meeting. It is envisaged that the management team may include people associated with both off and on site operations.

Specifically all matters relating to the production of contract information and site liaison shall be agreed,

The agreed minutes of this meeting or meetings shall if required by the Supervising Officer form part of the contract document to demonstrate that the Sub Contractor has understood his responsibilities.

A1.4 Contract Preliminaries

Refer to the main contract preliminaries for the Information in respect of:

- i) Contract Conditions/Appendices
- ii) Statutory/General Obligations
- iii) Management/Administration Procedures
- iv) Resources/Temporary Work and Services
- v) Protecting/Cleaning/Drying/Completing
- vi) Nominated Firms

A1.5 Discrepancies in Tender Documents

- i) Any queries relating to the Specification or the drawings must be sent in writing to the Supervising Officer, who will circulate the questions and answers to all firms tendering.
- ii) In the event of the discrepancies appearing in the drawings, or between the drawings and Specification, or drawings and schedules, Tenderers shall refer the matter in writing to the Supervising Officer for interpretation.

A1.6 Visit to Site

The contractor shall be deemed to have visited the site before tendering and to have satisfied himself as to the local conditions and accessibility of the site, the full extent and nature of the works, the supply of and conditions affecting labour, carriage, cartage, unloading, tools, scaffolding, ladders and everything else necessary for the execution of the works. No claims on the ground of lack of knowledge in such respect will be admitted.

The contractor is to allow in his prices for complying with all traffic and other regulations of the Main Contractor, the Local Authority and Police with regard to access to and egress from the site as advised from time to time.

Access to the site can be gained through arrangement with the project manager.

A1.7 Patented Articles

The Contractor shall be solely responsible for any expenditure incurred through the employment of patented articles or devices, including all royalties and other such charges. The Employer and Supervising Officer undertake no responsibility whatsoever in this matter.

A1.8 Customs and Excise Dues and Royalties

With the exception of Value Added Tax, the Sub-contractor shall include in his Tender, Custom and Excise Dues and Royalties and similar other charges all strictly nett. Any refund of these items shall be wholly to the Employer's benefit.

A1.9 Resources, temporary works and services to be provided by the Contractor in constructing the contract works.

A1.9.1 Supervision

- i) The contract shall allow for keeping on the site, throughout the duration of the contract period and until the work is completed to the satisfaction of the Supervising Officer, a competent Engineer whose name shall have been communicated in writing to the Supervising Officer. This representative shall supervise and superintend the carrying out of the works on the site, prepare progress schedules and programme's and ensure full exchange of information with other trades and shall be permanently available during the

working hours on the site and shall attend all meetings on the site when requested.

- ii) The site representative shall be fully authorised and qualified to accept written instructions from the Supervising Officer via the Main Contractor, and issue instructions on behalf of the Contractor, and shall keep a diary recording the day-to-day progress of the work and the details of all the instructions received. This diary shall be at the disposal of the Supervising Officer.
- iii) If, in the opinion of the Supervising Officer, the degree of site supervision is inadequate, he shall instruct the Contractor, who shall immediately rectify this matter to the satisfaction of the Supervising Officer.
- iv) The Supervising Officer shall be at liberty (by notice in writing to the Contractor), to object to any representative or persons employed by the contractor, in the execution of or otherwise about the works, who shall, in the opinion of the Supervising Officer misconduct himself or be incompetent or negligent, and the contractor shall remove such persons from the works forthwith.
- v) The Contractor's Engineer responsible for the Sub-contract works will be required to attend Site Meetings when requested.
- vi) The Tenderer must include with his Tender his management proposals together with details of his supervisory staff intended to be employed on the works. Where the sub-contractor has a design or design development responsibility his management proposals must include details of his design staff. The management proposals shall include the following information in respect of all supervisory/design staff:
 - a) Organisation chart - both off and on site.
 - b) Name
 - c) Title and function
 - d) Relevant experience and references
 - e) Duration and percentage of employment on the Works.
 - f) Cost per week
 - g) Total staff costs.

The above proposals shall include the Contractor's proposed Field Staff Organisation Chart showing lines of responsibility within the field staff and reporting lines of authority with key Head Office Managers/Directors, with particular regard to Safety, Quality, Project Controls and Project Management.

The above information does not in any way relieve the contractor of the obligations to provide suitable and adequate management to complete the works.

A1.9.2 Staff

The Contractor shall supply all the necessary labour, both skilled and unskilled, required to carry out the Contract and during the execution of the Contract, shall observe those conditions of employment which have been agreed between the Employer's Federation and the Trade Unions concerned to apply to the place and circumstances in which these works are to be carried out.

Additional nett overtime costs shall only be permitted as extra when specifically authorised by the Supervising Officer in writing for special or emergency

purposes. Overtime working for any purpose necessary for normal building organisation, such as that necessary to keep to programme, encouragement or working to provide continuity of working in certain trades, or to facilitate trade waiting on trade etc., shall not be regarded as special or emergency purposes.

A1.9.3 Work Area

The Contractor shall take all precautions necessary to restrict the area of his works to the immediate vicinity of the work involved under his contract and shall prevent his workmen from straying beyond the boundaries of such works.

A1.9.4 Planning

Co-operate with all other contractors in planning the construction of the contract works before the work commences.

Prepare a schedule detailing all items of plant and equipment with their true delivery period which he considers should be brought to the attention of the Main Contractor in the preparation of this main programme.

Liaise with the Supervising Officer and Main Contractor, providing them with a detailed program confirming when Client supply items if any are required for installation.

Sub-contractors shall advise the Main Contractor in sufficient time to allow access to be provided for the installation of large items of plant and equipment or long lengths of pipework, ductwork or cable, etc.

A1.9.5 Statutory Undertakings

The Contractor will be responsible for programming, co-ordinating and progressing the involvement of the statutory undertakings and other Authorities in the works as is necessary within the project. The contractor shall place all orders for the statutory authority works and shall be responsible for placing these orders in sufficient time so as not to adversely affect the construction programme and delivery dates.

The Contractor shall source and provide all necessary information so required by the statutory authorities.

The Contractor shall, in addition to the above, allow for full attendance by any necessary sub-contractors to satisfy the needs of the Statutory Authority undertaking and other Authorities and shall assist their Engineers on site to the full.

A1.9.6 Standard Specifications

Supply, as necessary, on loan only, to the Supervising Officer's representative on the works, one copy of each International or British Standard Specification, Code of Practice and other Standard Specifications referred to in these documents. Reference to International or British Standard Specifications, Code of Practice etc., do not give year of issue or date of amendment slips. The current version at the time the Main Contractor receives these documents shall apply.

A1.9.7 Roads

All necessary temporary roads, tracks, crossings and hard-standings will be provided free of charge to sub-contractors by the Main Contractor.

A1.9.8 Buildings and Security Measures

Provide, as necessary, temporary sheds, offices, other temporary buildings and security measures for your own exclusive use and clear away everything on completion.

The contractor shall allow for moving the site accommodation from time to time as may be required by the contract works, subject to the confines of the site. Storage area for the contractor's and Sub-contractor's materials, plant, etc., shall be provided by the Contractor. Suitable mess rooms and sanitary accommodation will be provided by the Contractor for all persons employed on the works all in compliance with the current Statutory Regulations and the Code of Welfare conditions of the National Joint Council for the Building Industry.

A1.9.9 Telephones/Facsimile/Computer

Provide, as necessary, temporary telephone, facsimile and computer facilities for your own exclusive use. Pay all charges.

A1.9.10 Water, Lighting, Electrical Power and Fuel

The Main Contractor will supply water, lighting, electric power and fuel in accordance with the Contract Preliminaries.

The Contractor is to assure himself that all the necessary electric supplies are available for the contract works.

A1.9.11 Plant

- i) The contractor shall include in his contract price for the provision of all tools, implements, instruments, cutting and bending machinery etc.
- ii) The contractor shall provide all special machinery and all tackle, tools and other equipment required for the execution of his work and will be held responsible for such equipment when on site.
- iii) Unless otherwise advised, all tools, etc., shall be suitable for operation on 110V 50Hz supply.

A1.9.12 Local Authorities Requirements

- i) The contractor shall comply with and give all notices required by any Act of Parliament, regulations or by-laws of any local authority, public services, company or authority who may have any jurisdiction with regard to the work or whose systems, the same, are or will be connected, and he shall pay and indemnify the Employer against any fees or charges legally demandable under such an Act of Parliament, regulations or by-laws in respect of the works. No extra charge will be allowed due to failure to allow for this requirement.
- ii) Where the requirements of any water or electricity authority call for the submission to them of any component part of the works for approval, testing, stamping or certifying, contractor shall, at his own expense, submit and deliver any such component part to the place required by such Authority.

After such component part has been satisfactorily approved, tested, stamped or certified, the Contractor shall return it to the site for

incorporation into the works. Any expense incurred shall be paid by the Contractor.

A1.9.13 Inspection and Testing at Works

- i) The contractor shall provide all assistance, labour, materials, power, fuel, stores, apparatus and properly calibrated and certified instruments for carrying out the necessary works, and shall allow in his Tender Sum for all costs in this regard.
- ii) The Supervising Officer shall be entitled at all times during the manufacture to inspect, examine and test on the contractor's premises the material and workmanship of all plant to be supplied under the contract and, if part of the said plant is being manufactured on other premises, the contractor shall obtain for the Supervising Officer permission to inspect, examine and test as if the said plant were being manufactured on the contractor's premises. Such inspection, examination or testing, if made, shall not release the contractor from any obligation under the contract.
- iii) The contractor shall give the Supervising Officer two weeks written notice of the date on and the place at which any plant will be ready for testing as provided in the contract and unless the Supervising Officer shall attend at the place so named within ten days of the date which the Sub-contractor has stated in his notice, the contractor may proceed with the tests which shall be deemed to have been made in the Supervising Officer's presence and shall forthwith forward to the Supervising Officer, duly certified, copies of the test reading.
- iv) In the event of the plant not so passing the tests, the Employer shall be at liberty to deduct from the contract price all reasonable expenses incurred by him in repeating the tests.

A1.9.14 Connecting to Existing Services

Give seven days notice to the Supervising Officer of your intention to connect into or isolate any of the existing services and await his approval for so doing.

Include for all overtime and other additional payments necessary to ensure that the interruptions to existing services are carried out within the minimum possible inconvenience. Work without pause until the services are back to normal.

A1.9.15 Operation of Plant, Etc.

Prior to practical completion ensure that working plant is doing so correctly. Provide your own skilled personnel to attend the plant etc., while working, together with such specialist personnel as are necessary for each circumstance.

A1.9.16 Damage Due to Inclement Weather

The contractor shall take all such measures and precautions deemed necessary for the protection of the works forming the contract and shall make good free of charge to the Employer or his assigns such damage, defects or faults which shall appear during the progress of the works due to inclement weather, frost etc.

A1.9.17 Practical Completion

Before the contract works are included in a Certificate Of Practical Completion, the contract works, or such part as is referred to in the Certificate, shall be complete. The completion shall include setting to work, testing and

commissioning, including proving the performance is in accordance with the Specification, of all items included in the Certificate, and full adjustment and balancing, in as far as is possible without the building being occupied or the system being subject to a full climatic cycle, subject to the approval of the Supervising Officer.

Unless otherwise agreed the whole or any part of the sub contract works will only be included in a Certificate of Practical Completion when the contractor has issued to the Supervising Officer the required number of sets of Operating Manuals, Record Drawings and Building Owner's Log Book, as detailed later in this document.

After the installation has been shown to meet the commissioning requirements, the Supervising Officer may call for further operation of the plant in evaluating the performance of the installation. Be prepared to operate the plant, the cost of which will be reimbursed.

Include in your Tender for all additional works and expenditure necessary as a consequence of phase completion and handover.

A1.9.18 Training of Employer's Personnel

The Contractor shall provide experienced personnel to instruct the Employer's personnel in the operation, maintenance and servicing of all the installation. Give instructions for a period of one week before the issue of the Certificate of Practical Completion.

The contractor shall, at a time to be agreed prior to Completion or Completion of Section as defined in the Main Contract Preliminaries, instruct the Employer's representative in the use and correct operation of the contract works and shall satisfy himself that such staff are capable of taking over the installation. During this period of instruction, the contractor shall be responsible for the correct operation and maintenance of the installation.

The training shall take place prior to completion and during the system reliability trial with all systems fully operational. The contractor shall allow for a minimum of five days training for two representatives. All two representatives will attend each day of training. The contractor shall provide training handout notes and background information to the employer's representative prior to the training period.

Training shall be structured to suit all the relevant building elements (building and its services) and shall include theory, demonstration and hands-on experience in the operation and maintenance of the building. Each training day shall allow for relevant instruction on an elemental basis.

Theoretical training shall be carried out in a suitable quiet room with all necessary visual aids and facilities. A register shall be kept of attendance at each of the training sessions and a certificate shall be issued to all attendees at the end of each training session.

A1.9.19 Obligations after Practical Completion

Between the issue of a Certificate of Practical Completion and the Certificate of Making Good Defects relating to the whole or part of the Contract works, provide the following:

- i) A prompt call-back service, available at all times, to attend to any faults.

- ii) Prepare and submit a record of any failure or malfunction of any part of the contract, the remedial action taken, subsequent re-testing and the results thereof.
- iii) Notify of any malfunction in, or damage to, the Contract which the Contractor can demonstrate had been caused by incorrect operation of the system, vandalism or action of a third party.
- iv) Inform when all defects are finally rectified so that an inspection may be carried out prior to the issue of the Final Certificate.
- v) Carry out a final test at the end of the Defects Liability Period to demonstrate to the Supervising Officer that the contract works are operating efficiently and that all components are functioning correctly.

Carry out all work using competent, trained personnel and except where made necessary by abuse, misuse or negligence by other than the contractor, make no change to the Employer.

Notwithstanding the foregoing paragraph, charge to the Employer the nett cost of replacement for life expired disposable parts.

A1.10 Information required from the Contractor/Sub-contractors

A1.10.1 Generally

Select materials and products capable of attaining the performances specified in the Schedules and ensure that the various components of the systems can be coupled together in a proper manner to provide a workmanlike installation.

Provide Installation Drawings, as detailed later, to demonstrate your solutions to the Supervising Officer.

Provide Builder's Work Drawings, as detailed later, to illustrate the contract and sub-contract requirements in this respect to the Main Contractor and Supervising Officer.

Respond, in such good time that the Completion of Works will not be delayed, to the directions of the Supervising Officer and assist in integrating the Sub-contract works into the design of the works as a whole.

All Sub-contractors must ensure that they are provided, through the Main Contractor, with up-to-date copies of Architectural and Structural detail drawings and with working drawings of other trades where they may affect the Sub-contractor's own drawings. Site dimensions should be used wherever possible in preference to drawings.

The Supervising Officer will be advised of the cost of the Sub-contract works by the Quantity Surveyor. Carry out the services entrusted to you with strict regard to the Employer's budget for the project.

Sub-contractors shall perform all duties in accordance with a programme to be agreed with the Main Contractor and/or Supervising Officer.

- A1.10.2 The Contractor shall provide for agreement by the Supervising Officer fully documented Quality Assurance Procedure (QAP) to International or British Standards, prior to commencement of draughting, procurement or installation.

The contractors QAP must be provided in concert and agreement with the main contract procedures.

The QAP must detail specific procedures related to the tendered project and not be generalised.

The QAP shall be provided by the sub-contractor at tender, its content subject only to the Supervising Office and Main Contractors comment.

A1.10.3 Contractor to State Objections

In the event of anything described in the Specification or other relevant documents, or shown in the drawings being in the opinion of the Contractor, unsuitable or undesirable, or inconsistent with his guarantee and responsibilities under the contract, he shall draw the Supervising Officer's attention to such matters at the time of tendering or, in the case of matters arising out of documents, or in the case of instructions issued after the time of tendering, immediately on receipt of such documents or instructions and prior to the commencement of any part of works affected thereby.

A1.10.4 Integration

All contractors shall co-operate in planning the installation before the work commences. Take particular care to ensure that there is no obstruction of electrical services positions, cable routes, switch positions, mechanical services, pipework, access points and plumbing, etc. Arrange services in ducts so that the services are readily accessible for maintenance.

The routes of services and the positions of the equipment and the apparatus are to be identified by the contractor's designers. Attend such meetings as are necessary to enable the contractor to provide the Installation Drawings which the Supervising Officer requires to process.

The meetings will be called and be under the direction of the Supervising Officer.

The object of the meetings will be:

- i) To establish the inter-relationship of services in such confined spaces as ceiling voids, ducts and plantrooms;
- ii) To allow adequate space for maintenance and access purposes;
- iii) To assist in the proper provision of Builder's Work Drawings.

A1.10.5 Installation Drawings

Prepare, agree with the Supervising Officer and supply for issue all detailed Installation Drawings (including wiring diagrams and builders work drawings) required to enable the contract works to be vetted for compliance with the employer's requirement documents. The design of the works as a whole shall be completed and issued for comment, with comments incorporated before installation on site is commenced.

Drawings provided by the Contractor shall be drawn to commonly recognised scales on A0 or A1. sheets. In addition to the project title, the Architect's and Consulting Engineer's name and address, a unique drawing number, drawing title, scale and date shall be entered in the title block, together with full cross-reference details to the related drawings.

All drawings shall be produced and presented in print form and on computer disk with files in DXF format (unless agreed otherwise).

All drawings shall have independent layers of information in accordance with International or British Standards.

All layers shall be displayed 'on screen' in different colours.

The Contractor shall verify the accuracy of all dimensions abstracted from the drawings, including verifying the accuracy by taking dimensions on site, in the preparation of any construction drawings by the Contractor and before the relevant works proceeds.

All drawings, schedules and other information provided by manufacturers, suppliers or approved specialist Contractors shall be checked by the Contractor who shall ensure that all requirements of the design installation and working drawings/documents have been incorporated prior to submission.

Inform the Supervising Officer before changing any component or detail of installation shown on the Tender Drawings or described elsewhere in these documents.

At the time notify the Supervising Officer of the total effect of these changes, including the design parameters of the system and their effect on power requirements, cable sizes, performance or rotating machines and ductwork or pipework resistance, etc.

The installation drawings must also clearly show withdrawal space required for dismantling of plant and access space which must be kept clear of obstruction.

Builder's work drawings shall form part of the installation drawings and shall show the sizes and locations of all foundations, bases, plinths, sumps, chases, holes, etc, required and shall be based on certified manufacturers drawings.

The drawings shall be clear and concise in detail to enable building works to be carried out without misunderstanding.

The scale of these drawings shall be 1:50 or, where necessary 1:20.

Ductwork shop drawings shall be to a scale of not less than 1:50 and in congested areas, not less than 1:20, and shall indicate the length of each duct section, the internal dimensions of the bare sheet steel, dimensions of bends and fittings, location of stiffeners and supports and shall be dimensionally located the ducts in relation to the supporting or any adjacent structure.

In addition, the location and size of all equipment, grilles, diffusers, access panels, dampers, test points, penetrations and associating fittings for automatic controls and instrumentation, etc., shall be shown.

Switchgear, starter control and instrument panel drawings shall show the construction, the external and internal layout of panels, and wiring diagrams comprising internal wiring diagrams, for the complete systems in the panels. The drawing shall also show all pipework and capillary connections from the panels to external equipment.

Manufacturer's equipment drawings shall show the precise details of each and every item they will be providing and shall highlight all dimensions and particular

requirements necessary for the correct installation and maintenance of their equipment.

Specific installation drawings may with the prior specific and express written permission of the Supervising Officer omit minor details such as conduit provided that a method statement rigorously covers the installation intent. This permission will not be unreasonably withheld but will not be given where either Client operation or visual appearance is affected nor where details are needed for following trades.

The contractor shall submit such drawings as the Supervising Officer may reasonably require at any stage of the contract.

Supply four copies of each drawing for inspection by the Supervising Officer and, if required, four copies of each subsequent amendment. When agreement has been reached, issue further copies of the drawings as follows:

- i) For the Supervising Officer - 4 copies
- ii) Copies of drawings as necessary for use by other trades

Issue copies of drawings to those of your suppliers and Sub-contractor's affected by the drawings.

Allow in your programme for the preparation and obtaining approval of drawings, plus time to make any necessary amendments.

A1.10.6 Definition of Approval

Understand that whenever you submit information to the Supervising Officer for approval, such approval will be approval in principle only and will not, in any way invalidate your responsibility for ensuring the accuracy and suitability of the information in accordance with requirements specified elsewhere.

The exact position in the works of the above items relative to grid lines, floors, beams, ceilings, walls and other structural/finishes items, and any other services is the contractor's responsibility and the Supervising Officer's approval does not absolve you from the necessity of checking these items with the Main Contractor and other Sub-contractor's.

Note also that approval of drawings will not relieve you of your responsibility for complying with the Specification and the Employer's requirements.

When submitting any drawings the Sub-contractor shall advise the Supervising Officer if, in order to avoid delay in the completion of the works, early approval is necessary. The supervising officer will attempt to assist in meeting the timescale but this can not be guaranteed. All detailed drawings submitted for approval shall be to a reasonable scale and the Supervising Officer's decision as to what constitutes a reasonable scale shall be final.

A1.10.7 Drawing Approval Categories

A co-ordinating consultant will be identified by the Supervising Officer for each specialist Sub-contractor.

In addition to the co-ordinating consultant, fabrication drawings will be commented on by other consultants as considered appropriate by the Supervising Officer.

Two sets of drawings shall be issued to each commenting consultant.

The co-ordinating consultant will arrange receipt of other consultant's comments and transfer these to a single set of Sub-contractor's drawings to be returned to the Main Contractor within 10 working days (or less by special arrangement and mutual consent).

Drawings may be returned direct to the specialist Sub-contractor's by agreement in writing with the Sub-contractor and Main Contractor. Copies of correspondence covering return of drawings will be copied to the Main Contractor or Sub-contractor in either case.

Installation drawings will be returned under one of three following categories.

Drawings Stamped Category 'A'

Installation, manufacture or construction may proceed in accordance with the drawings submitted. Unless indicated to the contrary on such drawings, the works shall comply with the Contract Documents.

Drawings Stamped Category 'B'

Installation, manufacture or construction may proceed in accordance with the drawings submitted subject to the contractor taking necessary action based on the Supervising Officer's comments and all annotations added to the returned drawings. Unless indicated to the contrary on such drawings, the work shall comply with the Contract Documents. The required number of copies of the amended drawings shall be sent to the Supervising Officer.

Drawings Stamped Category 'C'

No work shall be installed, manufactured or constructed. The contractor shall re-submit new shop drawings to the Supervising Officer for review until re-submission is not required. Any submission marked 'C' shall not be permitted on site.

The co-ordinated, returned drawings will incorporate the most onerous classification awarded by any consultant making comment.

1.10.8 "As Installed" Record Prints

Throughout the execution of the Sub-contract works, keep on the site a complete set of up-to-date prints and schedules marked with "As Installed" details. Make these prints available at any time to the Supervising Officer or his representative.

If, in the event, upon completion of the works, of it being discovered that, the contractor shall have failed to comply with this requirement and it becomes necessary for the Supervising Officer to examine or trace through installed services in order to update the "As Installed" drawings, the cost of this work will be time charged and debited to the retention monies being held on the Contract.

A1.10.9 "As Installed" Drawings and Diagrams

Unless otherwise agreed, the contract works, or any part thereof, will only be included in a Certificate of Practical Completion when you have issued to the Supervising Officer the final "As Installed" Drawings and Diagrams. These shall consist of two paper copies and a dxf computer disk.

You may purchase copy negatives or dxf computer disk's where appropriate of the Tender Drawings from the Consultant.

Before the above mentioned final issue, send two prints of the "As Installed" drawings and diagrams to the Supervising Officer for approval of format and general content. Allow 14 days for approving.

Include on the "As Installed" Drawings and Diagrams the following in as far as they are the subject of the Sub-contractor works. The general content and layout of the drawing shall be as that required for the "Installation Drawings" see 1.10.5.

- i) The location, including level if buried, of Public Authority supplies provided within the Sub-contract, whether carried out by the Sub-contractor or by the appropriate Authority together with the points of origin and termination, size and materials of pipes, line pressure and/or other relevant information.
- ii) The layout, location and extent of all piped services showing pipe sizes throughout, together with all valves for regulation, isolation and other purposes, shown numbered in accordance with the actual installation.
- iii) The layout, location and extent of all air ducts, including those formed in builder's work or otherwise outside this Sub-contract but forming part of the system, showing all dampers and other equipment, acoustic attenuators, grilles, diffusers or other terminal components. Each duct and each terminal component shall be marked with its size and the air quantity flowing, as actually measured after approved regulation of the system or as computed by the addition of such measured quantities.
- iv) Single line and schematic wiring diagrams for the whole of the Sub-contract works showing all terminal references and cable sizes.
- v) The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, distribution boards, switches, outlets and lighting fittings which form part of the Sub-contract works, including dimensioned layouts of all concealed work. Where components are grouped or housed in a cubicle or on a common panel, an exploded arrangement must be incorporated.
- vi) The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, switches, outlets, terminals and indicators and alarms of all ancillary communication, detection, alarm and control installations which form part of the Sub-contract works, including dimensioned layouts of all concealed work.
- vii) The location and identity of each room of space housing plant, machinery, distribution boards, draw-in boxes or apparatus.
- viii) The detailed general arrangements, to one-twentieth scale (minimum), of all boiler rooms, machinery spaces, air handling plant, refrigeration plant, tank rooms, switchrooms, meter rooms and other plant spaces, including the location, identity, size, colour coding and details of each piece of plant and equipment.
- ix) The detailed general arrangements, to one-twentieth scale of service subways, ducts, meter rooms or other special sections of the work where, in the opinion of the Supervising Officer, the small scale drawings cannot provide an adequate record.

- x) Manufacturer's drawings showing the general arrangement and assembly of component parts of all machines and any pieces of equipment which may require servicing.
- xi) Flow diagrams indicating the principles of the arrangements and operation of each of the various services as related to central plant, other principal components and zoning of distribution etc.
- xii) Diagrams illustrating the principles of automatic controls and of instruments, presented in combination with the foregoing or separately, as agreed with the Supervising Officer.
- xiii) Location of all earth tapes, earth electrodes and test points.
- xiv) In conjunction with schedules of location and detail and reference, voltage and wattage of all lighting fittings.
- xv) Comprehensive electrical diagrams or sets of diagrams which shall show:

Size, type and length (to within one meter) of each main and sub-main cable, together with the measured conductor and earth continuity resistance of each.
- xvi) Manufacturer's internal wiring diagrams for each piece of electrical equipment supplied under the Sub-contract, together with physical arrangement drawings to locate and identify the component parts.
- xvii) Comprehensive diagrams showing in detail all power wiring and all control wiring and/or pneumatic of other control piping executed within the Sub-contract by others in accordance with detail provided by the Sub-contractor, including size and type of conductor or piping used and identifying the terminal points of each.

A1.10.10 Operating Manuals

Unless otherwise agreed, issue to the Supervising Officer, four copies of all manuals and operating and maintenance instructions in stiff-backed ring binders together with an electronic copy on CD ROM.

Before the above mentioned final issue, send one proofed copies of the manuals to the Supervising Officer for approval of format and general content. Allow 14 days for approving prior to practical completion.

Include the following information in the operating manuals:

- i) Index
- ii) General description of the installation, equipment used and method of operation of the installation
- iii) Handbooks, maintenance instructions, drawings and spare parts list for all components, plant and equipment used in the Sub-contract works.
- iv) Line diagrams indicating the main features of the plant, drawing attention to the method of setting the controls, switchgear, safety precautions etc.
- v) Schedule of routing maintenance, complete with list of normal consumables, routine oil and grease points and recommended lubricants.

- vi) Schedule of periodic and preventative maintenance for specialised equipment.
- vii) Schedules of methods of adjustments, typical fault-finding routines.
- viii) Schedule of operation and maintenance risk assessment sheets in accordance with the Construction (Design and Management) Regulations 1994.
- ix) Wiring diagrams of plant etc.
- x) Service manual for all specialised plant, giving all details as listed above.
- xi) Schedule for obtaining and ordering replacement parts.
- xii) Schedules of equipment valves and motors related to the "As Installed" drawings and giving names, addresses, telephone and facsimile numbers of manufacturer, serial number of plant, kilowatt-power electrical supply, performance duties and location within the building.
- xiii) Description of emergency action which should be taken in the event of a breakdown of equipment. Telephone numbers of essential contacts shall be included.
- xiv) Outline design data of plant.
- xv) Test and performance data.
- xvi) Test Certificates.
- xvii) Schedule of "As Installed" Drawings.
- xviii) Legend for colour - coded services.
- xix) Copies of all manufactures guarantees.
- xx) As fitted drawings.
- xxi) A separate A3 copy of as fitted drawings.
- xxii) Building log book, produced in accordance with CIBSE Template.
- xxiii) Simplified building user manual in line with BREEAM requirements

In addition, and separate from the Operating Manuals, supply four sets of manufacturer's catalogues relating to specialised plant and equipment.

The requirements and obligations of manufacturers to provide literature as part of the installation record shall form part of plant and equipment orders and such orders shall be considered unfulfilled until literature requirements have been met.

A1.10.11 Preparation of Manuals

The manuals shall be encased in A4 size, plastic-covered, loose leaf, four ring binders, with hard covers, each indexed, divided and appropriately cover titled. Drawings larger than A4 shall be folded and accommodated in the binder so that they may be unfolded without being in any way detached from the rings.

Prepare the Operation and Maintenance Manuals in draft as soon as the Installation Drawings are in hand.

Make two temporary manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employers staff to familiarise themselves with the installation. These should be of the same format as the final manuals with temporary insertions for items which cannot be finalised until the contract is commissioned and performance tested.

The cover shall be printed with the following information:

"Operating and Maintenance Instruction Manual" (Project Name and Service).

Where more than one volume is required, the cover shall also be printed with volume number.

Each section of the manual shall be divided by a stiff divider of the same size as the holder. The divider shall be labelled as to the section of the manual.

All written instructions within the manual shall be typewritten with a margin on the left hand side.

The arrangement of the manual shall be as follows:

Section One	Index
Section Two	Description of the Design Intent
Section Three	Description of the operational routes. The description must include step by step instructions on starting and stopping each plant or system and a fault diagnosis procedure in diagrammatic and tabular form to show the action necessary to correctly identify defective pieces of equipment and the steps to be taken to rectify faults.
Section Four	Planned maintenance instruction. This section must include step by step instruction on the maintenance of all items of plant. Data shall also be provided for ordering replacements. Full sets of manufacturers maintenance instructions including wiring diagrams, cable schedules, circuit chart. Protection and overload relay settings shall be recorded and calibration charts shall be incorporated. This section shall include a set of drawings of the installation upon which is recorded all plant settings, water flow rates, pump heads and noise level readings as adjusted and measured during the testing commissioning period.
Section Five	A set of record drawings and Test Certificates. If necessary due to the number of drawings which have to be included in the manual, each drawing shall be photographically reduced to size to suit the manual.
Section Six	Emergency measures including telephone numbers of the sub-contractors emergency staff, names, addresses and telephone numbers of all manufacturers.

A1.10.12 Submission of Operation and Maintenance Manuals

The final draft of the Operation and Maintenance Manuals shall be submitted in due time, and in any case not less than four weeks prior to Practical Completion, so that at least one copy of the complete final version is in the possession of the Employer at Practical Completion in order to comply with the Health & Safety at Work Act.

If partial possession is required by the Employer then the documentation shall also be phased accordingly and so arranged to finally form one comprehensive document.

It shall be the contractor's responsibility, whenever a successive phase of contract is handed over, to amend and update the previously issued version of the Operation and Maintenance Manuals, bring it to the appropriate stage of completion and submit same to the Main Contractor in due time to comply with the Health & Safety at Work Act.

A1.10.13 Maintenance Contract

The contractor shall provide a separate quotation for the maintenance of all equipment and systems (pipework, ductwork, cabling, etc.) within his scope of works for a full 12 months period from the date of completion or completion of section as defined in the Main Contract Preliminaries.

The maintenance to be carried out shall be strictly in accordance with the various manufacturers recommendations and shall be sufficient to ensure that the services operate at optimum efficiency and that the life expectancy of the various items of equipment and system components are in no way compromised.

A1.10.14 Spare Parts and Tools

The Contractor shall submit a Schedule of additional spare parts and tools that he recommends should be supplied over and above those consumable spares required up to Practical Completion and for routine Maintenance.

A1.10.15 Notice Prior to Covering Works

Any section of the work located below the ground, within trenches, ducts, ceiling voids or other concealed area, must be inspected and approved by the Supervising Officer prior to that section of the work being covered in. Seven days minimum notice shall be given to the Supervising Officer of intent to cover or enclose the works.

A1.11 Responsibilities (Services Co-ordination)

The contractor is responsible for the design, installation, commissioning and testing of the services installation so as to provide systems that are fully in accordance with the employer's requirements and this specification document. The contractor shall be fully responsible for the coordination, programming, placing of orders, attendance and all necessary works to facilitate the successful delivery of the new incoming services and statutory authority works in line with the contract programme.

The contractor shall be responsible for the full co-ordination and proper execution and completion of the public health, life safety, mechanical and electrical installations. The positions of equipment, pipework, cables, etc., indicated on the drawings are given for tendering purposes only and the exact co-ordinated positions shall be proposed by the Sub-contractor for approval by the Supervising Officer. The contractor's tender price shall include

for any modifications that may be necessary to provide fully co-ordinated and installed engineering services.

The mechanical sub-contractor shall make allowances within his tender price for taking responsibility as the lead sub-contractor in organising the co-ordination of all services drawings with the other trades. The successful mechanical sub-contractor will be requested to provide a method statement showing how this will be carried out with co-ordination meetings etc.

Should any dispute arise between sub-contractors relating to co-ordination the Supervising Officer will arbitrate.

The Tender drawings for each of the engineering services installations do not indicate the presence of other engineering services or supports for suspended ceilings, etc. The contractor is responsible for ensuring liaison with all trades to ensure that all engineering services are accommodated satisfactorily in the building, particularly in ducts, voids, cavities, and other potentially congested areas. The contractor shall, without cost to the Employer, make any alterations that may be found necessary due to non-compliance with this clause.

The contractor shall acquaint himself with the general arrangement of all services and ensure that in fixing any work it will not obstruct the fixing or future maintenance of any other services. He shall also co-ordinate the engineering services with other trades and take all necessary precautions to ensure that the progress of any trade does not impede the progress of any other trade and that all engineering services are accommodated satisfactorily.

The contractor shall allow for obtaining and co-ordinating the submission of fully co-ordinated engineering services installation drawings and shop drawings from all his Sub-contractor's and suppliers and all related builders work drawings. The drawings are to be compatible, correctly annotated and cross-referenced at their interfaces.

The contractor shall agree with all his Sub-contractor's and suppliers and be responsible for the positions of their work or materials including pipe runs in ducts, ducts, conduits and cables, etc. and the positions of holes, chases, recesses, fixing and the like, before work is put in hand, in order to ensure that they do not conflict with other work.

The contractor and their sub-contractors shall be responsible for taking all their own dimensions on site, checking runs and levels and marking out for the builders work and shall allow for such work in his Tender. The contractor shall ensure that the setting out of plant and equipment, pipes and ducts, etc. permits it to fit into the space allocated and allows access for maintenance and replacement purposes.

To ensure co-ordination between his Sub-contractor's and suppliers the contractor shall allow for arranging and attending any necessary meetings with the relevant Sub-contractor's and/or suppliers in order to agree such priorities as are necessary and in order to monitor progress, obtaining the necessary data for and preparing co-ordinated drawings of all the work involved in the engineering services installation together with its associated builders work and giving all necessary instructions to overcome any potential conflicts. Where such co-ordination requires any amendment to the drawings or specifications prepared by the Employer's Consultants, the matter shall be referred to the Supervising Officer in the first instance.

These activities shall be carried out to ensure that any amendments or revisions to data can be implemented without delaying progress of any part of the Works. The contractor shall allow for the cost of all amendments or revisions required to provide a properly co-ordinated engineering services installation.

Any section of work found to be covered up without the Contractor having obtained an acceptance certificate from the Supervising Officer shall be exposed for inspection by the Supervising Officer and the cost of uncovering the works and recovering the works shall be paid by the Sub-contractor.

A1.12 Defects Liability

It shall be deemed that the Warranty on the plant shall commence from the issue of the Certificate of Practical Completion, not upon delivery.

Unless otherwise stated in the main contract preliminaries document, the warranty period shall run for one year from the date of acceptance.

A1.13 Valuation of the Sub-Contract works

A1.13.1 Sub-Letting

State in your Tender names of all firms to whom you propose to sub-let portions of the work. No section of the work shall be assigned or transferred to another company without the prior consent of the Supervising Officer.

A1.13.2 Alternative Makes/Delivery Periods

Where a particular manufacturer is specified, alternative makes of equal quality will be considered by the Supervising Officer. However, include in the Tender for the makes specified and give quotation for alternatives separately in an Appendices to the Form of Tender. The contractor is responsible for ensuring that any proposed alternatives are equal in quality, performance and efficiency and as such, approval from the supervising officer to change supplier or model does not remove this responsibility from the contractor.

The contractor shall ensure that the dates of deliveries covered by orders placed with manufacturers, suppliers or other contractors are confirmed at regular periods between the placing of the orders and the date of delivery. To this end, a delivery schedule of all major items must be submitted to the Supervising Officer within 60 days of acceptance of the Sub-contractor's tender.

A1.13.3 Builder's Work

The formation of brick or concrete bases for engineering plant, boilers, calorifiers, pumps, switchgear, etc., the building-in of radiator, pipe and cable brackets, the formation of cable trenches, the provision of riddled earth in the trench, both before and after laying, and trench back-filling, the cutting of holes, chasing making good will be carried out free-of-charge by the Main Contractor. Sub contractors are to provide full dimensioned drawings. Unless otherwise agreed with the main contractor.

A1.13.4 Adjustments to the Contract Sum

No addition will be made to the contract Sum if the contractor has failed to ascertain, before tendering, all the requirements for carrying out the works, which inspection of the site or of the Specification and Tender drawings would have disclosed.

No change will be made to the contract Sum unless the variation is authorised by an instruction from the Supervising Officer.

Within 14 days of the date of issue by the Supervising Officer of an instruction varying the content of the contract works, agree with the Quantity Surveyor the order of value of the variation, submitting documentary support where necessary. Thereafter, proceed diligently, with the Quantity Surveyor to agree the final price

for the variation. Variations shall be valued in accordance with the appropriate Clause of the Contract.

If you require work to be valued on a Daywork basis, the Supervising Officer's permission must be obtained before work commences. Submit two copies of Daywork sheets to the Supervising Officer for examination and signature during the week following the week in which the work is done. Include on the Daywork Sheet the Instruction Number, details of other documentation, the location of the work and the full details of the labour, plant and materials employed.

Include in your Tender for all additional payments for overtime necessary to carry out the contract works in accordance with these Documents. Where further overtime becomes necessary to overcome problems (see Clause A1.9.2) seek the Supervising Officer's approval in each specific case to the inclusion of these overtime payments in the Final contract Sum. Keep detailed records of the labour involved. Submit to the Supervising Officer for approval and signature during the week following that in which the work is done.

At the time of the settlement of account, and as one of the documents referred to in the Contract Conditions, the Main Contractor will obtain a statement from each of the Sub-Contractor's that the sum and/or credits to be included in respect of such Sub-Contractor's are accepted in full and final settlement of their Sub-Contracts.

A1.13.5 Valuations for Interim Certificates

At the time of every valuation of the works for Interim Certificates, submit to the Quantity Surveyor a statement showing:

- i) The gross amount (including cash discount and retention) claimed supported by a detailed approximate priced statement of work executed and materials supplied.
- ii) The nett amount received from the Contractor to date excluding Contract charge.

A1.13.6 Revision and Variations

Where schemes are subject to revision or instruction, the installation/working drawings, and finally the record drawings, must shown the full effect of such revision. Where the scheme revision involves change to the architectural or structural details immediate notice must be given to the Supervising Officer.

Where scheme revisions are required in the main contract works or other sub-contract works due to the sub-contractors variation or revision then all cost for such revision will be the contractors responsibility including the design team consultants costs.

Where drawings are revised and updated during construction these shall be issued to the Supervising Officer for comments on the revision only.

Only if the contractor can give proof that a significant departure from the intent of the tender drawings has been necessary will a variation be recorded. This will not include normal detail design development relating to inclusion of nor development of, factors within the contractors design responsibility.

A1.14 Insurance and Indemnification

The contractor and sub-contractors shall include for all insurance other than those for which they are responsible. Sub-contractors will, in addition, be held responsible for any damage caused to the Main Contract or other Sub-contract works by the execution of this Sub-contract, and the cost of making good any such damage shall be borne by the Sub-contractor.

A1.15 Commencement and Completion

- i) The contractor shall execute his works within the dates described for the Main Contract. The contractor shall include in his price for any expenses he may incur in completing his works within this programme.
- ii) The contractor's attention is drawn to the fact that his work in his contract may well entail several visits to the site. No claim in respect of the number of visits to the site or discontinuity of the work will be entertained and the contractor shall allow in his rates for all extra costs incurred due to this method of working.
- iii) The erection programme is to be agreed with the sub-contractors/Main Contractor before any materials are delivered to site.
- iv) The contractor will be required to submit a detailed programme of works to the Supervising Officer.

A1.16 Drying out

The Main Contractor may, by arrangement with the Sub-contractor, and following consent from the Supervising Officer, wish to run the heating system for drying out the building. The Sub-contractor shall make due allowance in the sequence of his work to provide heat for drying out at the stated date in the Main Contractor's programme. This event will not relieve the Sub-Contractor of his obligation to hand over the installation in good order, nor shall the interim period from the time of commencement of use for drying out to the handover, be considered as constituting any part of the Maintenance Guarantee period hereinafter specified. If beneficial use is obtained from the plant then the warranty periods shall be extended at the expense of the contractor so as to remain at a period length of one year from practical completion date (or longer if stated so in the Main Contract Preliminaries document).

A1.17 Regulations

A1.17.1 General

Materials, products and completed systems in this Sub-contract shall comply with the following:

- i) This Specification.
- ii) Health and Safety at Work Act.
- iii) Home Office Rules.
- iv) Local Authorities By-Laws and Regulations.
- iv) Water Supply Authority Requirements.
- vi) Electricity Supply Authority Requirements.
- vii) Gas Supply Authority Requirements.
- viii) Fire Prevention Officer's Requirements.

- ix) Any Other Special Licensing Authority Requirements.
- x) Appropriate International, British Standard Specifications and Codes of Practice current and those to be being implemented during the course of the contract.
- xi) Gas Safety Regulations.
- xii) Construction Design Management Regulations 1994.
- xiii) Clean Air Acts
- xiv) Control of Pollution Act
- xv) Regulations under the Factories Act.

The sub-contractor shall notify the Supervising Officer of any revisions or addition to the foregoing as they are published during the installation of the works. The Supervising Officer will give appropriate instructions in each case.

The sub-contractor shall pay all charges made by an Authority approving any part of the sub-contract works.

A1.17.2 CDM Regulations

The construction (Design and Management) Regulations 2007 apply to this project and the sub-contractor shall be fully aware of the duties laid down in these Regulations.

The Planning Supervisor shall provide a Health & Safety Plan to the Principal Contractor for this project, in this case the Main Contractor.

The Principal Contractor will be responsible for the development and implementation of the Health & Safety Plan during the construction phase.

The sub-contractor shall ensure he obtains a copy of the Health & Safety Plan and any amendments and ensure that their personnel comply with any construction phase Health & Safety Rules as identified in the Plan and have been given suitable training.

The sub-contractor shall ensure that the Planning Supervisor or Principal Contractor is provided with all the required information including Method Statements.

A1.18 Suitability of Materials and Products

Materials and products shall be supplied to suit the pressures, temperatures voltage and other conditions of use normally expected to apply after the installation is completed and also to withstand the tests specified herein or in any documents referred to herein.

A1.19 Ordering Materials and Products

The contractor shall order the necessary materials and products immediately upon the Supervising Officer instructing the contract works or any part thereof, to proceed. The Sub-contractor must not delay Practical Completion, or completion of any part of the works, by delays in ordering or delivery of materials and products.

To avoid any possible delays to Practical Completion the Sub-contractor may submit details of alternative manufacturers or types of materials and products for consideration by the Supervising Officer. The Supervising Officer will give appropriate instructions in each case.

A1.20 Handling and Storage of Materials and Products

The contractor shall:

- i) Deliver, off-load, store and transport about the works all materials and products in the manner recommended by their manufacturer.
- ii) Provide adequate safe, covered storage and protection for all new materials and products.
- iii) Store pipework and similar products on properly made racks and adequately support to prevent bending and distortion.
- iv) Close ends of pipework and protect threads by means of purpose made caps.
- v) Store gaskets carefully to avoid damage. Rubber gaskets shall be stored in a cool place, free from draughts or placed in boxes containing powdered chalk and stored in a cool, dry place.
- vi) Protect electrical cables from physical damage and seal ends.

Where materials and products cannot be stored in dry buildings they shall be raised clear of the ground and supported. They shall be protected from damage by frost, water and building work with covers or other appropriate means. Materials and products must not be stored by placing directly on earth or any other damp or corrosive surface.

Materials and products shall be adequately coated to prevent damage by oxidation, etc., and this coating shall be maintained until ready for final finishing.

A1.21 Samples of Materials and Products

At the request of the Supervising Officer, the contractor shall submit, for examination and approval, samples of materials and products proposed for use in the contract works.

Samples shall include but not be limited to labelling, luminaires, radiators, valves, grilles, room sensors, socket outlets, switches and all items that shall be on show in the building, particularly where the aesthetic appearance is of prime importance.

Samples shall also be required to demonstrate standard of finish and colour. Approximate or 'similar' colour samples will not be accepted.

Samples approved by the Supervising Officer shall either:

- i) Remain in the possession of the Supervising Officer until the end of the Defects Liability Period or,
- ii) Be embodied in the Sub-contract works.

Where samples are not available, the contractor shall submit such detailed drawings as the Supervising Officer may require.

A1.22 Protection to Fixed and Unfixed Items of Plant

- i) The contractor is to take all measures necessary to screen and protect all plant, equipment and accessories, whether in storage, in course of erection or erected, from

the ingress of dust, moisture or foreign bodies, or from damage or marking by other trades to Practical Completion of the contract works.

Failure to arrange for such protection will make the contractor liable for all consequent reinstatement.

- ii) All parts of the installation liable to corrosion are to be properly cleaned and painted with heat resistant and/or corrosion resistant paint at works and a further coat immediately after erection.
- iii) Any plant, equipment and accessories found to be unduly marked by tools or damaged, corroded or distorted by any cause will be rejected by the Supervising Officer and must be replaced by the Sub-contractor at his own expense.
- iv) Final painting or finishing coats will be carried out by the Main Contractor unless otherwise indicated in the Particulars Specification hereinafter.
- v) When final finishes are provided to equipment at Manufacturer's works, all such finishes are to be of an approved material, process and colour and the Sub-contractor shall ensure adequate provision for the protection during transit, storage during and after erection to avoid damage to the finishes. The contractor shall inspect all paint and equipment immediately on delivery and shall not accept any that are damaged.
- vi) The Supervising Officer must be notified and the damaged works be subject to inspection before remedial work commences.
- vii) The contractor shall be responsible for the protection of his work during execution, but the Main Contractor shall be responsible for necessary casing and protection after the contractor's work has been executed.

A1.23 Deleterious Materials

Refer to main contract preliminaries document.

A1.24 Housekeeping and Site Cleanliness

It shall be the contractor's responsibility to keep his working area clean and tidy at all times and remove all rubbish to a dump or other place on the site on an agreed regular basis. Prior to any air system being started all of the following must be 'signed off' as being complete by the Supervising Officer.

- i) Temporary protection of air inlet if site conditions require.
- ii) Cleanliness of ductwork.
- iii) Dust sealing of all structural and architectural components within the air stream (floor void and ceiling voids included).

A1.25 Condition of Site on Completion

On completion of the contract, the contractor shall remove from the site all tools and plant used for the execution of the Works together with all rubbish, packing cases and redundant material or equipment, and he shall make good or reimburse for making good any damage to buildings, roads or other parts of the site, where in the opinion of the Main Contractor such damage has been caused by or is the responsibility of the contractor.

A1.26 Tender Drawings and Documents

The contractor shall treat the details of this Specification and attached documents as confidential and return them to the Supervising Officer after he has prepared his Tender.

A1.27 Disagreement

In the event of any disagreement between the parties of the Contract as to the requirements of the Specification, definition of terms or value of works done, the matter shall, in the first place, be decided by the Supervising Officer, and, if such decision be challenged by either of the parties shall be referred to arbitration under the provisions of the signed Contract.

A 1.28 Discrepancies in tender information

Any discrepancies in the tender information provided shall be clarified prior to tendering otherwise the tender shall allow for the most cost onerous of the available options.

SECTION B – SCOPE OF WORKS

INDEX

- 1.0 INTRODUCTION**
- 2.0 NEW INCOMING SUPPLIES AND DIVERSIONS**
- 3.0 DESIGN PARAMETERS**
- 4.0 MECHANICAL SERVICES INSTALLATIONS**
- 5.0 ELECTRICAL SERVICES INSTALLATIONS**

1.0 Introduction

This document forms the Tender document for the mechanical and electrical engineering services for the proposed new Kings Academy, Woolston. The relevant design team member's tender documents, specifications and drawings shall be read in conjunction with this specification. The scope of works associated with the new college building are summarised as follows, more detailed phasing arrangements can be seen in the architectural tender submission documents.

The following outlines a summary of the mechanical engineering services scope of works that are anticipated for inclusion within these buildings, which are more fully detailed later in this document:

- Ventilation systems
- Natural ventilation systems
- Heating systems
- Comfort cooling systems
- Domestic hot and cold water systems
- Above ground drainage systems
- Natural gas distribution systems
- Controls systems
- Low and zero carbon technologies
- New incoming services connections

The following outlines a summary of the electrical engineering services scope of works that are proposed for inclusion within this building and these are more fully detailed later in this document:

- Low voltage distribution systems
- Small power systems
- Voice and data systems
- General and emergency lighting systems
- External lighting systems
- Fire alarm systems
- CCTV systems
- Access Control Installation
- Security alarm systems
- Lightning protection system
- Earthing and bonding
- Low and zero carbon technologies
- Services diversions
- New incoming services connections
- PV Installation

2.0 New Incoming Supplies and Diversions

2.1 Diversions

It is considered from the site records that there are no diversions necessary, but the contractor shall make themselves familiar with the site records so they understand the location of existing services.

The only area of concern may be to the West side of the site where an underground HV cable exists, considered to be routed from the adjacent Scottish Power Primary substation, which may clash with the below ground ducts serving the bollard lighting.

Also to the East of the site, but away from the main contract works, HV overhead lines traverse the site and the contractor should make themselves familiar with their location.

2.2 New Incoming Gas Supply

The building shall be served with a new gas supply sized to suit the appliances installed therein. The new gas supply shall be taken from the street main. The contractor shall be responsible for obtaining the quotations for the new main and gas meter, making the payment, coordinating and managing the utility services works in sufficient time and manner so as not to be detrimental to the construction programme. The contractor shall make full allowance of any attendances necessary in support of the utility companies works.

The contractor shall allow for the formation of an external gas meter enclosure and for the installation of the private gas main from the meter to the building. An emergency gas solenoid shut off valve shall be installed on the main incomer into the building which shall be linked to the fire alarm. The solenoid valve shall be supplied with the system to prove closure of valves prior to establishment or restoration of gas flow, in accordance with BG IM/20. Gas solenoid valves shall be auto reset. The gas meter shall be a pulsed meter in line with the BREEAM assessment requirements for monitoring and shall be linked to the central college BMS system.

All works shall be carried out in accordance with the IGEM gas regulations by registered gas installers accredited to work on incoming mains supplies.

2.3 New Incoming Electricity Supply

The electrical supply to the building shall be derived from a new utilities 500KVA substation located adjacent to the site entrance, which in turn shall terminate into an LV customer switch room located adjacent to the substation. The meter will be housed within this switchroom as shall an ACB, protecting the cables serving the building.

Multi core SWA cables with dedicated CPC's will be routed from the LV customer switchroom to the switch panel located within the plantroom. The cables will be routed below ground within PVC ducts as shown on the tender drawings.

The pipe ducts shall be punctuated at intervals by draw pits as shown on the tender drawings, which will be of construction and cover type to support heavy traffic.

The new electricity main connection shall be provided by the utility company however the contractor shall be responsible for obtaining the necessary quotations, issuing payment, coordinating and managing the statutory authorities activities on site and programming their works in line with the contract programme, placing orders and payments, providing all necessary on site attendances from associated specialists and sub-contractors, inspecting and signing off the works.

The connections from the LV customer switchroom to the substation and from the LV customer switchroom to the plant room will be supplied and installed by the contractor.

2.4 New Incoming Water Supply

New water supplies to new building shall be taken from the main utilities infrastructure within the main road. The new supply shall be provided by the utility company with the mechanical contractor installing a new private water main from the boundary meter location to the new building.

The new water main connection shall be provided by the utility company however the contractor shall be responsible for obtaining the necessary quotations, issuing payment, coordinating and managing the statutory authorities activities on site and programming their works in line with the contract programme, placing orders and payments, providing all necessary on site attendances from associated specialists and sub-contractors, inspecting and signing off the works.

All works shall be carried out in accordance with the water byelaws regulations by registered installers accredited to work on incoming mains supplies.

The water meter shall be pulsed meter in line with the BREEAM assessment requirements for monitoring and shall be linked to the new building BMS system.

A major leak detection system shall be installed to meet the BREEAM requirement and the contractor shall allow for the necessary metering to comply with this requirement.

2.5 Telecommunications

The contractor shall be responsible for arranging for the delivery and installation of the BT ductwork as shown on the tender drawings, for the supply and installation of the new telephone and broadband lines for installation and ordered by others.

The contractor shall be responsible for issuing payment, coordinating and managing the statutory authorities activities on site and programming their works in line with the contract programme, placing orders and payments, providing all necessary on site attendances from associated specialists and sub-contractors, inspecting and signing off the works.

Dedicated phone lines shall be provided for the redcare lines which shall separately be provided to fire and intruder alarm systems.

Dedicated phone lines shall be provided for the lift installation.

All cable ducts and pits shall be as detailed for the electrical services.

2.6 Educational Network

The contractor shall be responsible for arranging for the delivery and installation of the ductwork for an educational network connection which shall be separate to the main BT ductwork network.

This system shall follow the same route as the BT duct work network and shall be routed from Hillcock Lane to the main plantroom.

The contractor shall be responsible for issuing payment, coordinating and managing this installation and programming their works in line with the contract programme, placing orders and payments, providing all necessary on site attendances from associated specialists and sub-contractors, inspecting and signing off the works.

The cabling system shall be provided by others.

All cable ducts and pits shall be as detailed for the electrical services.

3.0 Design Parameters

3.1 Design Standards

The following sets out the design parameters upon which the mechanical and electrical services design shall be based, in line with the current CIBSE relevant guidelines. The design of the building services installation shall take account of all current British Standards (and those to be implemented during the course of the contract), the requirements of local Authorities and Statutory Undertakings, the recommendations of the Chartered Institute of Building Services Engineers, BS 7671:2001 IEE Wiring Regulations 17th Edition (and associated guides) and the recommendations insofar as they apply to this project concerning legionella contained in the document CIBSE TM13 and Health and Safety Executive Guidance Notes EH48. Design life factors for building services equipment will be in line with life factors identified in table B18.2, pp18-5 of Volume B, of the CIBSE Guide.

Any specific design standards or parameters are also stated in the relevant specification sections of this document and must be incorporated into the design by the contractor.

3.2 Design Requirements and Information

The contractor is responsible for carrying out the full design of the installations and system so as to deliver the requirements set out within this specification document, accompanying drawings, schedules etc and all other consultants' tender packages that form the employer's requirement documentation.

The contractor shall employ suitably proficient designers to carry out the mechanical and electrical design works. The designers employed shall be Chartered Engineers and shall be as a minimum Members of CIBSE. The full CV's of the proposed designers shall be provided to Waterman Building Services for comment prior to their involvement in the design works of the project.

Upon completion of the design calculations and scheme drawings, the contractor shall issue a copy of all the mechanical and electrical system design calculations for every system proposed for installation. These calculations shall be produced by a recognised industry standard software package which shall be either Hevacomp, CYMAP, Amtech or equal and approved. Approval for the use of a different software package other than Hevacomp, Cymap or Amtech must be sought and gained before any design works are carried out on the software. Any works carried out before approval has been gained will need to be repeated if approval is not granted by Waterman Building Services, at no expense to the contract or the client/client's project team.

All calculations shall be issued as a bound, typed document, with full title, index and all supporting input data (such as assumptions, parameters etc). The design calculations shall be issued with supporting drawings and sketches as necessary to allow the calculations to be fully assessed. The information shall be issued in hard, printed copy to Waterman Building Services and responses shall be made within 10 working days of receipt by Waterman Building Services.

The contractor shall produce an SBEM or TAS based Part L2A model (no other software system shall be accepted) on the whole building to confirm compliance with the Approved Document Part L2A requirements. This model shall be issued to Waterman Building Services for comment. In addition to the hard, printed copy of the programme output data, Waterman Building Services shall also be provided (at the same time) with a copy of the building data file to allow independent assessment of the model by Waterman Building Services.

The contractor shall produce a thermal model of the building using the TAS software package (no other software system shall be accepted) of the building to prove the final design for the building complies with the requirements of this specification, in particular for the over heating design criteria set out for the building to achieve. In addition to the hard, printed copy of the programme output data, Waterman Building Services shall also be provided (at the same time) with an electronic copy of the computer building data file with all associated data files and input files to allow independent assessment of the model by Waterman Building Services on their computer system.

If insufficient supporting documentation has been issued to allow the full assessment of the written calculations or thermal models etc, the 10 working day time period for receiving comments back from Waterman Building Services shall not be deemed to have started until all the required supporting documentation to allow full assessment has been received by Waterman Building Services.

Waterman Building Services shall be provided with a full print out of all set points/design parameters incorporated within the designs at the time of issue of the design calculations.

The calculations submitted shall include the following as a minimum, this list is not exhaustive and Waterman Building Services reserves the right to request any such further information as deemed necessary to prove the design capabilities and efficiencies:

1. Room heat loss and heat gain calculations
2. Heating pipework sizing and pressure drop calculations, including schematics stating pipe flow volume, pipe pressure drop per metre length, pipe flow velocity and pipe size
3. Ductwork sizing and pressure drop calculations, including schematics stating duct flow volume, duct pressure drop per metre length, duct flow velocity and duct size
4. Room air change rate and fresh air ventilation rate calculations
5. Domestic hot and cold water demand calculations
6. Domestic hot and cold water pipework sizing and pressure drop calculations, including schematics stating pipe flow volume, pipe pressure drop per metre length, pipe flow velocity and pipe size
7. Above ground drainage capacity calculations
8. Above ground drainage pipework sizing and pressure drop calculations, including schematics stating pipe flow volume, pipe pressure drop per metre length, pipe flow velocity, pipe size and gradient of fall
9. Residual pressure drop calculations for heating and chilled water systems
10. Valve authority calculations
11. Controls zone strategy layouts
12. Plant and internal space noise calculations
13. Secondary regenerated noise calculations for ventilation systems
14. U-value calculations
15. Specific fan power calculations for each ventilation system
16. Seasonal efficiency calculations for the boiler and cooling plant
17. Part L2A 2010 assessments
18. Thermal model and CFD modelling to prove compliance with BB101 and also to prove the ventilation strategy
19. Metering strategy to prove compliance with CIBSE TM39 and Part L2A 2010
20. Controls system cable sizing and containment sizing calculations
21. Daylight factor calculations
22. Room lighting plots
23. Emergency lighting calculations and plots
24. Tabulated room light levels, uniformity, ceiling light illuminance, wall light illuminance, working plane light illuminance – to demonstrate compliance with CIBSE LG7
25. Cable sizing calculations showing voltage drop, earth loop impedance and disconnection times, short circuit faults, cable carrying capacity
26. Cable containment sizing calculations
27. Percentage spare capacity calculations
28. Fire alarm sounder anticipated in room noise level calculations
29. Fire alarm detection coverage drawings demonstrating compliance with specified fire alarm class/level of protection/coverage
30. Lightning protection system calculations
31. Lighting efficiency calculations showing lumens per circuit watt tabulated against lighting level in room (lux) and total light luminaire wattage per room.
32. Data cable length calculations showing compliance with maximum distance runs.
33. A schedule of all design assumptions made in the calculations
34. Full plant selections schedule stating model reference, performance etc

All designs, calculations and drawings must have been received, commented upon and accepted as being at a suitable standard to progress by Waterman Building Services prior to any of the mechanical and electrical installations commencing on site commencing. Any works carried out on site before the designs, calculations and drawings have been commented upon and accepted as being at a suitable standard to progress by Waterman Building Services, shall be deemed to have been carried out at the contractor's risk and any remedial or abortive works shall be carried out at cost by the contractor.

Waterman Building Services shall be allowed to call at any time, a design review meeting to assess the progression of the design of the mechanical and electrical services. This meeting shall be attended by the contractor(s) and the mechanical and electrical designers. The intention of the meeting is to review the design at an early stage before the final production of information has been completed to identify and assist the contractor/designers in complying with the employer's requirements and ultimately reduce the comments received back at formal design/drawing comment stage.

EPC Certificates and DEC

The contractor shall be responsible for producing and lodging the Building Energy Performance Certificate and Display Energy Certificate and displaying it in the reception of the building in a glass fronted frame. The contractor shall provide at the completion of the initial design stage and with the SBEM or TAS results their provisional EPC for comment to Waterman Building Services. The full and final EPC shall be produced two weeks before hand over and the DEC shall be on display at practical completion. The EPC and the DEC shall be produced by a qualified and registered certifier.

3.3 Design Criteria

3.3.1 Internal temperatures

The mechanical services design is outlined within the room data sheets but as an overview, shall be based on the following design criteria:

Internal temperature	Winter	Summer
Naturally ventilated Classrooms and education spaces / social spaces	21°C	Systems to be designed to achieve the requirements of section 1.7 Building Bulletin 101. RH uncontrolled
Comfort cooled offices	21°C	23°C DB. RH uncontrolled
Naturally vented offices	21°C	Systems to be designed to achieve the requirements of section 1.7 Building Bulletin 101. RH uncontrolled
Assembly hall	21°C	23°C DB. RH uncontrolled
Sports hall	21°C	Systems to be designed to achieve the requirements of section 1.7 Building Bulletin 101. RH uncontrolled
Kitchen	18°C	24°C DB. RH uncontrolled
Toilets/Stairways/corridors	18°C	Uncontrolled
Comms / server room	18°C	21°C DB. RH uncontrolled
Changing rooms/showers	22 °C	Uncontrolled
Storage areas	16 °C	Uncontrolled
Plantroom	16 °C	Uncontrolled
First aid	21°C	Uncontrolled
External Conditions	-5°C DB / 100% RH	28°C DB / 20°C WB

Note – plant shall be capable of running up to a maximum ambient temperature of 35°C (recorded at local weather station) whilst still providing the desired performance efficiencies.

3.3.2 Population Densities

To be taken from the maximum occupancy levels of rooms as indicated on the architect's drawings. Where no occupancies are stated these shall be obtained from the client and advised to the remainder of the team.

3.3.3 Outside Fresh Air Provision

Ventilation shall be provided so as to ensure compliance with Building Bulletin BB87 2003.

Mechanical ventilation shall be minimum 10 litres/second/person classrooms, teaching areas and sports hall and 12 litres/second/person in offices.

3.3.4 Internal Cooling Loads

The below figures are identified as a guide to the tendering process for approximate sizing of plant. The figures given shall be verified at design stage but will be a minimum figure that must be provided.

Area	Lighting and small power Heat Gains	Comment
Staff room / office areas	50 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Reception	30 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Circulation Areas	22 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Gym	50 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Classrooms and education spaces	50 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Assembly Hall	70kW sensible cooling	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Sports Hall	50 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Dining Hall	40 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
Kitchen and bar areas	-	To meet CIBSE recommendations for installed loads which ever is the larger
Server room	800 w/m ²	minimum or to match CIBSE recommendations for installed loads which ever is the larger
IT classroom	-	To meet CIBSE recommendations for installed loads which ever is the larger

People loads: As per CIBSE Guide A recommendations for occupant activity and internal room temperature

3.3.5 Noise Restrictions

Internal

Area	NR Level
Office	NR35
Entrances/corridors	NR38
Plantrooms	NR40
Storage	NR38
Classrooms, Gym, Assembly Hall, Sports Hall, Education areas, breakout spaces, dining hall	To Building Bulletin BB93 requirements
Kitchen	NR38
Toilets	NR38

(Under normal operating conditions due to mechanical plant and background noise)

The building shall be designed in accordance with the acoustic consultant's requirements or the above figures, whichever is the most onerous.

Plant at roof levels and in plantrooms shall be selected based upon a limiting noise levels as stated in the acoustic consultant's report and in line with the project planning requirements and to ensure that the required noise level within the adjacent spaces (in particular the naturally vented spaces) are achieved. Internal noise levels shall be dictated by the acoustic consultant's report requirements.

3.3.6 Filtration

To European standards: Pre-filter to EU3
 Final filter to EU7

3.3.7 Ventilation rates

Area	Supply	Extract
Occupied areas not naturally vented	10 litres/second/person classrooms and 12 litres/second/person in offices	10 litres/second/person classrooms and 12 litres/second/person in offices
Science prep room	Make up air from louvres	10 air changes per hour
Science classroom	Make up air from louvres	10 air changes per hour
Naturally vented areas	Building Bulletin BB87 2003	Building Bulletin BB87 2003
Toilets/ changing/ cleaners	Make up air from surrounding areas via undercut doors or door transfer grilles	10 air changes per hour
Food tech classroom	Make up air from louvres	10 air changes per hour
Kitchen	To meet the catering consultant's requirements	80% of extracted air flow with make up from server / dining area

Naturally ventilated areas shall be in accordance with the requirements of Building Regulations, 10 litres/second per person.

Note, heating systems in naturally vented areas are to be sized on 10litres/second/person ventilation rates and not those advised in BB87.

3.3.8 Public Health Services

Sanitary Provision

As per the Architects specification and drawings.

Sanitary pipework above ground

Sanitary pipework above ground shall be designed and installed in accordance with BS EN 12056 System III incorporating secondary ventilation. Access shall be provided at each floor level. All changes of direction shall be accompanied by rodding eyes and formed from a swept tee. Above ground drainage system shall be thermally insulated where necessary and acoustically insulated where necessary to remove nuisance noise from water flow in the pipework. Alternatively suitably acoustically factory treated pipework systems shall be used to comply with BB93.

All drainage from the science areas shall be installed in Vulcathene pipework to provide the required robustness to suit the types of discharges from the science areas.

All outlets from the art room areas shall be provided with silt traps to collect the debris in the art room waste water discharges.

Rainwater drainage

All pipework and fittings shall be thermally and acoustically insulated and shall pick up the rain water inlets at roof gullies. Rainwater shall be conveyed down the building to connect to the below ground drainage system. Drainage pipework shall be twin walled acoustic type or where it is necessary to achieve BB93 requirements. The rainwater shall be collected in an external rainwater harvesting system and reused in the flushing of the toilets.

3.3.9 Design Life of Services

Electrical and Mechanical plant 15 to 20 years depending on maximum achievable for item of installation, in accordance with the guidance set out within CIBSE guides, industry standards and manufacturer's recommendations.

The above assumes that building maintenance recommendations are followed and the building is used for its intended design. Electrical and Mechanical plant specifications shall be based upon suppliers that achieve equipment life in line with current industry good practice and quality.

3.3.10 Lighting

Internal lighting

Lighting to be in line with CIBSE lighting (including LG7) and DfEE guides.

For exact requirements refer to the tender drawings tender drawings.

The lighting design on the drawing are based on Whitecroft lighting, but Luxonic can be used as an acceptable alternative. No other manufacturer will be acceptable.

External Lighting

The external lighting shall be designed in accordance with the requirements of the CIBSE Lighting Guides including LG6.

The lighting design is based on Kingfisher lighting, but Whitecroft lighting can be used as an acceptable alternative. No other manufacturer will be acceptable.

3.3.11 Fire Engineering

The exact requirements for the fire engineering provisions are given in the fire consultant's report and forms part of the tender package. This shall be consulted and any requirements included within the tender submission.

3.3.12

SPARE CAPACITY AND VOLT DROP ALLOWANCES

The system shall be designed and installed to meet the following criteria of supply:

1. Volt drop shall be a maximum of 3% on lighting circuits from the origin of supply at the utility meter in the customer switch room
2. Volt drop shall be a maximum of 5% on all other circuits from the origin of supply at the utility meter in the customer switch room
3. 25% spare capacity shall be installed on boards (load and spare ways)
4. 25% spare capacity shall be allowed on sub mains

3.3.13 BREEAM

Although the building is not required to achieve a BREEAM rating, the requirements for BREEAM shall be incorporated into the building services design to ensure a good standard of design and installation is achieved.

The following list indicates the BREEAM criteria which is to be complied with:

Management.
Health & Well being
Energy
Water
Materials
Pollution

4.0 Mechanical Services Installation Overview

4.1 General

The scope of works shall generally comprise, but not be limited to, the following:-

- Liaison with the statutory authority for incoming gas and water supplies
- Design, installation, testing, commissioning and full demonstration of all systems
- Heating installations
- Mechanical ventilation
- Comfort cooling
- Domestic hot and cold water services
- Natural gas distribution
- Automatic controls
- Above ground drainage
- Rainwater drainage
- Natural ventilation system
- Thermal Insulation
- Low and zero carbon technologies
- Testing and commissioning
- As fitted and operating and maintenance manuals
- Building Log Book

4.2 Incoming Services

New connection shall be provided in accordance with section 2.0 of this specification.

4.3 Comfort Cooling

The requirement for cooling has been assessed throughout the building and it has been identified that there is a requirement for comfort cooling to particular areas such as the IT Suites, offices areas, gym, staff areas and the server rooms etc (as per the tender drawings) due to the high heat gains from the equipment used in these areas.

It is proposed that comfort cooling shall be provided to the Server Room area via run and standby refrigerant DX split systems. These shall be of the air source heat pump type and shall also provide heating to these areas as well as cooling. The system shall be selected so as to compliment the Part L2A 2010 performance parameters and shall be listed on the enhanced capital allowances scheme. The server room shall be served by dedicated split system, two independent systems, to allow for the required 24 hour operation of this room whilst still achieving a degree of robustness to the installation such that failure of one unit will not affect the operation of the room. Condenser units to be located upon the roof area.

These systems shall be monitored by the new central BMS system for fault and run condition and shall raise an alarm at the BMS front end in the instance of a fault. All DX units shall be controlled from hard wired wall mounted controllers; no infra red controllers are to be used. The wall mounted controllers shall be simple units allowing the operator to adjust only the fan speed and the room temperature set point. The units shall be automatic changeover from heating to cooling mode.

The classrooms, IT Suites, offices areas, gym, staff areas (as identified on the tender drawings) shall be served by a DX refrigerant based system derived from the air source heat pump condenser units to provide cooling and heating. The systems shall be a simultaneous heating and cooling system so that one room may be in heating whilst another off the same condenser can be in cooling. The DX system shall serve concealed fan coil units located above the ceilings within the rooms, ducting air into the rooms via ceiling mounted grilles (unless otherwise identified on the tender drawings). Attenuation shall be provided to the inlet and discharge from the fan coil units to achieve the in room noise requirements. All DX units shall be controlled from hard wired wall mounted controllers; no infra red

controllers are to be used. The wall mounted controllers shall be simple units allowing the operator to adjust only the fan speed and the room temperature set point, standard multiple function controller shall not be allowed and if installed shall be removed at the contractor's cost. The units shall be automatic changeover from heating to cooling mode.

The music rooms shall be served by an all air heating and cooling system from a central roof top air handling unit. The air shall be treated at the air handling unit to provide the cooling requirements of the rooms, with terminal heater batteries on the individual room supply ducts to provide fine tuning of the supply temperature to meet the room requirements.

The assembly hall shall be comfort cooled by an all air heating and cooling system from a central roof top air handling unit. The air shall be treated at the air handling unit to provide the cooling requirements of the room.

The kitchen shall be comfort cooled by an all air heating and cooling system from a central roof top air handling unit. The air shall be treated at the air handling unit to provide the cooling requirements of the room.

The music and the assembly hall air handling units shall be provided with DX cooling coil. The air handling unit shall be an integral heat pump air handling unit such as the Air Handlers Northern Envirofresh unit or equal and approved. This system shall be inclusive with the condenser unit located within the air handling so that the heat energy from the exhaust air is recycled and higher COP's are achieved. Separate condenser units outside the ahu serving the ahu shall not be permitted.

The kitchen air handling unit shall be provided with DX cooling coil with the condenser located in the plant area adjacent to the kitchen air handling unit.

The kitchen cooling loads shall take account of the kitchen equipment and in particular the catering freezers and fridges which may discharge heat into the kitchen spaces.

In all instances, the cooling plant shall be sized to provide for the sensible cooling requirement of the rooms as well as ensuring the total cooling is catered for. In all instances, the cooling plant shall be sized and selected so as to maintain the desired in room noise levels with acoustic attenuation measures applied as required to ensure the design criteria is met (when operating at the design cooling criteria/fan speed) and shall be selected to avoid excessive draughts when in operation. In all instances the minimum supply air temperature shall be set to 12°C by manufacturer's inbuilt limiting software.

The grille selection shall be based on ensuring there are no draughts. In particular the supply air pattern to the beauty and treatment areas as well as the main spa areas shall be designed to ensure the air is well mixed before entering the occupied zone to prevent the occupants discomfort from temperature differences between supply and room air temperatures.

General requirements for all comfort cooling systems

In all instances, the cooling plant shall be sized and selected so as to maintain the desired in room noise levels with acoustic attenuation measures applied as required to ensure the design criteria is met.

Fan coil units shall be sized to limit the supply air temperature to the room from the fan coil units to 12°C minimum at maximum design conditions (higher for beauty treatment and spa areas to suit internal comfort levels).

The fan coil unit systems shall be individually room controlled and monitored from the BMS system via such that the wall controller set point temperatures shall be automatically reset back to the control set point of 21°C at the end of each day regardless of the position it was left in, so that the next morning the system is back to the control set point for pre heat. The contractor shall allow for all necessary interfaces in the BMS and also in the DX plant to allow for this full function via the BMS.

Naturally Ventilated areas

Whilst the naturally ventilated areas on the main do not have comfort cooling they shall be designed to provide sufficient air flow to ensure the areas comply with Building Bulletin BB101. (see section 4.5 for further details).

4.4 Heating System

It is proposed that the building shall be heated by a mixture of gas fired boiler plant and biomass boiler.

The condensing gas fired boiler units and biomass boiler unit shall be located within the ground floor plantroom with flues rising to discharge through the roof. Flues to be twin walled and housed in a fire rated riser separate from other services where necessary.

The interface between the gas boiler and the biomass boiler shall be designed and controlled so as to ensure that the biomass boiler is the lead boiler whenever possible to maximise the efficiency of this renewable energy system.

All the pumps serving the heating systems shall be inverter driven to achieve the full potential of energy savings within the operation of the systems. The heating system distribution pipework shall be installed on the basis of using differential pressure control valves with minimum bypass valves at the end of each branch to allow for the pump minimum flow rate to be met and the system reactions rate to be optimised.

The heating installations shall be complete with all necessary pumpsets (twin head), pressurisation units, expansion vessels, flues, dirt air separator, dosing pot, control valves, sensors and gauges as required to allow for the full operation of the system.

LTHW overdoor air curtains shall be provided above the entrance doors and every reception desk shall be provided with a separate electric fan heater for the receptionist's individual control. The heating system to these entrance spaces shall be sized without taking into account the overdoor and fan heater.

Heating to all areas shall make full allowance for heating the incoming fresh air to meet the space ventilation requirements, based on the building regulations requirement of a minimum of 10 litres per second per person. **Note, heating systems in naturally vented areas are to be sized on 10litres/second/person ventilation rates and not those advised in BB87.**

Each underfloor heated room zone shall be controlled by a room wall mounted in-room temperature sensor. These sensors shall allow a degree of limited temperature adjustment by the teaching staff between the agreed set point parameters. The thermostat shall not show temperature readings on the stat display but shall show "plus" and "minus" to indicate the occupants raising or lowering the room temperature. The exact degree of adjustment shall be remotely adjusted from the BMS front end terminal, but shall initially be set to +/- 2°C and shall be reset by the BMS back to the set point at the end of each day.

Each room zone shall be controlled by a room wall mounted in-room temperature sensor (return air temperature sensors in the ducted systems or fan coil units will not be permitted). These sensors shall allow a degree of limited temperature adjustment by the teaching staff between the agreed set point parameters. The thermostat shall not show temperature readings on the stat display but shall show "plus" and "minus" to indicate the occupants raising or lowering the room temperature. The exact degree of adjustment shall be remotely adjusted from the BMS front end terminal, but shall initially be set to +/- 2°C and shall be reset by the BMS back to the set point at the end of each day.

Where radiators are used in classrooms they shall be controlled by the BMS via two port control valves (three port on the end of each leg to ensure quick response time). The heating system shall include differential pressure control valves to ensure that the pressure within the system is controlled

within limits as valves shut down. Where radiators are installed in corridors and general use areas they shall be controlled by thermostatic radiator valves and these shall be lockable to prevent tampering with the settings. All radiators shall be provided with combined lockshield valves/draincock units.

Particular spaces (as indicated on the tender drawings) shall be heated by an all air system served off the integral air handling unit DX air source heat pump where all components are included within the air handling unit. This system shall be inclusive with the condenser unit located within the air handling so that the heat energy from the exhaust air is recycled and higher COP's are achieved. Separate condenser units outside the ahu serving the ahu shall not be permitted. Control of the air handling unit and heat pump system shall be as described above off the BMS via room sensors.

Certain spaces shall be heated from the DX air source heat pump VRF system (as indicated on the tender drawings). In these instances the fan coil unit or cassette systems shall be individually room controlled and monitored from the BMS system via the wall mounted room controller. The BMS shall control the DX system such that the wall controller set point temperatures shall be automatically reset back to the control set point of 21°C at the end of each day regardless of the position it was left in, so that the next morning the system is back to the control set point for pre heat. The contractor shall allow for all necessary interfaces in the BMS and also in the DX plant to allow for this full function via the BMS. The systems shall be a simultaneous heating and cooling system so that one room may be in heating whilst another off the same condenser can be in cooling. The DX system shall serve concealed fan coil units located above the ceilings within the rooms, ducting air into the rooms via ceiling mounted grilles (unless otherwise identified on the tender drawings). Attenuation shall be provided to the inlet and discharge from the fan coil units to achieve the in room noise requirements. All DX units shall be controlled from hard wired wall mounted controllers; no infra red controllers are to be used. The wall mounted controllers shall be simple units allowing the operator to adjust only the fan speed and the room temperature set point, standard multiple function controller shall not be allowed and if installed shall be removed at the contractor's cost. The units shall be automatic changeover from heating to cooling mode.

The systems shall be sized to provide a suitable pre-heat margin (minimum 20%).

The plantroom shall be heated to provide frost protection.

Pipework shall be thermally insulated throughout except where it is exposed to view such as to serve radiators where it shall be painted. In addition, pipework shall be trace heated to prevent freezing where it is exposed to cold temperatures such as where it crosses the roof to serve the air handling plant. Roof top and plantroom pipework and in plantrooms shall be metalclad class O foil faced mineral wool insulation, and elsewhere where concealed, insulation shall be class O foil faced mineral wool.

Pipework system shall be designed in accordance with the following design criteria/parameters:

Maximum velocity in pipework	- 1.5 m/s
System design margin	- 10% (or more if required for preheat)

All residual pressures shall be controlled within the system by automatic pressure regulating valves to prevent excessive residual pressure on the control valves etc.

The heating system shall provide frost protection to the building and plant via the BMS system monitoring.

Where routed externally or in areas where there is a risk of freezing, the pipework shall be trace heated.

Plantroom shall be heated by electric bar heaters activated on thermostats to protect against freezing.

The plantroom shall be provided with high and low level louvred ventilation to suit the plantroom heat gains and combustion air requirements in accordance with the British Standard requirements.

Flues and gas boiler installations shall be in accordance with the gas regulations and British Standards and shall be sited to avoid ventilation louvres.

4.5 Ventilation Systems

It is proposed that the ventilation shall be provided to the majority of the building by natural means with mechanical ventilation only being provided where the building layout or the particular function within the space is not suited to natural ventilation. The ventilation system shall be designed to adhere to the requirements of CIBSE, Building Regulations, Building Bulletins BB101 and BB87:2003.

Natural ventilation

The perimeter rooms of the building are to be naturally ventilated primarily via high level wall ventilators. These ventilators shall be automatically adjusted by the central control system in response to the in room sensed temperature and CO₂ levels (sensed in each room individually) and shall also have manual override switches to allow limited occupant control. The high level ventilators shall be broken down into a series of individual control dampers, maximum size of 1200mm wide. Each damper shall be individually BMS controlled so that the amount of air entering the room can be very accurately controlled.

The use of ventilators shall provide the fresh air requirement for these spaces as well as providing the route to alleviate potential high internal summertime temperatures. It is proposed that the natural ventilation strategy shall utilise high level vent openings at the rear of the classroom to allow the hot, exhaust air to pass out of the classroom into dedicated vertical vent stacks vented direct to outside via louvred openings on the roof. These louvred openings shall be sized and selected based on exposed weather conditions and shall not allow water to enter the shaft. The inlet and outlet vents shall be controlled in unison by motorised dampers.

Due to the acoustic constraints of the site and in accordance with the acoustic consultant's report, the ventilators on a number of facades and locations shall be installed complete with attenuated louvres or attenuators on the back of the inlet louvers above the windows, concealed in an architectural boxing, with a linear bar grille diffuser providing the air to the space. In addition, the stack shaft vents shall be provided with attenuating linings or attenuators or acoustic louvers to meet the noise attenuation criteria within the acoustic consultant's report.

The size of the inlet and outlet vents shall be designed/sized/demonstrated as proven by the contractor's design and this shall be demonstrated by the completion of dynamic thermal and CFD modelling of the naturally ventilated college areas as part of the contractor's design. The design of the vents will also need to take into account any requirement for them to be acoustically treated to prevent cross talk and noise carryover from different areas or from plant externally or on the roof. Mechanical boost fans shall be allowed for and included should the CFD modelling show that the stack vents/natural vent alone cannot meet the requirements of BB101 and BB87:2003. The contractor shall allow for the provision of boost extract fans in vent shafts and this shall be provided if proven as necessary by the design otherwise they shall be avoided.

The room occupants will have the ability to override the automatic controls and open or close the dampers by operating a wall mounted control switch, or alternatively opening the manually openable windows. When the automatic louver control has been overridden, the ventilators will stay under the room occupant control for ten minutes, after which time the ventilators will revert back into BMS control. As such, the wall switch shall be of a rocker type or self resetting with indicator lamps to show if the unit is manually held open/manually held closed/in automatic control.

Opening windows (where provided) shall also be provided and shall be manually opened to allow further occupant control of the internal environment, but the windows shall be installed with restrictors only allowing the panes to be opened a small amount for safety reasons. In all instances where there are windows, opening windows shall be provided. The ventilators shall be sized to provide the required ventilation rates to suit fresh air requirements and overheating criteria without the need to open the windows. The windows shall provide an extra ventilation capacity.

The ventilation strategy utilising motorized ventilation dampers shall provide the ability for night cooling of the building and it is proposed that they be arranged so as to actively cool the building across the night when the external air temperatures are lower. This shall be achieved by automatically opening external natural ventilators along with the corresponding classroom, classroom stack vent and corridor ventilation dampers, when the external conditions are suitable across the night time period, automatically controlled from the central BMS. The use of this free cooling resource shall aid the ability of the building to be at an acceptable temperature at the commencement of the day and will ensure that the natural rise in internal temperature across the day is offset to some degree. The final design of the night cooling system shall make full consideration of the security risks of opening ventilators during the night to ensure that the security of the building is not compromised.

The natural ventilation system strategy shall be fully integrated with the comfort cooling system (where comfort cooling is installed in a naturally ventilated room) such that the BMS system shall operate the natural ventilation system according to two distinct strategies, one for passive cooling mode and one for mechanical cooling mode. During passive cooling mode, the BMS shall modulate the dampers to maximise the throughput of ventilation air to suit the in room CO₂ level requirements and to maintain the in room temperature as close to the optimum room temperature of 22°C as possible. However, at times of peak conditions, the internal room conditions shall rise above this figure, and natural ventilation alone will not prevent the rooms from exceeding 24°C. Therefore, as the monitored in room temperature approaches the 24°C level, the BMS shall change the ventilation strategy from passive cooling mode to mechanical cooling mode when the room passes 23.5°C.

Under mechanical cooling mode, the ventilation system shall change from controlling CO₂ levels and temperature to purely controlling CO₂ levels within the room, in effect becoming a minimum fresh air system. In this way, the dampers will close down to allow just the minimum required fresh air into the room to satisfy the CO₂ levels, thereby reducing the cooling load imposed on the comfort cooling system from warm outside fresh air to a minimum, allowing the room comfort cooling system to initiate and take care of the cooling load. By utilising these two natural ventilation strategies, the amount of time the cooling system is operation is reduced to an absolute minimum as usage of the passive natural ventilation cooling is maximized fully.

The natural ventilation system components shall be designed to prevent the ingress of water in to the room vents or the stack shafts, be designed to prevent the formation of condensation on the internal side of the room ventilation dampers or room components, be designed to avoid thermal cold bridges and shall be in accordance with the SBEM requirements for building fabric performances.

The corridor areas of the building shall also be naturally ventilated by BMS controlled louvred opening rooflights positioned along the length of the building. These shall be controlled by the BMS using wall mounted temperature sensors located down the length of the corridors.

Mechanical Ventilation

The internal offices, assembly hall, music rooms and kitchen area shall be provided with mechanical supply and extract ventilation systems. The changing areas, toilets, food tech, prep and science rooms shall be provided with mechanical extract systems.

The mechanical ventilation system shall comprise of separate air handling plant serving ductwork distribution systems that shall take the fresh air into the room and extract the exhaust air for discharge to atmosphere.

The internal office air handling system shall comprise of a heat recovery air handling unit with an integrated electric heater battery to provide air at a constant tempered temperature to the rooms. The fan shall be operated under the dictates of a PIR.

The assembly hall ahu shall provide a varying volume of air to the room depending on the air quality and temperature of the space. The fans in the air handling unit shall be inverter controlled to achieve the required variable volume of air flow. The supply air ducts shall be provided with motorised

dampers to turn off sections as the air volume drops whilst still maintaining the desired air throw pattern of the sock.

The music room vent system shall operate as a variable volume all air heating and cooling system, with the volume of air supplied to the rooms varied according to the ventilation and cooling requirements of the room dictated by in room CO₂ and temperature sensors. The supply ducts to the room shall have terminal reheat batteries to provide control of individual rooms, cooling and main heating done at the ahu.

The kitchen air handling unit shall provide heated or cooled air to the kitchen via the air handling unit mounted DX coil.

In all instances free cooling potential through the ventilation systems shall be utilised.

The building shall be served by a number of separate systems. Where possible the air handling system shall make full use of thermal heat recovery via cross plate recuperators or thermal wheels, with recirculation, variable speed drives etc. The toilet extract systems shall have a twin fan (run and standby fan) unit. All systems shall be fully monitored for fault and controlled from the central BMS system, and shall be acoustically treated in accordance with the requirements of the acoustic consultant's report requirements and this shall include the requirement for internally plasterboard lining the fan and air handling units. Particular attention is drawn to the requirement for all fans to be housed in acoustic boxes. All vent systems shall be inverter controlled. Where possible systems shall be demand controlled with PIR sensors determining the room is occupied. Where possible, the systems shall be CO₂ controlled to maximise the recirculation and control the amount of fresh air entering the space directly in relation to the needs of the room based on CO₂ levels. As such system selection and design shall be based on a variable volume systems.

Each of the individual ventilation systems shall be individually time clock controlled to their own time schedules to allow different areas of the building to operate at different times.

The ductwork systems distributing through the building shall incorporate fire and smoke dampers as required to suit the fire compartmentation of the building as shown on the architect's drawings. All fire dampers shall be out of the airstream type of unit.

Access panels shall be provided to the ductwork systems in accordance with the HVCA DW144 level 3 of access requirement (highest level) and the requirements of this specification document. In summary the following requirements shall be adhered to in the siting of access panels as a minimum:

Access panels shall be provided:

1. Either side of attenuators
2. Either side of fans or air handling units
3. At all fire, smoke or volume control dampers
4. At base of risers
5. At all changes of direction
6. At all transition pieces
7. On the side of kitchen extract ducts
8. At connections to louvres
9. At every 6m linear measured duct run

The removal of a flexible connection can not be used as a substitute for an access panel.

Volume control dampers shall be located as close to the main duct off of which the branch duct has been taken to reduce the risk of secondary regenerated noise. Volume control dampers will not be permitted to be installed at the end of duct runs eg at connection to grille or bellmouth as a means to avoid the requirement to install an access panel. The contractor shall be responsible for correcting any such instances where it is found on site that a volume control damper could have been installed nearer to the main duct, and this will be at the contractor's expense, with no penalty incurred to the contract time. Volume control dampers shall be used on all branch ducts, off main ducts and onto

grilles. Under no circumstance shall the grille mounted volume control damper be utilised for balancing the ducts alone.

The contractor shall install, where necessary, cross talk attenuators to ensure that the activities in one room cannot be heard through the ductwork system in other rooms. In general, all ducts passing into rooms shall require cross talk attenuators. As a general rule, the contractor shall allow for cross talk attenuators where every duct passes across a dividing wall between two separate rooms.

Flexible ductwork shall only be used in straight lengths. These straight lengths shall be a maximum of 600mm long. Any flexible ducts installed in excess of 600mm long or not installed straight shall be removed and replaced by the contractor at their expense with no penalty incurred to the contract time. All flexible ducts shall be thermally and acoustically lined.

All grilles shall be installed with plenum boxes. The plenum boxes shall be thermally and acoustically lined internally with a black barofoam lining. The contractor shall be responsible for ensuring that the ceiling is capable of withstanding the weight of the grilles and plenum boxes, otherwise the grille/plenum box arrangement shall be independently supported off the soffit. Plenum boxes shall be riveted to the grille.

All grilles shall be four way blow louvre faced units in all areas with the exception of the toilets where circular disc valve grilles shall be utilised, and in the assembly hall where air sock fabric ductwork shall be utilised.

Return air grilles shall be provided to allow a return air path into the ceiling void when the void is used as a return air plenum. In these instances, the return air grilles shall be four way blow louvre faced diffusers and shall have a matt black painted oversized backing plate set above the back of the grille to prevent the room occupant from seeing up into the ceiling void.

Where the extract duct terminated in a bellmouth arrangement, the bellmouth duct shall be continued at the enlarged size for at least 800mm after the transition enlargement to allow the air to transfer correctly in a laminar fashion and avoid the risk of secondary regenerated noise.

When installing attenuators, the contractor attention is drawn to the requirement to ensure that there is sufficient straight length of duct before and after the attenuator to ensure that all air paths through the attenuator are utilised and avoid excessive pressure drops and secondary regenerated noise within the unit. Therefore attenuator straight after bends or after transition pieces will not be accepted.

Thermal insulation shall be installed in accordance with the requirements of this specification document. The contractor attention is drawn to the requirement for any external thermal insulation to be resistant to attack from birds. In addition, the contractor's attention is drawn to the requirement to correctly ensure that the class 'O' foil vapour seal is maintained at all times to prevent the risk of condensation forming underneath the thermal insulation on the outer face of the metal duct. This requires the vapour barrier to be taped continuous at duct connection to fan coil units, grille plenum boxes, supports etc. In addition, vapour seal and thermal insulation must be continued through building structures.

The contractor shall be responsible for ensuring that the installations by other trades, and in particular ceiling contractors, does not obscure the required access to the services installations.

The location and selection of grilles in areas such as spa and beauty salons shall require careful consideration of selection and location due to the need to eliminate all draughts and occupant discomfort due to any major differences in supply and room air temperatures. As such the grille selection and supply air temperatures shall be suitably chosen to suit the CIBSE recommendations for draughts in such specialist areas.

The contractor design shall take full account of secondary regenerated noise within the ductwork systems. The design shall assess the risk and include the necessary measures to remove the risk, such as secondary ductwork attenuators in addition to main attenuators, double volume control dampers on the first number of branches after the fan to avoid excessive pressure being removed at

one single damper etc. Secondary regenerated noise can be assessed and designed out at design stage and therefore any occurrences on site will not be accepted and will need to be rectified by the contractor at their expense with no knock on effect accepted to the contract duration.

The ventilation systems shall be designed according to the following general design parameters:

1. Maximum duct pressure drop	: 1 Pa per metre length
2. Maximum duct aspect ratio	: 4:1
3. Maximum duct air velocities	
i) Plantrooms	: 6 m/s
ii) Risers	: 5.5 m/s
iii) Main floor distribution ducts	: 4-4.5 m/s
iv) Branch ducts to grilles	: 2-2.5 m/s
v) Branch ducts to bellmouths	: 2-2.5 m/s
vi) Through bellmouth openings	: 2 m/s
vii) Through door transfer grilles	: 1.5 m/s

The natural ventilation louvres and motorized dampers shall achieve the following performances as a minimum:

U Value: 0.96 Watts/m²/K

Leakage: less than 5m³ per hour per sq/m at 50Pa

Weather Rating: Up to Class A

4.6 Domestic Hot and Cold Water Services

The new building shall be served by a domestic hot and cold water system sized to cater for the appliances and use of the building, taking particular account of the high use water demands of the kitchen and general uses such as toilets and changing areas.

The main cold water system shall be piped into the building and shall enter with a valve arrangement in accordance with the water byelaws and local water authority requirements. The main water shall be routed to the plantroom where it shall serve the cold water booster tank system and the Cat 5 water booster tank system (which is to serve the heating system pressurisation units).

The boosted cold water shall be routed to serve the cold water appliances in the building with pressure regulating valves to prevent over pressure as necessary. The boosted cold water supply shall be taken to serve the hot water calorifier unit.

Where necessary pressure reducing valves shall be installed on the boosted cold water and domestic hot water supplies to avoid areas of over pressure on the floors. Pipework shall be installed in chrome plated copper where routed exposed. All domestic hot water pipework in disabled toilets shall be fully boxed in.

A domestic hot water piped supply shall be routed through the building to serve the appliances as required. The domestic hot water supply pipework shall be served by a secondary return system to ensure that the water is maintained at the required temperature regardless of draw off flow rates. In addition all wash basins and showers shall be protected by thermostatic mixing valves to prevent scolding.

A cold water supply shall be taken to serve the corridor chilled water drinks fountains located at various points around the building (see architect's drawings).

The Cat 5 boosted cold water system shall be extended through the building to serve the science room appliances as well as the electric water heaters in the science rooms, from which the hot taps in the science rooms shall be served. Electric water heaters shall be installed in accordance with the

manufacturer's requirements and that of the water byelaws inspectors, complete with the necessary plumbing kits.

The domestic hot and cold water installation shall be designed so that the maximum pipework velocities are 1.5 m/s. in addition the system shall be designed to avoid deadlegs and shall be fully in accordance with CIBSE TM13.

The pipework shall be trace heated to prevent freezing where necessary.

Hot and cold water use within the building shall be metered linked to BMS.

The contractor shall allow for the installation of water supplies to the all appliances included in the staff rooms and brew areas including for a sink, dishwasher and hydroboil unit above the sink (provided by the contractor). The contractor shall also allow for the connection to all appliances within the kitchen.

4.7 Gas Distribution

The new gas main shall rise externally to the building before passing into the building into the plantroom area to serve the gas fired plant. The gas pipe shall be routed internally to serve the kitchen area and the science rooms. All gas installations shall be installed in accordance with the gas regulations.

Upon entry to the building the gas main shall connect to an emergency gas solenoid valve that shall isolate the whole building. In addition the gas service to the kitchen, the food tech room, the science prep rooms and the science classrooms shall also be protected by individual gas solenoid shut off valves, controlled off gas guard units. All solenoid valves shall be linked to a fire alarm interface so as to close upon activation of the alarm and reopen upon reset of the fire alarm. The gas solenoid valve shall be a gas flow proving type system. The plantroom gas solenoid valve shall be linked to an emergency shut off buttons located beside the plantroom exit doors. The kitchen gas solenoid valve shall be linked to an emergency shut off buttons located beside the plantroom exit doors. Emergency gas isolation buttons shall be shrouded to prevent accidental activation.

All solenoid valves shall be supplied with the system to prove closure of valves prior to establishment or restoration of gas flow, in accordance with BG IM/20.

Gas solenoid valves in the kitchen, food tech, science prep rooms and the science labs shall be interlinked to the extract ventilation systems and the inlet air vents to only operate if the vent systems are operational, in accordance with the gas regulations requirements.

4.8 Automatic Controls and Wiring

The automatic controls package shall include for all required controls and interfaces to suit the requirements of the design and as indicated within the tender documents and the tender layout and schematic drawings.

The mechanical services shall be interfaced back to a new BMS controls front end system installed in this new building. The contractor shall allow for all necessary works to provide this link and allow access to the full suite of front end operations from the existing main campus buildings. The new system is to be a TREND based system.

The contractor shall allow for providing a control panel to serve the new building plant and installations and this shall be interfaced back to the existing BMS system. The contractor shall allow for providing graphics for the new systems to cover the new building and to prove all operations are correct at time of hand over on both the new and existing sites.

The BMS shall allow the set time schedule settings or set points to be varied and the internal conditions or plant conditions can be monitored and adjusted from their PC front end. In addition any

faults or alarm raised by the system shall be generated at the front end and hard copies printed off by the associated printer unit. It is proposed that the BMS system shall be graphic based and simple to operate and that the college shall have input into the final graphic arrangements.

The BMS system shall be network based to allow the front end to be viewed across any computer in the campus if required via the data network.

The following provides a brief overview of the functions that shall be performed by the BMS system:

- Time clock schedules providing independent control of all plant, systems and zones
- Monitoring all plant for failure or operation outside of limits and raising an alarm accordingly
- Control of the heating system zones
- Control of ventilation systems
- Resetting the comfort cooling set system and heating system set points back to preset limits at the end of each day
- Monitoring the DX served rooms internal temperatures and allowing set point temperature adjustment off front end
- Sequence control of gas boilers, biomass boiler, pumps etc
- Incoming water, gas and electricity consumption monitoring and logging
- Energy monitoring of plant used and heat meters
- Metering of electricity used.
- Metering of heat produced at biomass boiler
- Metering of heat produced by PV cell system
- Timeclock and daylight control of the external lighting
- Metering of the hot and cold water, electricity and gas energy used by kitchen area. Hot water usage to be via a heat meter arrangement.
- Frost protection of building and plant
- Monitoring of the server room temperature with alarm if out of condition.

The Automatic Controls Specialist shall also be responsible for installing all power and controls wiring (plus containment) associated with the Mechanical Services throughout. Wiring to mechanical services shall be LSF cabling within metal conduit and metal trunking.

The contractor shall provide early in the controls system design stage a set of proposed front end graphics that can be commented upon. Ideally these will be demonstrated on a computer, but if not colour slides printed off will suffice. The operation of the graphics shall be decided at this stage and then reviewed in a subsequent review meeting once they have been programmed onto a computer before loading onto the site system.

The contractor shall provide a full schedule of proposed control set points for discussion and comment prior to commencing on the programming of the control software.

The necessary sensors and control logic shall be installed to allow the points to be logged and monitored.

Where the plant is controlled against in room conditions, the controls system shall utilise in room wall mounted sensors. Return air sensors shall only be used where it is deemed that the use of wall sensors will be impeded by the room use. Where adjustable sensors are to be used such as adjustable room thermostats, the sensors shall not display a temperature scale, but instead shall display a "+" and "-" symbol.

Control of the in room ventilation and heating systems etc shall be as described in the relevant sections of this document above.

Inverters, Valves and Control Equipment

The specialist controls contractor shall provide all inverters, valves and control equipment, sensors, probes, pockets etc to enable the system to operate as described in this document. Valves, pockets

etc shall be free issue to the mechanical contractor for their installation.

Meters

All meters (water, gas, electric, energy) shall be logged by the BMS. Water, gas and energy meters shall be provided by the controls specialist.

Main Panel

A main panel shall be provided in the packaged plantroom. The main panel fascia drawings shall be provided for comment prior to manufacture of the panel. The main panel shall house hand/off/auto switches for all plant, run/fault lamps, filter dirty lamps, power healthy lamp and lamp test button.

The main panel shall house, an audible common alarm buzzer, lamp and mute button. Outstations shall be located as required around the building.

Wind direction and wind speed indicator

The controls specialist shall provide windspeed and wind direction sensor in a suitable location on the roof of the building.

Proposed System Description of Operation

General

Cabling/Interfaces

The specialist control contractor shall supply and install all associated power cabling, controls cabling, containment, support brackets, field sensors, containment drops etc. to fully service the controls installation. The electrical contractor shall provide an electrical supply local to the main control panel terminating in an isolator from which the controls specialist shall cable to their control panel. All power cabling to all mechanical plant shall be derived from the control panel and cabled by the controls specialist. The controls specialist shall provide evidence of cable sizing to Waterman Building Services for comment prior to installation to support installation proposals.

The electrical contractor shall provide a fire alarm interface local to the control panel. The controls specialist shall cable from the fire alarm interface to the panel and shall terminate the cable at both ends.

Training & Data Logging

The controls specialist shall allow for two separate one day visits to the site to train the staff in the operation of the control system.

The controls specialist shall allow for setting up and initiating trend logging of the building for the first three months of operation from practical completion to prove the correct operation of the services installation. The contractor shall allow for downloading the information across the three month period on a minimum one month basis and the provision of the information to Waterman Building Services in an easily viewable colour format.

The contractor is to agree the format and points to be simultaneously logged with Waterman Building Services prior to completion of the works and the list below is informative of the desired level but is not exhaustive.

The contractor shall allow for the site to be data logged for three months after the practical completion of the project. During this time, the BMS system shall log the following control points and parameters on a 15 minute time interval across 24 hours, referenced against date/time. The data shall be downloaded by the contractor's controls specialist and shall be issued to Waterman Building Services

in hard copy paper at the end of each month within 5 working days of the last day of the month (failure to do so will affect release of retentions) and each monitored point shall be tabulated against time for cross referencing. In this fashion, the operation of the building post practical completion can be monitored. The minimum number of points to be monitored are as follows, however Waterman Building Services reserves the right to increase the list at a later stage:

1. DX system enable signals
2. Heating control valve % open settings
3. External temperature
4. Internal temperatures in all rooms (excluding cleaners rooms, stores rooms, stairways)
5. Gas boiler and biomass enable periods (for each module)
6. All heating system flow and return temperatures
7. PV cell meter readings
8. Air handling unit supply air temperatures
9. Common extract fan enable periods
10. Gas, water and electricity meter readings (on a daily basis)
11. Calorifier system temperature
12. Biomass boiler buffer vessel temperature
13. Alarm log
14. Domestic hot water supply temperature
15. Faults
16. VAV box % open positions
17. Kitchen extract fan run speed
18. Supply air volumes on VAV systems (off velocity grids)
19. Natural vent damper % open

Description Of Operation Of Plant

Main Power

A main panel shall be provided in the boiler plantroom and an ancilliary one in the rooftop plantroom. The main panel fascia drawings shall be provided for comment prior to manufacturer of the panel. The main panel shall house hand/off/auto switches for all plant, run/fault lamps, filter dirty lamps, power healthy lamp and lamp test button.

The panels shall house, an audible common alarm buzzer, lamp and mute button.

Plant Operation

Toilet/Changing room Extract Fans

The toilet/changing room extract fans shall run in accordance with the central time clock to run and stop in line with the building occupancy periods. They shall be controlled off PIR's in each room served with run on timer set to 15 minutes at commissioning.

The fans shall be monitored for fault and the extract fans shall have auto run/standby and duty rotation change over and raise alarms accordingly.

Kitchen supply air handling unit and extract fan and dishwash extract

The air handling unit and extract fans shall be inverter controlled and shall run in accordance with the central time clock to run and stop in line with the building occupancy periods. In addition, the extract fans shall be controlled off a wall mounted speed control switch (recessed single gang switch unit). The supply air handling unit speed shall be varied in accordance to the extract fan speed.

The air handling unit frost and main heater batteries shall be controlled via two port/three port control valves to modulate the flow through the coils to ensure the supply air temperature is maintained at a

temperature to suit the room conditions, sensed via in room temperature sensors. The BMS shall also control the air handling unit DX cooling coil according to the room conditions sensed.

The air handling units and the extract fan shall have motorised dampers which shall open when the fans are in operation and close when not.

The BMS shall monitor the supply air temperature to hold off the supply fan if the supply air temperature is too low. If the supply air fan is held off for any reason, the BMS shall also hold off the extract fan to prevent negatively pressurising the building.

The BMS shall monitor the in room conditions and the external air temperature and shall supply air to the space at a lower temperature when the conditions are right to allow free cooling. In this mode of operation, the supply air temperature shall never fall below 14°C.

The fans shall be monitored for fault.

The dishwasher extract fan shall be controlled via a wall switch.

The fans shall be monitored for fault.

Heat recovery void air handling units (offices)

The heat recovery supply and extract fan unit shall run in accordance with the dictates of a PIR sensor in the room (or rooms if serving multiple rooms), turning the fan on when the room is occupied. Sensor by the controls specialist.

The fans shall be monitored for fault and shall raise alarms accordingly.

All heat recovery air handling units shall be provided with BMS controlled face bypass dampers to and raise alarms accordingly.

Fans shall be demand controlled off PIR sensors in the rooms (in all rooms if a common system)

Science room, prep room and food tech room extract fans

The extract fans shall be controlled off a wall mounted speed control switch (recessed single gang switch unit) with the fan inverter controlled via the BMS. The fans shall be interlocked to the nat vent dampers to open the required amount of damper as the fan is turned on and sped up.

The fans shall be monitored for fault and shall raise alarms accordingly.

Classroom Natural Ventilation Louvres/Stacks

The naturally ventilated/comfort cooled classrooms/teaching/corridor areas are to be controlled by the BMS under two specific modes of operation that maximise the potential use of the free cooling natural ventilation system (mode 1) and, where DX comfort cooling is installed, to reduce the overall time that the comfort cooling system is operating for (mode 2), whilst then, when in cooling mode, reduces the potential wasted energy due to excessive fresh air loads during the cooling mode.

Under the proposed control schedule, the two specific control modes of operation as follows:

Operation Mode 1 – naturally vented and cooled rooms

Natural ventilation to be used for fresh air provision to control CO2 levels and for the cooling provision. The natural ventilation louvres are opened as required to allow sufficient air changes within the space to offset rising room temperature and/or CO2 levels

The classrooms are provided with motorised external high level wall ventilators, motorised vent shaft dampers. The ventilator and stack dampers shall be provided/installed by the mechanical contractor. The controls specialist shall provide a signal to these dampers to modulate the respective room dampers and stack dampers in accordance with the measured room temperature and CO₂ levels measured by in room wall mounted sensors.

The contractor design thermal model shall identify the operating set points however, these are likely to be of the order of:

- Commence opening vents on CO₂ when level exceeds 1000ppm
- Commence opening the motorised vents and stacks when the room temperature exceeds 20°C

The control system shall be organised to provide the naturally ventilated rooms with night cooling, such that the external wall ventilation and stack dampers shall open when the prevailing external conditions provide the possibility to free cool and purge the rooms across the night ready for the occupation on the next day. The BMS system shall monitor the space to prevent overcooling.

The controls specialist shall provide each room with a manual open/close/auto override switch (rocker switch/indicating lights) to override the auto control of the dampers. Damper to reset to auto control at the end of a 10 minute duration.

Heating valves shall be controlled by the BMS to open in advance of the nat vent louvre to ensure that cold down draughts off the louvres are minimised.

Operation Mode 2 – naturally ventilated and mechanically comfort cooled rooms

The natural ventilation systems shall operate as per mode 1 above until such time as the internal room temperature reaches a trigger temperature point when the mode of operation shall change to that of minimum fresh air provision with the comfort cooling plant enabled by the BMS.

The control system shall monitor the in room temperature and if the limiting threshold set point temperature of 25.0°C be exceeded, then the system shall change over into operation mode 2 and initiate the comfort cooling system.

To avoid excessive fresh air load on the cooling system, the BMS shall modulate the wall and shaft ventilators back to the minimum setting possible to achieve the required CO₂ levels within the room.

The BMS shall enable the DX comfort cooling systems.

The occupants shall be provided with adjustable in room sensors as previously described to adjust the room set point temperature.

The room shall revert to operation mode 1 as soon as possible to reduce the energy usage of the building as this shall be determined when the room temperature is stable at 24°C.

DX Comfort Cooling Systems

The BMS shall control the general DX heating and comfort cooling systems enabling the systems to provide preheat but also ensuring that the set point is automatically reset at the end of the day to the preset level of 21°C regardless of the position the room controller has been left in.

The control system shall monitor the server room cooling unit for fault and raising an alarm accordingly. The control system shall also monitor the server room temperature and raise a high level alarm accordingly.

The BMS shall monitor the systems for fault. The BMS shall monitor the DX room controllers for the in

room temperature and display on graphic and log accordingly.

Heating and Cooling Plant

The building is heated by a combination of biomass boiler and gas fired condensing boilers. The interface arrangement of the plant is shown on the schematic drawing.

The controls system shall provide sequence control of the heat producing plant to ensure that the biomass boiler is the lead boiler at all times.

The controls system shall pre-empt the operation of the ventilation system such that the heat emitters shall be opened to ensure sufficient heat is being emitted before the natural ventilation dampers are opened, to ensure no cold draughts.

The control system shall provide a 15 minute run on timer for the shunt pumps.

The control system shall provide a self learning optimised start control for the heating system via the external sensor. In addition the controls system shall provide weather compensated variable temperature radiator circuit controls for the space heating again via the external temperature sensor.

The control system shall enable, monitor and provide auto duty rotation/standby changeover for the twin head pumps sets. The controls system shall monitor for fault and shall raise an alarm accordingly.

The controls specialist shall supply, install and commission inverter control for the pumps and associated pressure monitoring devices. The controls system shall monitor for fault and shall raise an alarm accordingly.

The controls system shall provide modulating control to heat emitters via two port modulating control valves where necessary. The valves shall be free issue by the controls specialist to the mechanical contractor for installation by the mechanical contractor.

Underfloor heating System

The building shall be served by a number of zones of underfloor heating system. The underfloor heating system shall be controlled by the BMS such that the system shall control the motorised valves serving the underfloor zones, to bring on the heating as and when the room conditions (sensed by wall mounted thermostats in the auditoria, changing room and entrance foyer) dictate.

The BMS shall provide a high temperature cut off valve arrangement to protect the under floor systems.

Domestic hot water plant

The hot water requirement for the building is provided by two domestic hot water storage calorifier. The BMS control system shall enable the domestic hot water circuit pumps and valve sets to meet the output requirements of the systems. The BMS shall monitor the hot water flow temperature for low temperature and shall raise an alarm accordingly.

The BMS shall monitor the internal temperatures at various heights across the calorifier vessel.

The CT circuit serving the domestic hot water calorifiers shall be controlled via 2 port control valves. The domestic hot water calorifier shall be provided with a weekly pasteurisation cycle.

Heating System Pressurisation Units

The heating systems and solar collector systems shall be provided with separate pressurisation units. The control system shall permanently energise the units and shall monitor them for fault condition with an associated alarm.

Lighting Controls

The BMS shall control the external light switching according to timeclock controls and photocell.

Frost Protection

The building shall be protected by the controls system from frost by a number of staged measures. If the external temperature drops below 5°C or the internal conditions drop below 10°C then the controls system shall energise all of the pumps and open all control valves. If the external temperature drops to 2°C or the internal temperature drops to below 8°C then the controls system shall energise the heating plant in sequence until the building is up to 15°C internal. During frost protection cycle, the air source heat pump plant shall be utilised.

Front End Control Software

The control system shall be controlled from a suite of front end software that shall be housed upon a dedicated PC supplied, installed and commissioned by the specialist controls contractor. The PC shall be sized sufficient for the correct operation of the controls system. The PC shall be provided with a dedicated printer for printing off faults/alarms.

The system shall be set up with a series of graded password for limiting access to the relative authorised personnel. The controls specialist shall allow for the provision of the relevant software, licences etc and shall allow for the installation of the network software to allow for the access to the system from any PC in the future. The controls specialist shall also allow for the training of the chosen personnel in the use of the front end software across two separate days.

The controls specialist shall allow for the provision of graphic slides on the front end system. These slides shall be provided to Waterman Building Services for comment prior to the installation on the system. The graphic slides list is to be agreed with Waterman Building Services, but shall include the following as a guide and not an exhaustive list:

- Air handling plant
- General/toilet extract fans
- Kitchen supply ahu and extract fan systems
- Hot water heater/water flow temp
- Biomass boiler
- Classroom conditions, temp/CO₂, one slide per classroom
- External conditions
- Faults/alarms
- Energy metering and energy logging
- Boilers and associated plant
- Air source heat pumps and associated plant
- Floor by floor graphic overview slide with room temperatures on
- Pumps
- Meters
- Totaliser window slide

Renewable Energy Totaliser Screen

The controls specialist shall provide a wall mounted totaliser panel to be located on the wall of the Phase 2 building entrance atrium. The purpose of the panel is to show the students, staff and visitors how much energy within the building is being gained from renewable sources and how much carbon dioxide emissions have been avoided by using the installed system. The control system shall therefore incorporate the necessary energy metering and software calculations to provide the necessary information, that shall be displayed on an electronic display. The final appearance of the panel is to be developed by the contractor/controls specialist and shall be offered for comment/approval to Waterman Building Services and the client at the same time as the graphic slides are presented. However, one suggestion would be to use a wall mounted LCD monitor driven off the information from the BMS front end and replicating a slide on the front end system. Screen shall be a minimum of 32inch screen.

The renewable energy totaliser screen shall be permanently live and shall display running totals as well as cumulative totals. The screen shall show the following as a minimum, however the contractor is free to suggest additional information that they may wish to display:

1. The energy currently being contributed by the biomass system – heating (kWh)
2. The energy currently being contributed by the PV cell system (kWh)
3. The cumulative total energy contributed by all systems to date (kWh)
4. The kg of carbon dioxide emissions saved to date by the use of the systems (kgCO₂)
5. The total building energy used in gas and electricity at that time (kWh)
6. The total building energy used in gas and electricity to date (kWh)
7. The total building carbon dioxide emission to date (kgCO₂)

4.9 Above Ground Drainage

Sanitary pipework above ground

Sanitary pipework above ground shall be designed and installed in accordance with BS EN 12056 System III incorporating secondary ventilation as well as Building Regulations Approved Document H. Access shall be provided at each floor level. Drainage pipework shall be installed from all draw off points piped to a number of vertical stacks and each stack shall in turn connect to the below ground drainage system as dictated by the structural engineer's design. The above ground drainage system shall be adequately vented and laid to fall to ensure correct discharge of waste water. All changes of direction shall have rodding eyes and all tees shall be swept tees. Above ground drainage system shall be thermally insulated where necessary and acoustically insulated where necessary to remove nuisance noise from water flow in the pipework. Alternatively suitably acoustically factory treated pipework systems shall be used to comply with BB93.

All drainage from the science areas shall be installed in Vulcathene pipework to provide the required robustness to suit the types of discharges from the science areas.

All outlets from the art room areas shall be provided with silt traps to collect the debris in the art room waste water discharges.

Rainwater drainage

All pipework and fittings shall be thermally and acoustically insulated and shall pick up the rain water inlets at roof gullies. Rainwater shall be conveyed down the building to connect to the below ground drainage system. Drainage pipework shall be twin walled acoustic type or where it is necessary to achieve BB93 requirements. The rainwater shall be collected in an external rainwater harvesting system and reused in the flushing of the toilets.

Fire collars shall be installed wherever a drainage pipe passes through a fire wall or floor.

4.10 Metering

The building services systems within the proposed building shall be monitored and metered in accordance with the requirements set out in CIBSE TM39 and to meet the requirements of Building Regulations Approved Document Part L2A whereby 95% of all energy used shall be metered.

4.11 Hydrant

The contractor shall allow for the provision of an external fire fighting hydrant as per the requirements of the fire consultant's specification document.

4.12 Staircase and Corridor Smoke Ventilation

Ventilation shall be provided to the staircase and corridors in line with the Fire Engineer's Specification Document.

5.0 Electrical Services

5.1 General

The electrical engineering services element of the project shall, albeit not exhaustively, include the provision of the following:-

- Design, installation, testing, commissioning and full demonstration of all systems
- Utility services as detailed in section 2 of this specification
- Main switch panel and electrical intake position
- Sub main distribution systems including local distribution boards
- Small power systems
- Provision of power supplies for stage lighting Rig for the fitting out by others.
- Voice and data cabling systems
- Cable containment systems
- General lighting and emergency lighting systems, including emergency signage
- External lighting systems
- Fire alarm systems.
- CCTV systems
- Intruder alarm systems
- Communications Systems
- Disabled Call Systems
- Lightning protection system
- Door access systems
- Earthing and bonding
- Sound field systems
- TV and radio systems
- Wiring to mechanical systems
- Roof mounted PV installation
- Induction loop systems
- Testing and Commissioning
- Operating and Maintenance Manuals

5.2 Incoming Supply

The incoming supply shall be as detailed in section 2 of this specification.

A new LV customer switch room shall comprise of a GRP housing, located adjacent to the substation and will house the utility MOD156 panel, the main ACB serving the building, a local consumer to serve lighting and power within the switchroom and heater and thermostat to prevent condensation. A twin 49W IP65 fluorescent will be provided complete with 3hr self contained emergency lighting, with an RCD protected 13A Commando socket.

A low voltage electrical supply shall be provided into the building as detailed in earlier sections of this report, terminating onto a floor mounted front access MCCB main switch panel located within the within the plant room.

The panel will be complete with main meter, with outgoing ways being metered separately as shown on the tender drawings and in line with TM39. This metering shall be capable of remote monitoring in line with the BREEAM assessment requirements and shall be linked to the BMS system.

5.3 Main Switchboards

An MCCB main switchboard shall be provided located in the plant room. This main switchboard is to be a purpose built form 4 type 6 floor standing panel with front access switch panel, with top and

bottom entry access. This shall provide all electrical supplies to the building with circuits emanating to dedicated distributions boards located at strategic points around the building.

The panel will generally be as shown on the tender drawings and be complete with Schneider devices. No other manufacturer will be acceptable.

The panel will be manufactured by either Mardix or AF switchgear

5.4 Earthing and Bonding

It is proposed that all installations within the College shall be provided with earthing and bonding in accordance with BS7420 and BS7671.

5.5 Sub Main Distribution

It is proposed that the sub main distribution system shall emanate from the main switch board and shall be routed throughout the building to serve the distribution boards located in strategic positions as shown on the tender drawings.

The system will comprise of dedicated SWA cables fixed to cable basket, terminating on split load lighting and power MCB distribution boards.

All boards will be metalclad, be complete with lockable covers and Schneider devices.

The lighting and small power usage shall be metered at each board separately and shall be logged by the BMS system. In addition, high energy supplies such as mechanical control panels, lift supplies and areas such as plantrooms, shall be submetered and logged at BMS in order to comply fully with the metering requirements of part L and TM 39.

5.6 Low Voltage Distribution

Low voltage distribution shall be provided via MCB distribution boards located throughout the building. Sub main cabling shall be distributed on cable basket and cable drops to wall mounted accessories concealed within partitions or surface mounted in galvanised conduit where appropriate. It is proposed that low level skirting trunking systems shall be utilised or dado trunking will be utilised as detailed on the tender drawings.

Only primary containment routes are shown and the contractor is expected to have included for all containment to make a complete and fixed installation.

5.7 Wiring and Containment

It is proposed that the following wiring system shall be utilised throughout the building.

General mains distribution	XLPE/SWA/LSF cables on cable basket
Lighting	LSF Flat Twin & Earth routed on galvanised steel cable baskets with conduits to lighting control boxes. Final connection to luminaires via flexible cable from the control boxes.
Small power	LSF Flat Twin & Earth routed on galvanised steel cable baskets. Dado trunking in rooms
Fire alarms	Prysmian FP Plus enhanced cable on cable basket
Earthing and bonding	LSF single cables (Green/Yellow)

Emergency lighting	Self contained system, wired as part of the main lighting
Mechanical power and control cables	To be supplied and installed by the Mechanical Contractor in their own containment. LSF singles in metal conduit and trunking
External lighting and power	XLPE/SWA/LSF in ducts. Wall mounted luminaires to be wired from inside, with final connection back entry into the rear of the luminaire.
Plantrooms, kitchens, electronics rooms,	LSF single cable in metal conduit and trunking

All cabling will be BASEC approved.

All cabling will comply with the requirements of BS 8519:2010.

5.8 Lighting

The lighting will be as shown on the tender drawings and be manufactured from either Whitecroft or Luxonic lighting.

The lighting layouts on the tender drawings are indicative only and the contractor shall ensure the lighting levels are inline with CIBSE guides and DFEE requirements.

The lighting shall generally be controlled using PIR or Absence detectors as shown on the tender drawings, arranged to comply with building regulations and BREEAM requirements and will be complete with timer on periods adjusted to suit the activities within the rooms served and within circulation areas.

Manual switches shall be provided so that the occupants can manually switch lights on or off if they feel that the day lighting level is sufficient/ insufficient. The absence detector will only switch lights off when the room is vacated rather than switching them on automatically when someone enters.

In addition the absence detectors will also have photocell control element linked to dimming control gear within the luminaires adjacent the windows.

Therefore when the lighting is switched on luminaires adjacent to the windows will automatically dim up and down to suit the level of natural day light available and to save energy.

Within all class rooms incorporating a teachers wall the row of luminaires directly above the interactive white board shall be manually switched on/off via a local switch to the teachers wall dado trunking as shown on the tender drawings

The external lighting will be controlled via a BMS controlled time clock and photocell control system in accordance with the BREEAM requirements.

All luminaires will be complete with high frequency/high power factor control gear where applicable.

External lighting will also be compliant with ILE guidelines.

Lighting controls will be local to each room, using lighting control modules and flexible cable connections as shown on the tender drawings. Flexible cables shall be supported throughout their length and not just laid onto the ceiling grid.

Where lighting control modules are not used, the luminaires will be wired via the local detectors, with final connections via plug in ceiling roses, located adjacent to the luminaire.

5.9 Emergency Lighting

Emergency lighting shall generally be as shown on the tender drawings and be developed to ensure full compliance with BS5266, associated documents and DfEE guides. In general the lighting will comprise of integral self contained 3hr non maintained battery packs within the main luminaires and dedicated illuminated signage on final exit routes and changes of direction.

In high risk areas as defined in 'BS5266:10 Guide to the design and provision of emergency lighting to reduce the risks from hazards in the event of failure of the normal lighting supply', consideration shall be given to the use of a central battery system in order to provide the required times to full illuminance and lighting levels.

A self test system will be incorporated into the emergency lighting design, which shall be from the same manufacturer as the main luminaires.

5.10 Fire Alarms

It is proposed that the building shall be covered by a comprehensive analogue addressable fire alarm system as detailed on the tender drawings, which are to be developed to ensure compliance with the design requirements of BS5839, BS EN 54, DfEE recommendations, requirements of Building Control and the Fire detailed Fire strategy.

The design principle will be for the system to be a category L1 fire detection and alarm system should be provided, designed in accordance with BS 5839 - 1: 2002. Manual call points should comply with Type A of BS EN 54 – 11:2001.

The system shall be served from a main fire alarm panel and separate node panel as shown on the typical schematic.

The new fire alarm system shall be manufactured by Protec from their Algo-Tec system

Final exit routes will be provided with wall mounted break glass units (behind tamperproof covers) and electronic sounders complete with LED beacons (where required), will be provided in all areas to achieve the necessary audibility levels.

Sounders will either be integrated into the automatic detection devices or be wall mounted as shown on the tender drawings.

Audible alarms shall be fully co-ordinated with, and shall be clearly distinguishable from, other audible warning devices. Unless otherwise specified, alarms shall be coloured red and labelled 'FIRE'.

High intensity flashing xenon beacons shall be provided in areas as required. They shall be loop powered, with exact number being verified with the system manufacturer dependent on the system loading. They shall be red in colour and positioned so that attention is quickly attracted to the signal.

All external sounders shall be IP65 rated.

Where detectors are positioned in ceiling voids each shall have a remote indicator light mounted so that visible from the occupied space.

Fixed temperature heat detectors shall typically be installed in each cleaner's cupboards, kitchen and the plant room etc.

The fire alarm system shall be installed complete with a guaranteed electrical power supply facility providing a minimum of 72 hours back up period from loss of mains supply with the capability of a continuous 30 minute of sounding alarms in all areas.

Every detector shall have detector activated light and shall be finished white RAL 9010.

Fire alarm interface Units shall also be provided in general to the following systems:-

- Mechanical Control Panels
- Lifts.
- Kitchen Fire Shutter
- All electronic door locks
- All electronic door holders
- Servers
- Music systems
- Automatic Doors
- Access control system
- Miscellaneous FF&E systems
- Gas solenoid valves

Off site monitoring of the fire alarm alarm shall also be provided via a dedicated Redcare fire phone line.

5.11 Disabled Alarm System

It is proposed that the building shall be served by a disabled/refuge alarm system to cover disable refuge locations and disabled WC/shower areas.

The main control panel shall be positioned adjacent to the main fire alarm panel and will receive two way voice communications from each disabled refuge position. In addition, links shall be taken to the reception desk also providing two communication.

The disabled toilet and shower areas shall be provided with a pull cord type alarm system with local audible and visual alarm outside the toilet area and remote alarm back to the alarm panel.

All panels will be recessed. The disabled/refuge alarm panel will match the fire alarm panel. The panel positions will be agreed with the Architect and Client.

Adjacent to each call point and panel a traffolyte notice explaining all functions and procedure will be installed.

The refuge position call points shall be recessed stainless steel fascia type.

At each disabled refuge position a small panel shall be provided with a call button, a reset button and a reassurance lamp indicator that the call has been sent to the main panel. A notice shall be provided giving operating instructions and re-assurance indication that the operative will be attended to as soon as possible. The system shall include two way voice communication and be approved for use by Building Control.

At each disabled WC/shower a pull cord c/w reassurance light, buzzer and reset button shall be provided in the WC/shower with an indicator lamp outside the WC/shower above the door and at specific other locations. It should be noted connection to the main panel refuge system panel is required.

All cabling to be BS7346-6:2005. The system is to be complete with all required emergency back-up power and control systems.

The alarm system shall operate with an open protocol programming language and shall be provided with all necessary interfaces to allow interrogation and monitoring by the site wide central PC based monitoring system.

5.12 Small Power

The small power design has been developed as shown on the tender drawings and the design and installation shall comply with the following:

- BS7671
- Power radial circuits – minimum cable size 2.5mm²
- Ring circuits – minimum cable size 4mm²
- High integrity earthing for all circuits with socket outlets shall be used throughout, with sockets having dual earths..
- No ring mains shall cover an area exceeding 100m²
- Residual current detection (RCD) protection 30mA to all sockets serving sockets.
- Ring main circuits – mcb size 32A, maximum design current 15A
- Radial circuits – mcb size 20A, maximum design current 50% of rating.

Within the plant rooms, all outlets shall be of the metal clad type.

Within circulation areas, all outlets shall be of the White PVC type.

Where detailed multi-compartment surface fixed Dado trunking shall be used as containment for final small power circuit wiring and structured cabling. Outlets shall be flush mounted without requiring mounting houses. Prior to installation the Services Contractor shall provide samples to the Engineer, Client and Architect for approval. The trunking shall be installed using manufacturer's prefabricated components. Site constructed components will not be acceptable. Where junctions and changes of direction are present, proprietary units shall be installed as per the manufacturer's instructions.

All sockets on dado trunking or on white walls will be complete with coloured infill panels to make them distinguishable from the background in line with DDA requirements.

All fused connection units, and other isolation devices, shall be fully labelled showing the equipment they are serving. A sample of the engraving shall be offered to the design team for approval.

The Services Contractor shall provide NICEIC certification upon completion of the electrical installation.

5.14 Electrical Services Associated with Mechanical Services

This wiring shall generally be limited to the provision of main power supplies to each central panel and specific pieces of equipment with high electrical loads. Power wiring for the main mechanical plant items from the control panels shall be by the specialist controls contractor.

5.15 Security Alarm System

A security alarm system comprising of dualtech PIR/microwave automatic detection and door contacts will be provided and be designed to secure by design standards. The system shall comply with current legislation for connection onto remote stations. The system shall be installed and maintained in accordance with BS EN 50121-1:Part 1:1997 and PD6662:2004, to give a minimum of grade 3 alarm system standard. The system shall be installed by a NSI or SSAIB registered and accredited installer. The system design shall adhere to Code of practice draft for development BSDD243:2004, excluding paragraph 6.4.4.

The system shall operate on a dual event alarm notification basis (confirmed alarm signal).

Off site monitoring of the security system shall also be provided via a dedicated Redcare phone line.

General provision requirements are indicated on the tender drawings and the installations shall provide these as a minimum, expanding the installation as necessary to meet the design requirements identified.

The academy access/open up and egress/lock up strategy shall be as follows:

- First person onto site to attend the main entrance and gain access to the main site intruder alarm keypad unit. From this unit, the authorised person shall be able to disarm the respective college zones individually or disarm all zones in one action.
- Once zones have been disarmed, the authorised person shall then move through the building manually unlocking all respective doors and opening any doors that have been closed onto their magnetic hold open devices.
- At the end of the day, the authorised person shall work their way through the building systematically locking up rooms and areas.
- Main entrance doors shall be locked once all personnel have left the building.
- Once the building is empty and all areas are locked down, the authorised person shall set the intruder alarm for all zones at the main keypad and shall leave site.
- Alternative access to limited areas shall be provided as shown on the tender drawings.

5.16 Closed Circuit Television (CCTV)

It is proposed that the new building shall be protected by a CCTV system comprising of fixed cameras and pan tilt and zoom cameras as shown on the tender drawings.

Cameras will be colour monochrome operating down to a minimum of 0.1 lux and be complete with integral LED lighting.

1No colour/monochrome monitor, digital recorder and multiplexer will be located within the server rack.

The cameras will be served by a power over IP network.

Cameras will be wired back to a multiplexer to match the number required and provide 25% spare capacity. 24 hour digital recording and 2No 19" colour flat screen monitors will be provided.

Cameras and recording equipment will be of a standard capable of providing facial recognition suitable for prosecution purposes if required.

The facility for off site monitoring of the CCTV system shall also be provided via a dedicated ISDN line.

5.17 Access Control system

The site will be equipped with an access control system to cover the doors as shown on the tender drawings.

An intercom system shall also be provided as detailed to allow for unauthorized accompanied access to the main entrance of the building.

The means of access control will be by contactless smart proximity card and reader. Visitors to the college will be allowed access via an intercom system and receptionist control.

Door controller devices shall serve multiple doors and all door controllers shall be connected together on the data network and be part of the BMS system.

The doors on entrances shall be locked with maglock arrangements and the doors shall unlock when a valid ID smart card is presented to the adjacent proximity card reader. Automatic opening doors shall then open automatically whereas manual opening doors shall unlock allowing them to be pushed open. To exit, the doors shall be push button to open/release from the inside.

In the event of a fire alarm being activated, the door maglocks shall be disabled and the doors shall remain locked but can be opened by the manual push bar locking mechanism.

Fire escape doors and doors not used as main entrances but opening up to general circulation areas shall be controlled in a different manner. These doors shall be held permanently locked with maglock devices to prevent them being used at anytime. However, in the event of a fire alarm being activated, the door maglocks shall be disabled and the doors shall remain locked but can be opened by the manual push bar locking mechanism.

As part of the integrated design approach, the access control system will also be capable of being used as an electronic registration system, and the cards shall also have the facility to interface with a cashless printing facilities.

One access control proximity card will be issued to every member of staff and each pupil plus 50 spares.

5.18 Induction Loops

Induction Loop Systems shall be provided to the areas detailed on the tender drawings.

A hearing aid wearer wishing to utilise the system should be notified to switch their ear piece to the 'T' or Transducer position and make sure they are within a defined radius to where the system is installed. Once both these criteria have been met the hearing aid wearer will be able to clearly hear the speech of staff at the counter.

The induction loop system shall be installed in line with the recommendations of part M of the building regulations.

The design and choice of the induction loop system shall take into account the risks of cross talk between rooms.

Sound Field systems

Fixed soundfield systems will be installed in areas as shown on the tender drawings.

The system shall be installed by SSE Audio Group – North, contact Mark Hatfield tel No. +44(0)1274 304083, E mark.hatfield@sseaudio.com

5.19 Lightning Protection

A new comprehensive lightning protection scheme shall be provided which shall be fully compliant with BS EN 62305-1:2011.

Surge protection will be provided on the main switch panel and to all services serving external equipment.

The contractor shall employ a specialist to design and install the lightning protection system.

5.20 ICT Installation

The building shall be provided with a complete ICT installation comprising of containment, cabling, and outlets and as a minimum be as shown on the accompanying drawings.

The designer will include for all other data connections to serve associated services such as the mechanical plant, the CCTV, the door access and security systems etc.

In general the installation shall be full compliant with the requirements of CAT 6 cabling and cabling shall be routed from the server room to RJ 45 outlets routed within the cable basket and within the dado trunking as indicated in general on the accompanying drawings.

The data rack shall comprise of a floor mounted mounted cabinet with lockable door, internal power supply and a patch panel sized to serve the points shown plus 25% spare. The cabinet shall be circa 2000mm tall and be sized to hold the patch panel, the active equipment and the CCTV systems.

Where it is considered cable lengths may exceed 90M, local hubunits/patch panels will be provided, wired back to the main ground floor rack.

The works will include for all standard industry wide cable testing.

Wifi will be provided to those areas indicated on the accompanying drawings.

The electrical contractor shall allow for installing all of the containment, wiring and passive equipment as detailed on the layout drawings and as directed by the preferred ICT provider.

The contractor shall include for the provision and installation of all field wiring, its termination in the form of male RJ45 connectors at the hub and female RJ45 receptors within the user areas and shall provide identification labelling at both ends

All cat 6 cables shall be tested to ensure they are fit for purpose and marked up/identified after they have been installed from the field terminal connection to the data cabinet. Each cable shall be certified as passed with the test results attached. Damaged cables shall be replaced at no cost or detriment to the contract.

The wiring will be routed on a dedicated cable basket complete with foam matting and be protected, with all containment designed and installed to make due allowance of the large bending radii required for this cable.

5.21 Table of Co-ordinated Accessories/Containment Systems:-

The table below lists out the level of accessories and containment system that are intended to be installed in the various:

Area / wall finish	Containment	Accessories
General - Plastered walls	Flush painted galvanized steel conduit	Flush white PVC
General - Painted blockwork	Surface painted galvanized steel conduit.	Surface 'Metalclad' where stated.
General - Self finished/fair faced blockwork	Surface painted galvanized steel conduit . Galvanized steel conduit recessed within wall finish in sports hall area.	Surface white PVC / Surface 'Metalclad' where stated. Flush metal clad within sports hall area
General - Blockwork to dado and painted plaster	Surface painted galvanized steel conduit . Galvanized steel conduit recessed within wall finish in sports hall area.	Surface white PVC / Surface 'Metalclad' where stated. Flush metal clad within sports hall area
General – Ceramic tiles	Flush galvanized steel conduit	Flush surface white PVC
Showers – Ceramic tiles	Flush galvanized steel conduit	Flush white IP56 'Master Seal'

KINGS ACADEMY
MECHANICAL AND ELECTRICAL SERVICES PERFORMANCE SPECIFICATION

Changing – Plastered Block work	Flush galvanized steel conduit	Flush White IP56 'Master Seal'
Plant Rooms – Blockwork	Surface galvanized steel conduit	Surface 'Metalclad'
External accessories fixed to building – as elevations	Wired directly from adjacent internal space/cavity in galvanized steel conduit	Surface IP56 'Masterseal'
External Blockwork	Surface galvanized steel conduit	Surface IP56 'Masterseal'

5.22 Lifts

1 No Part M2 (of Building Regulations) compliant passenger lifts will be installed, incorporating key preference control for equipment movement. The type of lift is to be confirmed with the Main Contractor.

The Services Contractor shall provide adequate electrical supplies, telephone lines, fire alarm interfaces, ventilation, CCTV and access control for the correct running and operation of the lift. Upon activation of the fire alarm, the lift shall return to ground floor level and doors open.

The lift installation will comply with BSEN81: Part2, BS5655 Part 1 and The New Lift Directive 1991.

5.23 Installation of Photo Voltaic (P.V.) Panels and ancillary control equipment.

The contractor shall allow for engaging the services of Energi Holdings plc on 01772 730300 to provide design and install a p.v. system which shall be mounted onto the flat section of the south facing roof above the pod and as shown on the architects drawings.

The contractor shall allow for the provision and installation, commissioning and demonstration of the system including all interconnecting cables and equipment to provide a fully functional p.v. installation which will be fed back to the main switchboard as detailed on the drawings and as directed by Energi Holdings plc. The contact at Energi Holdings plc is Andrew Baird and can be emailed at andrew@energiplc.com The address of this company is 9A and 9B Hurstwood Court, Lancashire Business park, Centurian Way, Leyland, PR25 3UQ.

The P.V. system shall be connected to the main switch panel and as such shall be compatible for the paralleled connection to the Electrical Authorities supply via a G59 compliant assembly.

5.24 Metering

Extensive sub-metering of electrical usage is provided for individual meters on all significant loads.

Tender drawing WBS-SH-60-E02 'LV Distribution Schematic' indicates all sub-meters included for the project which generally includes the following :-

- Individual general split distribution boards with separate lighting & power sub-meters
- Specialist teaching areas/room power distribution boards such as :- comms room and Kitchen
- External lighting and power distribution boards
- BMS control panel for mechanical services generally (integral with panel)
- Lifts

Electricity sub-meters will provide pulsed signals, MODBUS or other agreed industry standard.

All meters and sub-meters referred to above will be hard wire connected into the BMS for collection and analysis of meter readings/consumption of the individual end uses. The meters will provide pulsed signal, MODBUS network or other agreed standard of communication.

The controls specialist will give each meter an individual reference and will set up software to present individual meter readings, collective readings for end use and analysis.

CIBSE TM39:2009 should be used for guidance.

The BMS will include it's own PC and 28" LCD display monitor which will allow standard formats to be displayed on screen. The addition of a printer will also allow print out.

6.0 Plant Locations, Services Distribution and General Considerations

6.1 Plant locations

It is currently proposed that the building shall be arranged so as to provide a number of dedicated plant areas as follows:

1. Ground floor plant room
2. Roof mounted plant areas.

6.2 Access to plant and plant removal

The plant areas and plantroom sizes shall be considered to accommodate adequate maintenance access for routine and replacement maintenance activities and an access and maintenance strategy shall be developed as part of the design.

6.3 Plant vibration

It is intended that the required measures shall be taken in the siting and the design of the plant to control structure borne vibration to within the required parameters. In order to achieve this the fan units shall be located on anti vibration mounts and the pump sets shall be located on inertia bases.

6.4 External and internal acoustics

The external and acoustic noise criteria outlined within the acoustic consultants report shall be incorporated into the design of the mechanical and electrical services to ensure that the criteria are not exceeded. Particular attention shall be applied to the street roof vents and their close proximity to the plant areas with respect to noise break into the building.

C14 BUILDING SERVICES SURVEY

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

- The contractor is to visit site during the tender process to review the site and to ensure they are fully familiar with the building layout and nature of the contract. The contractor is to use the opportunity for the site visit to establish the methods for delivering the project successfully within the limit site constraints.
- The contractor is to have the opportunity to visit site to familiarize themselves with the site layout and conditions on site so as to effectively cost and programme the work.
- Access to the site is obtained by prior arrangement with the project manager

R11 FOUL DRAINAGE ABOVE GROUND

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test, commission and demonstrate an above ground drainage system conveying wastes to the point of connection to the below ground drainage system. The installations shall be in accordance with the specification document, in accordance with the Building Regulations and relevant British Standards. The contractor shall allow for the connection of all above ground drainage wastes to appliances and sanitary ware items. Where units are not installed at the time of commissioning, the contractor shall cap for future connection.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

210.000 PIPELINES

210.010 GENERAL:

Comply with work section general clauses reference Y10.1000 and those detailed below.

210.015 SANITARY FITTINGS:

Comply with work section general clauses reference Y10.1000 and those detailed below:

- As schedule reference

210.030 COPPER PIPES AND FITTINGS:

- Fluid Conveyed waste water
- Copper pipe, half hard (Class X)
- Uncoated - reference Y10.2270A
- Capillary fittings for copper tubing
- General potable range - reference Y10.2310A
- Compression fittings for copper tubing
- Type A compression fittings - reference Y10.2320A

210.050 PLASTICS PIPES AND FITTINGS:

- Fluid conveyed waste water
- Plastics piping systems for water supply
- Pipes to BS EN 1452 - reference Y10.2455A
- Fittings to BS EN 1452 - reference Y10.2475A
- PVC-U fittings to BS 4514
- Reference Y10.2490A
- Plastics piping systems with structured-wall pipes for soil and waste discharge within the building structure
- Pipes to BS EN 1453 - reference Y10.2495A
- Polyethylene piping systems for underground drainage and sewerage to BS EN 12666
- Reference Y10.2500A
- Compression fittings for polyethylene
- Reference Y10.2510A
- Polyethylene pipe - reference Y10.2520
- Polyethylene pipe to BS EN 1555 - reference Y10.2528

- Polyethylene fittings - reference Y10.2530
- Polyethylene fusion fittings to BS EN 1555 - reference Y10.2538
- Polypropylene piping systems for underground drainage and sewerage to BS EN 14758
- Reference Y10.2552A
- Plastics piping systems for soil and waste discharge within the building structure
- Pipes to BS EN 1451-1 - reference Y10.2545A
- Fittings to BS EN 1451-1 - reference Y10.2555A
- PVC-U pipes to BS EN 1329-1 - reference Y10.2580A
- PVC-U fittings to BS EN 1329-1 - reference Y10.2585A
- Plastics piping systems for hot and cold water systems within buildings
- Special materials
- GRP-UP to prEN 1796 and prEN 14364 - reference Y10.2772
- Jointing materials
- Jointing materials for plastics pipes to BS 7291

210.070 PIPEWORK ACCESSORIES:

- Wall, floor and ceiling masking plates
- Chromium plated - reference Y10.3190A.
- Plastic - reference Y10.3190B
- Pipework support - reference Y10.4210

210.080 GENERAL WORKMANSHIP

- Appearance - reference Y10.4010
- Spacing - reference Y10.4020
- Gradients - reference Y10.4030
- Air venting requirements
- Air bottles - reference Y10.4040A
- Automatic air vents - reference Y10.4040B
- Drain requirements - reference Y10.4050
- Expansion and contraction - reference Y10.4060
- Pipe fittings
- Bends/swept tees - reference Y10.4070A
- Elbows/square tees - reference Y10.4070B
- Pipes through walls and floors - reference Y10.4110
- Pipe sleeves
- Reference Y10.4120A
- Insulation carried through - reference Y10.4120B
- Pipe sleeves through fire barriers - reference Y10.4125
- Connections to equipment - reference Y10.4130
- Distribution headers - reference Y10.4140
- Temporary plugs, caps and flanges
- Reference Y10.4150A.
- Flanged joints general - reference Y10.4160
- Dissimilar metals - reference Y10.4170
- Pipe rings and clips - reference Y10.4180
- Anchors - reference Y10.4190
- Location
- As drawing numbers
- Slide guides - reference Y10.4200
- Location
- As drawing numbers
- Pipe supports - reference Y10.4205
- Support spacing - reference Y10.4220
- Isolation and regulation
- Reference Y10.4230A

- Maintenance and renewal - reference Y10.4240
- Cleaning - reference Y10.4250
- Non-ferrous components - reference Y10.4260

210.100 WORKMANSHIP, COPPER PIPEWORK:

- Compression joints - reference Y10.6030
- Capillary joints - reference Y10.6040
- Anchors
- Flanges - reference Y10.6060A
- Saddle clamps - reference Y10.6060B

210.120 WORKMANSHIP, PLASTICS PIPES:

- Solvent welded joints, PVC - reference Y10.8010
- Fusion joints, PE - reference Y10.8020
- Mechanical fittings, PE - reference Y10.8030
- Anchors, PVC - reference Y10.8040
- Jointing polybutylene pipes and fittings - reference Y10.8050

210.130 WORKMANSHIP:

- Steam and condense mains
- Trap sets at low points - reference Y10.9020A
- Trap sets at low points and at automatic control valves
- Reference Y10.9020B
- Protection of underground pipework - reference Y10.9030
- Location
- Protection of buried pipes
- Unmarked - reference Y10.9040A
- Marked - reference Y10.9040B
- Location
- Steelwork painting
- Reference Y10.9120A

211.000 PIPELINE ANCILLARIES

250.000 THERMAL INSULATION

250.010 GENERAL:

Comply with work section general clauses reference Y50.1000 and those detailed below.

250.015 ZERO GLOBAL WARMING POTENTIAL (GWP):

Use insulating materials with a Global Warming Potential (GWP) of zero.

250.017 ZERO OZONE DEPLETION POTENTIAL (ODP):

Use insulating materials with an Ozone Depletion Potential (ODP) of zero.

250.020 INSTALLER SELECTION:

- Use a contractor specialising in the supply and installation of thermal insulation.

- Use thermal insulation materials supplied by a manufacturer assessed and registered in accordance with BS ISO 9000-2.

250.030 MINERAL FIBRE THERMAL INSULATION - PIPEWORK:

- European Classification for Reaction to Fire Performance
- Class A1 - reference Y50.1035A
- Class A2 - reference Y50.1035B
- Class B - reference Y50.1035C
- Class C - reference Y50.1035D
- Spread of flame as BS 476-7
- Reference Y50.1050A
- Smoke emission characteristics
- Reference Y50.1055A
- Inspection and testing - reference Y50.1090
- Thermal conductivity - reference Y50.2010
- Thermal performance life expectancy
- For plant design life - reference Y50.2015A
- Details - reference Y50.2015B
- Restrictions on use of materials - reference Y50.2020
- Mineral fibre pipe insulation
- Foil faced - reference Y50.2030A
- Vapour barrier permeance
- Adhesives - reference Y50.2190
- Protection
- Polyisobutylene- reference Y50.2200A
- Flat aluminium-zinc coated steel - reference Y50.2200C
- Aluminium sheeting - reference Y50.2200E
- Galvanized sheet steel - reference Y50.2200F
- Laminated foil/film - reference Y50.2200J
- Reinforcement
- Aluminium bands
- 300mm centres - reference Y50.2210A
- Thickness table
- Insulation thickness calculation methods - reference Y50.2285
- Non-domestic hot water supply services - reference Y50.2290
- Non-domestic heating installations - reference Y50.2310
- Domestic central heating and hot water systems - reference Y50.2330
- Chilled and cold water supplies to prevent condensation
- High emissivity - reference Y50.2350
- Low emissivity - reference Y50.2370
- Chilled water services - reference Y50.2390
- Protection against freezing - reference Y50.2420

250.090 WORKMANSHIP PIPEWORK INSULATION:

- General - reference Y50.3010
- Installation of foil faced mineral wool insulation - reference Y50.3020
- Installation of protection
- Polyisobutylene (PIB) - reference Y50.3120
- Sheet metal finish
- Reference Y50.3130A
- Aluminium sheeting - reference Y50.3170
- Aluminium-zinc coated steel - reference Y50.3180
- Laminated foil/film - reference Y50.3195
- Flanges and valves - reference Y50.3210
- Liners - reference Y50.3220

- Installation where insulation is carried through pipeline support
- Reference Y50.3230A
- Installation where insulation is not carried through pipeline support - reference Y50.3240
- Liquid vapour barriers - reference Y50.3260
- Integrity of vapour barriers - reference Y50.3270

251.000 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

251.010 GENERAL:

Comply with work section general clauses reference Y51.1000 and those detailed below.

251.030 STATIC TESTING:

- Pressure testing
- General - reference Y51.2010
- Soil, waste, ventilation, anti-syphon and rainwater pipework - reference Y51.2080
- Underslab drainage - reference Y51.2090
- Vacuum testing - reference Y51.2100
- Provide an air compressor and subject the pipework to sectional testing by air at low pressure (not exceeding .5 bars) before commencing any flushing or testing with water.
- There is to be no loss of pressure for a period of not less than 30 minutes for each test.
- Testing records - reference Y51.2110
- Distribution to WBS.

251.040 COMMISSIONING:

- Commissioning codes - reference Y51.3020
- Commissioning
- Water distribution
- Including BSRIA pre-commissioning check list
- Reference Y51.3030A
- Instruments and gauges
- Reference Y51.3090A
- Commissioning records
- Distribution to WBS
- For water systems
- To BSRIA Application Guide 2/89.3 - reference Y51.3100B
- Pre-commissioning - reference Y51.3120
- Commissioning - reference Y51.3150

251.050 PERFORMANCE TESTING:

- System performance testing - reference Y51.4010
- Testing to specified conditions
- Sanitary Systems - reference Y51.4040B
- Hydraulic Systems - reference Y51.4040E
- Performance test records - reference Y51.4050
- Distribution to WBS

254.000 IDENTIFICATION - MECHANICAL

254.010 GENERAL:

Comply with work section general clauses reference Y54.1000 and those detailed below.

254.020 PIPEWORK IDENTIFICATION:

Reference Y54.2010

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.100 DANGER AND WARNING NOTICES:

Reference Y54.2090

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO R11

300.000 PRODUCTS/MATERIALS

300.030 TRAPS:

- Appliance
- W.C. pan
- Urinal
- Sink
- Wash basin
- Shower unit
- Type
- Integral with appliance.
- Bottle.
- Form
- P.
- S.
- Standard
- Plastic to BS EN 274-1, BS EN 274-2, BS EN 274-3.
- BS 416-1
- BS EN 877
- Copper alloy
- Chromium plated.
- where exposed waste shall be chrome plated

300.110 DOMICAL GRATINGS:

- Material
- Galvanized steel to manufacturer's standard.
- Plastic, (removable).

300.120 COVER PLATES:

- Type
- Snap on.
- Material
- Rolled steel - chromium plated.

300.130 PLASTICS WC PAN CONNECTOR:

- For horizontal outlet and shrouded pans.
- BS 5627 for pans to BS EN 33, BS EN 37, BS EN 997.
- Figure 1 'S' or turned 'P' traps.
- Figure 2 'P' traps new installations.

300.150 SINGLE STACK PLUMBING:

Ensure that there is a change of gradient at stack connections. Use swept branches on small diameter pipes. Use swept inlet or 45 degree branch connections for pipe 75mm diameter or over.

310.000 WORKMANSHIP

310.010 PERFORMANCE CRITERIA:

Install pipework fittings and accessories to ensure that:-

- appliances drain quickly, quietly and completely at all times without nuisance or risk to health.
- discharge is conveyed without crossflow, backfall, leakage or blockage.
- air from drainage system does not enter building.
- pressure fluctuations in pipework do not vary by more than plus or minus 38mm water gauge and traps retain a water seal of not less than 25mm.

- system can be adequately tested, cleaned and maintained.

310.020 ROUTES:

Ensure pipe routes are shortest practicable, with as few bends as possible and no bends in wet portion of soil stacks, unless indicated otherwise on drawings.

310.030 COATED PIPES:

Make good damaged coatings and cut ends, or recoat, as recommended by manufacturer.

310.040 INSTALLATION GENERALLY:

Install pipes, fittings and accessories in accordance with BS 8000-13, BS EN 12056-2 and manufacturer's recommendations.

- Obtain all components for each type of pipework from the same manufacturer, unless otherwise indicated.
- Inspect components carefully before fixing and reject any which are defective.
- Ensure cut ends of pipes to be clean and square with burrs removed.
- Allow for thermal and building movement when jointing and fixing.
- Form junctions using fittings intended for the purpose, ensuring that jointing material does not project into bore of pipes, fittings and appliances.
- Avoid contact between dissimilar metals and other materials which would result in electrolytic corrosion.
- Provide access covers and cleaning eyes as necessary in convenient locations, to permit adequate testing and cleaning of pipework.
- Prevent entry of foreign matter into any part of system by sealing openings during construction.
- Fit all access covers and cleaning eyes as work proceeds.
- All changes of direction to have rodding eyes.

310.050 CONNECTIONS BETWEEN PIPES OF DIFFERENT MATERIALS:

- Plastic
- Connect plastics pipework to pipework of other materials using approved connectors and methods in accordance with plastics pipework manufacturer's recommendations, to form a watertight joint.
- Copper
- Connect copper pipework to clay/concrete sockets using a caulking bush (brazed on), bitumenised yarn and 1:3 cement:sand mortar, neatly finished, to form a watertight joint.

310.060 FOOT OF PIPE STACKS:

Fix cast iron rest bends supported on brick-work or concrete bases where indicated on drawings.

310.070 WASTES:

Bed in waterproof jointing compound and fix with resilient washer between appliance and backnut.

310.080 WASTE CONNECTORS:

Join to traps as manufacturer's recommendations.

310.090 WC PANS:

- Plastic

- Connect all soil pipe spigots with plastic connectors in accordance with manufacturer's recommendations.

310.100 TRAP TEST REQUIREMENTS:

Ensure there is a retention of 25mm water seal in every trap, and that no air is blown through the trap seal when performance is tested.

310.110 ACCESS POINTS:

Provide rodding and access points at all changes of direction to enable whole system to be maintained.

Provide square door type access points as indicated on drawings at foot of all soil and ventilation pipes. Where practicable, locate access points and horizontal anti-siphon pipes above fitment flood level.

In general make WC connections to drain points and soil pipes via flexible connectors.

BS APPENDIX

BS 416-1:1990

Discharge and ventilating pipes and fittings, sand-cast or spun in cast iron. Part 1 Specification for spigot and socket systems

BS 437:1978

Specification for cast iron spigot and socket drain pipes and fittings

BS 4514:2001

Unplasticized PVC soil and ventilating pipes of 82.4mm minimum mean outside diameter, and fittings and accessories of 82.4mm and of other sizes. Specification

BS 476-7:1997

Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 7291-1:2006

Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings. Part 1 General requirements

BS 7291-2:2006

Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings. Part 2 Specification for polybutylene (PB) pipes and associated fittings

BS 7291-3:2006

Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings. Part 3 Specification for cross-linked polyethylene (PE-X) pipes and associated fittings

BS 7291-4:1990

Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings. Part 4 Specification for chlorinated polyvinyl chloride (PVC-C) pipes and associated fittings and solvent cementCurrent, Obsolescent

BS 8000-13:1989

Workmanship on building sites. Part 13 Code of practice for above ground drainage and sanitary appliances

BS EN 1092-2:1997

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 Cast iron flanges

BS EN 12056-2:2000

Gravity drainage systems inside buildings. Part 2 Sanitary pipework, layout and calculation

BS EN 1329-1:2000

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Unplasticized poly(vinyl chloride) (PVC-U). Specifications for pipes, fittings and the system

BS EN 1451-1:2000

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Part 1 Polypropylene (PP). Specifications for pipes, fittings and the system

BS EN 1452-1:2000

Plastics piping systems for water supply. Unplasticized poly(vinyl chloride) (PVC-U). Part 1 General

BS EN 1452-2:2000

Plastics piping systems for water supply. Unplasticized poly(vinyl chloride) (PVC-U). Part 2 Pipes

BS EN 1452-3:2000

Plastics piping systems for water supply. Unplasticized poly(vinyl chloride) (PVC-U). Part 3 Fittings

BS EN 1452-4:2000

Plastics piping systems for water supply. Unplasticized poly(vinyl chloride) (PVC-U). Part 4 Valves and ancillary equipment

BS EN 1452-5:2000

Plastics piping systems for water supply. Unplasticized poly(vinyl chloride) (PVC-U). Part 5 Fitness for purpose of the system

BS EN 1453-1:2000

Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings. Unplasticized poly (vinyl chloride) (PVC-U). Part 1 Specifications for pipes and the system

BS EN 274-1:2002

Waste fittings for sanitary appliances. Part 1 Requirements

BS EN 274-2:2002

Waste fittings for sanitary appliances. Part 2 Test methods

BS EN 274-3:2002

Waste fittings for sanitary appliances. Part 3 Quality control

BS EN 545:2002

Ductile iron pipes, fittings, accessories and their joints for water pipelines. Requirements and test methods

BS EN 598:1995

Ductile iron pipes, fittings, accessories and their joints for sewerage applications. Requirements and test methods

BS EN 877:1999

Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings. Requirements, test methods and quality assurance

BS EN 969:1996

Specification for ductile iron pipes, fittings, accessories and their joints for gas pipelines. Requirements and test methods

BS ISO 9000-2:1997

Quality management and quality assurance standards. Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003

S10 COLD WATER

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, supply, install, test, commission and demonstrate a cold water distribution system in accordance with the specification document. The installations shall be carried out in accordance with the water regulations, the local water company requirements, CIBSE guidelines, BSRIA guidelines and the Building Regulations and all relevant British Standards.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

210.000 PIPELINES

210.010 GENERAL:

Comply with work section general clauses reference Y10.1000 and those detailed below.

210.015 SANITARY FITTINGS:

Comply with work section general clauses reference Y10.1000 and those detailed below.

210.030 COPPER PIPES AND FITTINGS:

- Copper pipe, half hard (Class X)
- Uncoated - reference Y10.2270A
- Capillary fittings for copper tubing
- General potable range - reference Y10.2310A
- Compression fittings for copper tubing
- Type A compression fittings - reference Y10.2320A

210.070 PIPEWORK ACCESSORIES:

- Wall, floor and ceiling masking plates
- Chromium plated - reference Y10.3190A.
- Plastic - reference Y10.3190B
- Pipework support - reference Y10.4210
- Wire rope suspension system - reference Y10.4215#

210.080 GENERAL WORKMANSHIP

- Appearance - reference Y10.4010
- Spacing - reference Y10.4020
- Gradients - reference Y10.4030
- Air venting requirements
- Air bottles - reference Y10.4040A
- Automatic air vents - reference Y10.4040B
- Drain requirements - reference Y10.4050
- Expansion and contraction - reference Y10.4060
- Pipe fittings
- Bends/swept tees - reference Y10.4070A
- Elbows/square tees - reference Y10.4070B
- Pipes through walls and floors - reference Y10.4110

- Pipe sleeves
- Reference Y10.4120A
- Insulation carried through - reference Y10.4120B
- Pipe sleeves through fire barriers - reference Y10.4125
- Connections to equipment - reference Y10.4130
- Distribution headers - reference Y10.4140
- Temporary plugs, caps and flanges
- Reference Y10.4150A.
- Flanged joints general - reference Y10.4160
- Dissimilar metals - reference Y10.4170
- Pipe rings and clips - reference Y10.4180
- Anchors - reference Y10.4190
- Slide guides - reference Y10.4200
- Pipe supports - reference Y10.4205
- Support spacing - reference Y10.4220
- Isolation and regulation
- Reference Y10.4230A
- Maintenance and renewal - reference Y10.4240
- Cleaning - reference Y10.4250
- Non-ferrous components - reference Y10.4260

210.100 WORKMANSHIP, COPPER PIPEWORK:

- Compression joints - reference Y10.6030
- Capillary joints - reference Y10.6040
- Anchors
- Flanges - reference Y10.6060A
- Saddle clamps - reference Y10.6060B

211.000 PIPELINE ANCILLARIES

211.010 GENERAL:

Comply with work section general clauses reference Y11.1000 and those detailed below.

211.030 STOP VALVES:

- Service fluid
- Water
- Operating temperature (°C) 10oC
- WRAS approved.
- Kitemark certified.
- Pipe material
- To suit copper tube.
- Stop taps to BS 1010-2
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2010A
- Capillary to BS EN 1254-1 - reference Y11.2010B
- Stop valves to BS EN 1213 for potable water supplies
- Compression ends for copper - reference Y11.2015A
- Capillary - reference Y11.2015C
- Threaded - reference Y11.2015D
- Gate valves to BS EN 12288
- Screwed to BS EN ISO 228-1, or ISO 7-1 - reference Y11.2020A
- Compression to BS EN 1254-2 - reference Y11.2020B
- Flanged to BS EN 1092-3 - reference Y11.2020C
- Loose nut/union end - reference Y11.2020D

- Gate valves to BS EN 1171
- Flanged to BS EN 1092-2 - reference Y11.2030A
- Globe valves to BS 5154
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2040A
- Flanged to BS EN 1092-3 - reference Y11.2040B
- Compression to BS EN 1254-2 - reference Y11.2040C
- Compression to BS EN 1254-3 - reference Y11.2040D
- Globe valves to BS EN 13789
- Flanged to BS EN 1092-2 - reference Y11.2050A
- Handwheel operated gate type to BS EN 1984
- Flanged to BS EN 1092-1 - reference Y11.2070A
- Threaded - reference Y11.2070D
- Auxiliary connections
- Ball type, copper alloy to BS EN 13828.
- Screw driver/key operated
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080A
- Compression to BS EN 1254-2 - reference Y11.2080B
- Lever operated
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080C
- Compression to BS EN 1254-2 - reference Y11.2080D

211.080 TEST PLUGS:

- Self sealing test points - reference Y11.2670A

211.170 CHECK VALVES:

- WRAS approved.
- Kitemark certified.
- Service fluid
- Water.
- Operating temperature (°C) 10oC
- Pipe material
- To suit copper tube.
- Swing check type to BS 5154
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2320A
- Flanged to BS EN 1092-3 - reference Y11.2320B
- Check valve to BS EN 12334
- Swing check
- Flanged - reference Y11.2330A
- Wafer body - reference Y11.2330B
- Lift check
- Flanged - reference Y11.2330C
- Wafer body - reference Y11.2330D
- Wafer flange fitting type
- Reference Y11.2340A
- Device to prevent contamination of water by backflow to BS 6282
- Combined check and anti-vacuum - reference Y11.2385A
- Anti-back syphonage valve, combined check and anti-vacuum type
- Reference Y11.2390A

211.180 WORKMANSHIP:

- Installation - reference Y11.4010
- Location - reference Y11.4020
- Vent cocks - reference Y11.4060
- Discharge connections

- Safety and Relief valves - reference Y11.4080A
- Vent cocks - reference Y11.4080B
- Air bottles - reference Y11.4080C
- Automatic air vents - reference Y11.4080D
- Expansion devices - reference Y11.4090
- Expansion compensators - reference Y11.4100
- Flexible connections installation - reference Y11.4110
- Terminal unit connections installation - reference Y11.4120

211.210 DRAIN COCKS:

- WRAS approved.
- Kitemark certified.
- Throughway gland cock type
- Reference Y11.2440A
- Screwdown to BS 2879, type 1 - reference Y11.2450
- Ball type - reference Y11.2460

211.220 VENT COCKS:

- Kitemark certified.
- Two way gland cock type - reference Y11.2470
- Ball type - reference Y11.2480

211.230 AUTOMATIC AIR VENTS:

- Float type
- Reference Y11.2510A

225.000 CLEANING AND CHEMICAL TREATMENT

225.010 GENERAL:

Comply with work section general clauses reference Y25.1000 and those detailed below.

225.040 PRELIMINARY CHECKS:

- Reference Y25.2030A

225.050 PROCEDURAL PRECAUTIONS:

- Reference Y25.2040A
- Including taking samples - reference Y25.2040B

225.070 MONITORING AND SAMPLING:

- Monitoring - reference Y25.2070A
- Remote location
- Sampling - reference Y25.2070B
- Sampling kits - reference Y25.2070C

225.085 AVOIDANCE OF STAGNANT WATER IN PRESSURISATION UNIT EXPANSION VESSELS:

- Reference Y25.2090

225.090 FLUSHING:

- BSRIA Application Guide 1/2001 - reference Y25.3010A
- System filling
- Temporary connection from mains in compliance with the Water Supply (Water Fittings) Regulations 1999, and the Water Supply (Water Fittings) (Amendment) Regulations 1999.
- Temporary connection from fire hydrant pipework.
- By installation of temporary tank and pump arrangement.
- Flushing - reference Y25.3010B
- Flush system until discharge water is clear and free from stones or other rubble.

225.120 STERILIZATION:

- General - reference Y25.3040
- Mains water system - reference Y25.3050
- System standing time to suit chemicals used and system volume
- Water storage systems - reference Y25.3060

225.150 DOCUMENTATION:

- Reference Y25.3090

250.000 THERMAL INSULATION

250.010 GENERAL:

Comply with work section general clauses reference Y50.1000 and those detailed below.

250.015 ZERO GLOBAL WARMING POTENTIAL (GWP):

Use insulating materials with a Global Warming Potential (GWP) of zero.

250.017 ZERO OZONE DEPLETION POTENTIAL (ODP):

Use insulating materials with an Ozone Depletion Potential (ODP) of zero.

250.020 INSTALLER SELECTION:

- Use a contractor specialising in the supply and installation of thermal insulation.
- Use thermal insulation materials supplied by a manufacturer assessed and registered in accordance with BS ISO 9000-2.

250.030 MINERAL FIBRE THERMAL INSULATION - PIPEWORK:

- Temperature of fluid in pipes (°C) 100C
- European Classification for Reaction to Fire Performance
- Class A1 - reference Y50.1035A
- Class A2 - reference Y50.1035B
- Class B - reference Y50.1035C
- Class C - reference Y50.1035D
- Spread of flame as BS 476-7
- Reference Y50.1050A
- Smoke emission characteristics
- Reference Y50.1055A
- Inspection and testing - reference Y50.1090
- Thermal conductivity - reference Y50.2010
- Thermal performance life expectancy
- For plant design life - reference Y50.2015A
- Details - reference Y50.2015B

- Restrictions on use of materials - reference Y50.2020
- Mineral fibre pipe insulation
- Foil faced - reference Y50.2030A
- Vapour barrier permeance
- Adhesives - reference Y50.2190
- Protection
- Polyisobutylene- reference Y50.2200A
- Flat aluminium-zinc coated steel - reference Y50.2200C
- Aluminium sheeting - reference Y50.2200E
- Galvanized sheet steel - reference Y50.2200F
- Reinforcement
- Aluminium bands
- 300mm centres - reference Y50.2210A
- Valve and flange insulation
- Thickness table
- Insulation thickness calculation methods - reference Y50.2285
- Chilled and cold water supplies to prevent condensation
- High emissivity - reference Y50.2350
- Low emissivity - reference Y50.2370
- Protection against freezing - reference Y50.2420

250.090 WORKMANSHIP PIPEWORK INSULATION:

- General - reference Y50.3010
- Installation of foil faced mineral wool insulation - reference Y50.3020
- Installation of protection
- Polyisobutylene (PIB) - reference Y50.3120
- Sheet metal finish
- Reference Y50.3130A
- Aluminium sheeting - reference Y50.3170
- Aluminium-zinc coated steel - reference Y50.3180
- Flanges and valves - reference Y50.3210
- Liners - reference Y50.3220
- Installation where insulation is carried through pipeline support
- Reference Y50.3230A
- Installation where insulation is not carried through pipeline support - reference Y50.3240
- Liquid vapour barriers - reference Y50.3260
- Integrity of vapour barriers - reference Y50.3270

250.110 WORKMANSHIP EQUIPMENT INSULATION:

- General - reference Y50.3010
- Installation of insulation on tanks - reference Y50.3090
- Installation of mineral wool insulation on vessels - reference Y50.3100
- Installation of phenolic foam insulation on vessels - reference Y50.3110
- Installation of protection
- Polyisobutylene (PIB) - reference Y50.3120
- Sheet metal finish
- Reference Y50.3140A
- Aluminium sheeting - reference Y50.3170
- Aluminium-zinc coated steel - reference Y50.3180
- Integrity of vapour barriers - reference Y50.3270

251.000 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

251.010 GENERAL:

Comply with work section general clauses reference Y51.1000 and those detailed below.

251.030 STATIC TESTING:

- Pressure testing
- General - reference Y51.2010
- Water mains - reference Y51.2040
- Provide an air compressor and subject the pipework to sectional testing by air at low pressure (not exceeding .5 bars) before commencing any flushing or testing with water.
- On completion of all cleaning, flushing and air testing operations, recharge each system with clean water and subject them to sectional hydraulic tests of one and a half times the working pressure.
- There is to be no loss of pressure for a period of not less than 30 minutes for each test.
- Testing records - reference Y51.2110
- Distribution to WBS

251.040 COMMISSIONING:

- Commissioning codes - reference Y51.3020
- Commissioning
- Water distribution
- Including BSRIA pre-commissioning check list
- Reference Y51.3030A
- Instruments and gauges
- Reference Y51.3090A
- Commissioning records
- Distribution to WBS
- For water systems
- To BSRIA Application Guide 2/89.3 - reference Y51.3100B
- Pre-commissioning - reference Y51.3120
- Plant ready for control system commissioning
- Reference Y51.3130A
- Commissioning - reference Y51.3150

254.000 IDENTIFICATION - MECHANICAL

254.010 GENERAL:

Comply with work section general clauses reference Y54.1000 and those detailed below.

- Provide identification - mechanical as specified in work section

254.020 PIPEWORK IDENTIFICATION:

Reference Y54.2010

254.040 PLANT AND EQUIPMENT IDENTIFICATION:

- Lettering
- Laminated plates, multi-coloured with outer layer removed for lettering - reference Y54.2030B

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.050 VALVE AND COCK IDENTIFICATION:

Reference Y54.2040

254.080 AIR VOLUME REGULATING AND CONTROL DAMPER IDENTIFICATION:

Reference Y54.2070

254.090 INSTRUMENT IDENTIFICATION:

Reference Y54.2080

254.100 DANGER AND WARNING NOTICES:

Reference Y54.2090

254.110 SYSTEM IDENTIFICATION INSTALLATION CHARTS:

- Perspex sheet glazing with frame - reference Y54.2100A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S10

300.000 PRODUCTS/MATERIALS

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through The Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.005 APPROVALS:

Ensure all water fittings and materials are listed in the Water Fittings and Materials Directory published by WRAS.

300.010 WATER METERS:

Install a water meter to the incoming mains supply. Locate the meter to allow for easy access for meter reading by the building's occupants.

- See drawings for requirements for water sub meters
- Standard - BS EN 14154-1.
- Provide full flow accumulative type water meter with dial indicator to record quantity of water passed. Enclose mechanism of each meter within a cast iron body with a helical vane mounted centrally in the body of the meter. Supply an interchangeable pattern mechanism. Incorporate, as an integral part of each meter, a water guide at inlet to direct water evenly on to helical vane. Provide each meter with zeroing device.
- Provide isolating valves on either side of each meter, and full-bore valved by-pass installed around meter assembly.
- Provide flanged connections to BS EN 1092-1, BS EN 1092-2, BS EN 1092-3 or BS EN 1092-4 on each meter. Where meters are of smaller bore than connecting pipework, install flanged reducers.
- Provide facility for remote monitoring.

310.000 WORKMANSHIP

310.010 CONNECTIONS TO TAPS AND APPLIANCES:

Make final connections to taps and appliances. All connections to appliances to be valved.

BS APPENDIX

BS 1010-2:1973

Specification for draw-off taps and stopvalves for water services (screw-down pattern). Part 2 Draw-off taps and above-ground stopvalves. Current, obsolescent

BS 21:1985

Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).

Partially superseded by BS EN 10226-1:2004

BS 2879:1980

Specification for draining taps (screw-down pattern)

BS 476-7:1997

Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 5154:1991

Specification for copper alloy globe, globe stop and check, check and gate valves.

Partially replaced by BS EN 12288:2003

BS 6282-1:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 1 Specification for check valves of nominal size up to and including DN 54

BS 6282-2:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 2 Specification for terminal anti-vacuum valves of nominal size up to and including DN 54

BS 6282-4:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 4 Specification for combined check and anti-vacuum valves of nominal size up to and including DN 42

BS EN 10226-1:2004

Pipe threads where pressure tight joints are made on the threads. Part 1 Taper external threads and parallel internal threads. Dimensions, tolerances and designation

BS EN 1092-1:2002

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1 Steel flanges

BS EN 1092-2:1997

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 Cast iron flanges

BS EN 1092-3:2003

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 3 Copper alloy flanges

BS EN 1092-4:2002

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 4 Aluminium alloy flanges

BS EN 1171:2002

Industrial valves. Cast iron gate valves

BS EN 1213:2000

Building valves. Copper alloy stopvalves for potable water supply in buildings. Tests and requirements

BS EN 12334:2001

Industrial valves. Cast iron check valves

BS EN 1254-1:1998

Copper and copper alloys. Plumbing fittings. Part 1 Fittings with ends for capillary soldering or capillary brazing to copper tubes.

Replaces BS 864-2:1983 which remains current.

BS EN 1254-2:1998

Copper and copper alloys. Plumbing fittings. Part 2 Fittings with compression ends for use with copper tubes

BS EN 1254-3:1998

Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 13789:2002

Industrial valves. Cast iron globe valves

BS EN 13828:2003

Building valves. Manually operated copper alloy and stainless steel ball valves for potable water supply in buildings. Tests and requirements

BS EN 14154-1:2005

Water meters. Part 1 General requirements

BS EN 1984:2000

Industrial valves. Steel gate valves

BS ISO 9000-2:1997

Quality management and quality assurance standards. Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003

S11 HOT WATER

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, supply, install, test, commission and demonstrate a hot water distribution system in accordance with the specification document. The installations shall be carried out in accordance with the water regulations, the local water company requirements, CIBSE guidelines, BSRIA guidelines and the Building Regulations and all relevant British Standards.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

210.000 PIPELINES

210.010 GENERAL:

Comply with work section general clauses reference Y10.1000 and those detailed below.

210.030 COPPER PIPES AND FITTINGS:

- Fluid Conveyed water
- Working temperature 650C
- Copper pipe, half hard (Class X)
- Uncoated - reference Y10.2270A
- Capillary fittings for copper tubing
- General potable range - reference Y10.2310A
- Compression fittings for copper tubing
- Type A compression fittings - reference Y10.2320A

210.070 PIPEWORK ACCESSORIES:

- Wall, floor and ceiling masking plates
- Chromium plated - reference Y10.3190A.
- Pipework support - reference Y10.4210

210.080 GENERAL WORKMANSHIP

- Appearance - reference Y10.4010
- Spacing - reference Y10.4020
- Gradients - reference Y10.4030
- Air venting requirements
- Air bottles - reference Y10.4040A
- Automatic air vents - reference Y10.4040B
- Drain requirements - reference Y10.4050
- Expansion and contraction - reference Y10.4060
- Pipe fittings
- Bends/swept tees - reference Y10.4070A
- Elbows/square tees - reference Y10.4070B
- Pipes through walls and floors - reference Y10.4110
- Pipe sleeves
- Reference Y10.4120A
- Insulation carried through - reference Y10.4120B
- Pipe sleeves through fire barriers - reference Y10.4125
- Connections to equipment - reference Y10.4130

- Distribution headers - reference Y10.4140
- Temporary plugs, caps and flanges
- Reference Y10.4150A.
- Flanged joints general - reference Y10.4160
- Dissimilar metals - reference Y10.4170
- Pipe rings and clips - reference Y10.4180
- Anchors - reference Y10.4190
- Location
- Slide guides - reference Y10.4200
- Location
- Pipe supports - reference Y10.4205
- Support spacing - reference Y10.4220
- Isolation and regulation
- Reference Y10.4230A
- Maintenance and renewal - reference Y10.4240
- Cleaning - reference Y10.4250
- Non-ferrous components - reference Y10.4260

210.100 WORKMANSHIP, COPPER PIPEWORK:

- Compression joints - reference Y10.6030
- Capillary joints - reference Y10.6040
- Anchors
- Flanges - reference Y10.6060A
- Saddle clamps - reference Y10.6060B

210.130 WORKMANSHIP:

- Steelwork painting
- Reference Y10.9120A

211.000 PIPELINE ANCILLARIES

211.010 GENERAL:

Comply with work section general clauses reference Y11.1000 and those detailed below.

211.030 STOP VALVES:

- Service fluid
- Water
- Operating temperature (°C) 65oC
- WRAS approved.
- Kitemark certified.
- Pipe material
- To suit copper tube.
- Stop taps to BS 1010-2
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2010A
- Capillary to BS EN 1254-1 - reference Y11.2010B
- Stop valves to BS EN 1213 for potable water supplies
- Compression ends for copper - reference Y11.2015A
- Compression ends for plastics - reference Y11.2015B
- Capillary - reference Y11.2015C
- Threaded - reference Y11.2015D
- Gate valves to BS EN 12288
- Screwed to BS EN ISO 228-1, or ISO 7-1 - reference Y11.2020A
- Compression to BS EN 1254-2 - reference Y11.2020B

- Flanged to BS EN 1092-3 - reference Y11.2020C
- Loose nut/union end - reference Y11.2020D
- Gate valves to BS EN 1171
- Flanged to BS EN 1092-2 - reference Y11.2030A
- Globe valves to BS 5154
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2040A
- Flanged to BS EN 1092-3 - reference Y11.2040B
- Compression to BS EN 1254-2 - reference Y11.2040C
- Compression to BS EN 1254-3 - reference Y11.2040D
- Globe valves to BS EN 13789
- Flanged to BS EN 1092-2 - reference Y11.2050A
- Handwheel operated gate type to BS EN 1984
- Flanged to BS EN 1092-1 - reference Y11.2070A
- Threaded - reference Y11.2070D
- Ball type, copper alloy to BS EN 13828.
- Screw driver/key operated
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080A
- Compression to BS EN 1254-2 - reference Y11.2080B
- Lever operated
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080C
- Compression to BS EN 1254-2 - reference Y11.2080D
- Lockshield
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080E
- Compression to BS EN 1254-2 - reference Y11.2080F

211.080 TEST PLUGS:

- Self sealing test points - reference Y11.2670A

211.160 LOOSE ITEMS:

- Keys for spindle shank valves - reference Y11.3010A
- Number 4
- For drain cocks - reference Y11.3010B
- Number 4

211.170 CHECK VALVES:

- WRAS approved.
- Kitemark certified.
- Service fluid
- Water.
- Operating temperature (°C) 65oC
- Pipe material
- To suit copper tube.
- To suit plastic tube.
- To suit steel tube.
- Swing check type to BS 5154
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2320A
- Flanged to BS EN 1092-3 - reference Y11.2320B
- Check valve to BS EN 12334
- Swing check
- Flanged - reference Y11.2330A
- Wafer body - reference Y11.2330B
- Lift check
- Flanged - reference Y11.2330C
- Wafer body - reference Y11.2330D

- Device to prevent contamination of water by backflow to BS 6282
- Combined check and anti-vacuum - reference Y11.2385A
- Anti-back syphonage valve, combined check and anti-vacuum type
- Reference Y11.2390A

211.180 WORKMANSHIP:

- Installation - reference Y11.4010
- Location - reference Y11.4020
- Location of thermostatic radiator valves - reference Y11.4025
- Positioning of components
- Flow/pressure measurement valves - reference Y11.4030
- Double regulating variable orifice valves - reference Y11.4040
- Control ball valves - reference Y11.4045
- Control components
- Vent cocks - reference Y11.4060
- Expansion devices - reference Y11.4090
- Expansion compensators - reference Y11.4100
- Flexible connections installation - reference Y11.4110
- Terminal unit connections installation - reference Y11.4120

211.200 DIRECT ACTING SAFETY VALVES TO BS EN ISO 4126-1:

- Copper alloy
- Single spring - reference Y11.2430A
- Double spring - reference Y11.2430B

211.210 DRAIN COCKS:

- WRAS approved.
- Kitemark certified.
- Throughway gland cock type
- Reference Y11.2440A
- Screwdown to BS 2879, type 1 - reference Y11.2450
- Ball type - reference Y11.2460

211.220 VENT COCKS:

- Kitemark certified.
- Two way gland cock type - reference Y11.2470
- Ball type - reference Y11.2480
- Three way gland cock type - reference Y11.2490

211.230 AUTOMATIC AIR VENTS:

- Float type
- Reference Y11.2510A

211.260 EXPANSION ARRANGEMENTS/DEVICES:

- Expansion loops
- Copper - reference Y11.2620
- Expansion compensators
- Axial bellows
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2630A
- Flanged to BS EN 1092-1 - reference Y11.2630B

- Articulated bellows
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2630D
- Flanged to BS EN 1092-1 - reference Y11.2630E
- Angular bellows
- Hose compensators
- Flexible connections
- EPDM rubber, up to 100°C
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2650B
- EPDM rubber, up to 70°C
- Chlorobutyl rubber, up to 100°C
- Chlorobutyl rubber, up to 60°C
- Flanged to BS EN 1092-1 - reference Y11.2650H

224.000 TRACE HEATING

224.010 GENERAL:

The contractor shall install an electric self regulating trace heating system in accordance with the relevant schedule of technical requirements and this specification.

Comply with work section general clauses reference Y24.1000 and those detailed below.

224.020 ELECTRIC TRACE HEATING:

- Constant power cable
- Self regulating tape
- RCD protection - reference Y24.2010C

224.050 WORKMANSHIP:

- Installation of electric trace heating - reference Y24.3010
- Installation of piped trace heating
- Thermal insulation - reference Y24.3040

225.000 CLEANING AND CHEMICAL TREATMENT

225.010 GENERAL:

Comply with work section general clauses reference Y25.1000 and those detailed below.

225.020 CLEANING AND CHEMICAL TREATMENT SPECIALIST:

- Reference Y25.2010

225.040 PRELIMINARY CHECKS:

- Reference Y25.2030A

225.050 PROCEDURAL PRECAUTIONS:

- Reference Y25.2040A
- Including taking samples - reference Y25.2040B

225.070 MONITORING AND SAMPLING:

- Monitoring - reference Y25.2070A
- Sampling - reference Y25.2070B

- Sampling kits - reference Y25.2070C

225.085 AVOIDANCE OF STAGNANT WATER IN PRESSURISATION UNIT EXPANSION VESSELS:

- Reference Y25.2090

225.090 FLUSHING:

- BSRIA Application Guide 1/2001 - reference Y25.3010A
- System filling
- Temporary connection from mains in compliance with the Water Supply (Water Fittings) Regulations 1999, and the Water Supply (Water Fittings) (Amendment) Regulations 1999.
- Temporary connection from fire hydrant pipework.
- By installation of temporary tank and pump arrangement.
- Flushing - reference Y25.3010B
- Flush system until discharge water is clear and free from stones or other rubble.

225.120 STERILIZATION:

- General - reference Y25.3040
- Mains water system - reference Y25.3050
- System standing time to suit chemical used and the system volume
- Water storage systems - reference Y25.3060

225.150 DOCUMENTATION:

- Reference Y25.3090

250.000 THERMAL INSULATION

250.010 GENERAL:

Comply with work section general clauses reference Y50.1000 and those detailed below.

250.015 ZERO GLOBAL WARMING POTENTIAL (GWP):

Use insulating materials with a Global Warming Potential (GWP) of zero.

250.017 ZERO OZONE DEPLETION POTENTIAL (ODP):

Use insulating materials with an Ozone Depletion Potential (ODP) of zero.

250.020 INSTALLER SELECTION:

- Use a contractor specialising in the supply and installation of thermal insulation.
- Use thermal insulation materials supplied by a manufacturer assessed and registered in accordance with BS ISO 9000-2.

250.030 MINERAL FIBRE THERMAL INSULATION - PIPEWORK:

- Temperature of fluid in pipes (°C) 65oC
- European Classification for Reaction to Fire Performance
- Class A1 - reference Y50.1035A
- Class A2 - reference Y50.1035B
- Class B - reference Y50.1035C
- Class C - reference Y50.1035D
- Spread of flame as BS 476-7

- Reference Y50.1050A
- Smoke emission characteristics
- Reference Y50.1055A
- Electrical bonding terminal - reference Y50.1080
- Inspection and testing - reference Y50.1090
- Thermal conductivity - reference Y50.2010
- Thermal performance life expectancy
- For plant design life - reference Y50.2015A
- Details - reference Y50.2015B
- Restrictions on use of materials - reference Y50.2020
- Mineral fibre pipe insulation
- Foil faced - reference Y50.2030A
- Vapour barrier permeance
- Adhesives - reference Y50.2190
- Protection
- Polyisobutylene- reference Y50.2200A
- Flat aluminium-zinc coated steel - reference Y50.2200C
- Aluminium sheeting - reference Y50.2200E
- Reinforcement
- Aluminium bands
- 300mm centres - reference Y50.2210A
- Valve and flange insulation
- Thickness table
- Insulation thickness calculation methods - reference Y50.2285
- Non-domestic hot water supply services - reference Y50.2290
- Protection against freezing - reference Y50.2420

250.090 WORKMANSHIP PIPEWORK INSULATION:

- General - reference Y50.3010
- Installation of foil faced mineral wool insulation - reference Y50.3020
- Installation of protection
- Polyisobutylene (PIB) - reference Y50.3120
- Sheet metal finish
- Reference Y50.3130A
- Aluminium sheeting - reference Y50.3170
- Aluminium-zinc coated steel - reference Y50.3180
- Flanges and valves - reference Y50.3210
- Liners - reference Y50.3220
- Installation where insulation is carried through pipeline support
- Reference Y50.3230A
- Installation where insulation is not carried through pipeline support - reference Y50.3240
- Integrity of vapour barriers - reference Y50.3270

251.000 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

251.010 GENERAL:

Comply with work section general clauses reference Y51.1000 and those detailed below.

251.030 STATIC TESTING:

- Pressure testing
- General - reference Y51.2010
- Water circulating and supply systems and steam and condense lines - reference Y51.2020
- Water mains - reference Y51.2040

- Provide an air compressor and subject the pipework to sectional testing by air at low pressure (not exceeding .5 bars) before commencing any flushing or testing with water.
- On completion of all cleaning, flushing and air testing operations, recharge each system with clean water and subject them to sectional hydraulic tests of one and a half times the working pressure.
- There is to be no loss of pressure for a period of not less than 30 minutes for each test.
- Testing records - reference Y51.2110
- Distribution to WBS

251.040 COMMISSIONING:

- Commissioning codes - reference Y51.3020
- Commissioning
- Water distribution
- Including BSRIA pre-commissioning check list
- Reference Y51.3030A
- Instruments and gauges
- Reference Y51.3090A
- Commissioning records
- Distribution to WBS
- For water systems
- To BSRIA Application Guide 2/89.3 - reference Y51.3100B
- Pre-commissioning - reference Y51.3120
- Commissioning - reference Y51.3150

254.000 IDENTIFICATION - MECHANICAL

254.010 GENERAL:

Comply with work section general clauses reference Y54.1000 and those detailed below.

254.020 PIPEWORK IDENTIFICATION:

Reference Y54.2010

254.040 PLANT AND EQUIPMENT IDENTIFICATION:

- Lettering
- Laminated plates, multi-coloured with outer layer removed for lettering - reference Y54.2030B

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.050 VALVE AND COCK IDENTIFICATION:

Reference Y54.2040

254.090 INSTRUMENT IDENTIFICATION:

Reference Y54.2080

254.100 DANGER AND WARNING NOTICES:

Reference Y54.2090

254.110 SYSTEM IDENTIFICATION INSTALLATION CHARTS:

- Perspex sheet glazing with frame - reference Y54.2100A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S11

300.000 PRODUCTS/MATERIALS

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through The Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.005 APPROVALS:

Ensure all water fittings and materials are listed in the Water Fittings and Materials Directory published by WRAS.

300.020 INSTANTANEOUS WATER HEATER(S):

- Supply and install
- Gas fired instantaneous water heater to BS EN 26.
- Multipoint.
- Water supply
- Mains.

300.080 EXPANSION VESSELS:

- Standards
- Supply expansion vessels for unvented hot water supply systems in accordance with the following standards.
- BS 6144.
- BS 7074-1.
- BS 7074-2.
- BS 6920.

310.000 WORKMANSHIP

310.020 CONNECTIONS TO TAPS AND APPLIANCES:

Make final connections to taps and appliances

310.030 WATER HEATER INSTALLATION:

Comply with manufacturer's instructions and recommendations for the installation of heater.
Locate heater with adequate surrounding space for service and maintenance.

310.040 INSTALLATION OF MIXING VALVES:

Install thermostatic mixing valves and mechanical mixing valves in accordance with manufacturer's recommendations.

BS APPENDIX

BS 1010-2:1973

Specification for draw-off taps and stopvalves for water services (screw-down pattern). Part 2 Draw-off taps and above-ground stopvalves. Current, obsolescent

BS 21:1985

Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).

Partially superseded by BS EN 10226-1:2004

BS 2879:1980

Specification for draining taps (screw-down pattern)

BS 476-7:1997

Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 5154:1991

Specification for copper alloy globe, globe stop and check, check and gate valves.

Partially replaced by BS EN 12288:2003

BS 6282-1:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 1
Specification for check valves of nominal size up to and including DN 54

BS 6282-2:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 2
Specification for terminal anti-vacuum valves of nominal size up to and including DN 54

BS 6282-4:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 4
Specification for combined check and anti-vacuum valves of nominal size up to and including DN 42

BS 6340-1:1983

Shower units. Part 1 Guide on choice of shower units and their components for use in private dwellings

BS 6340-2:1983

Shower units. Part 2 Specification for the installation of shower units

BS 6340-4:1984

Shower units. Part 4 Specification for shower heads and related equipment

BS 6340-5:1983

Shower units. Part 5 Specification for prefabricated shower trays made from acrylic material.
Partially superseded by BS EN 251:2003.

BS 6340-6:1983

Shower units. Part 6 Specification for prefabricated shower trays made from porcelain enamelled cast iron.

Partially superseded by BS EN 251:2003

BS 6340-7:1983

Shower units. Part 7 Specification for prefabricated shower trays made from vitreous enamelled sheet steel.

Partially superseded by BS EN 251:2003

BS 6340-8:1985

Shower units. Part 8 Specification for prefabricated shower trays made from glazed ceramic.

Partially superseded by BS EN 251:2003

BS EN 10226-1:2004

Pipe threads where pressure tight joints are made on the threads. Part 1 Taper external threads and parallel internal threads. Dimensions, tolerances and designation
BS EN 1092-1:2002

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated.
Part 1 Steel flanges

BS EN 1092-2:1997

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated.
Part 2 Cast iron flanges

BS EN 1092-3:2003

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated.
Part 3 Copper alloy flanges

BS EN 1171:2002

Industrial valves. Cast iron gate valves

BS EN 1213:2000

Building valves. Copper alloy stopvalves for potable water supply in buildings. Tests and requirements

BS EN 12334:2001

Industrial valves. Cast iron check valves

BS EN 1254-1:1998

Copper and copper alloys. Plumbing fittings. Part 1 Fittings with ends for capillary soldering or capillary brazing to copper tubes.

Replaces BS 864-2:1983 which remains current.

BS EN 1254-2:1998

Copper and copper alloys. Plumbing fittings. Part 2 Fittings with compression ends for use with copper tubes

BS EN 1254-3:1998

Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 13789:2002

Industrial valves. Cast iron globe valves

BS EN 13828:2003

Building valves. Manually operated copper alloy and stainless steel ball valves for potable water supply in buildings. Tests and requirements

BS EN 1984:2000

Industrial valves. Steel gate valves

BS EN 26:1998

Gas-fired instantaneous water heaters for the production of domestic hot water, fitted with atmospheric burners

BS ISO 9000-2:1997

Quality management and quality assurance standards. Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003

S32 NATURAL GAS

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test, commission and demonstrate the natural gas system in accordance with the gas regulations. The works entail the removal of gas from the building only.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

210.000 PIPELINES

210.010 GENERAL:

Comply with work section general clauses reference Y10.1000 and those detailed below.

210.015 SANITARY FITTINGS:

Comply with work section general clauses reference Y10.1000 and those detailed below.

- As schedule reference

210.020 STEEL PIPES AND FITTINGS:

- Carbon steel pipes to BS EN 10255
- Medium, black - reference Y10.2010B
- Carbon steel fittings to BS 1965-1
- Medium weight - reference Y10.2060B
- Malleable cast iron fittings, screwed
- Black - reference Y10.2070A
- Jointing materials
- Circular flanges
- Welding flanges - reference Y10.3010A
- Screwed flanges - reference Y10.3010B
- Jointing rings for circular flanges
- Non-metallic flat for flanges to BS EN 1092-1 - reference Y10.3020A
- Metallic for flanges to BS EN 1092-1 - reference Y10.3020B
- Screwed joints to BS 21 and BS EN 10226-1.
- Paste and hemp and PTFE tape - reference Y10.3030A
- PTFE tape - reference Y10.3030B
- Where chemical cleaning is required - reference Y10.3030C
- Union connections

- Railroad pattern - reference Y10.3040A
- Navy pattern - reference Y10.3040B
- Welding rods
- Reference Y10.3050A

210.025 STEEL PIPES AND FITTINGS: PIPE-IN-PIPE:

- Inner pipe
- Carbon steel pipes to BS EN 10255
- Medium, black - reference Y10.2010B
- Carbon steel fittings to BS 1965-1
- Medium weight - reference Y10.2060B
- Malleable cast iron fittings, screwed
- Black - reference Y10.2070A
- Jointing materials
- Screwed joints to BS 21 and BS EN 10226-1.
- Paste and hemp and PTFE tape - reference Y10.3030A
- PTFE tape - reference Y10.3030B
- Where chemical cleaning is required - reference Y10.3030C
- Union connections
- Railroad pattern - reference Y10.3040A
- Navy pattern - reference Y10.3040B
- Welding rods
- Reference Y10.3050A
- Outer pipe
- Carbon steel pipes to BS EN 10255
- Medium, black - reference Y10.2010B
- Carbon steel fittings to BS 1965-1
- Medium weight - reference Y10.2060B
- Malleable cast iron fittings, screwed
- Black - reference Y10.2070A
- Jointing materials
- Screwed joints to BS 21 and BS EN 10226-1.
- Paste and hemp and PTFE tape - reference Y10.3030A
- PTFE tape - reference Y10.3030B
- Where chemical cleaning is required - reference Y10.3030C
- Union connections
- Railroad pattern - reference Y10.3040A
- Navy pattern - reference Y10.3040B
- Welding rods
- Reference Y10.3050A

210.030 COPPER PIPES AND FITTINGS:

- Copper pipe, half hard (Class X)
- Uncoated - reference Y10.2270A
- Capillary fittings for copper tubing
- General potable range - reference Y10.2310A
- Compression fittings for copper tubing
- Type A compression fittings - reference Y10.2320A

210.070 PIPEWORK ACCESSORIES:

- Wall, floor and ceiling masking plates
- Chromium plated - reference Y10.3190A.
- Pipework support - reference Y10.4210

- Wire rope suspension system - reference Y10.4215#

210.080 GENERAL WORKMANSHIP

- Appearance - reference Y10.4010
- Spacing - reference Y10.4020
- Pipe fittings
- Bends/swept tees - reference Y10.4070A
- Elbows/square tees - reference Y10.4070B
- Pipes through walls and floors - reference Y10.4110
- Pipe sleeves
- Reference Y10.4120A
- Insulation carried through - reference Y10.4120B
- Pipe sleeves through fire barriers - reference Y10.4125
- Connections to equipment - reference Y10.4130
- Temporary plugs, caps and flanges
- Reference Y10.4150A.
- Flanged joints general - reference Y10.4160
- Dissimilar metals - reference Y10.4170
- Pipe rings and clips - reference Y10.4180
- Pipe supports - reference Y10.4205
- Support spacing - reference Y10.4220
- Isolation and regulation
- Reference Y10.4230A
- Maintenance and renewal - reference Y10.4240
- Cleaning - reference Y10.4250
- Non-ferrous components - reference Y10.4260

210.090 WORKMANSHIP, STEEL PIPEWORK:

- Welding, general
- Class 1 - reference Y10.5010A
- Class 2 - reference Y10.5010B
- Welded joints - reference Y10.5020
- Painting welded joints - reference Y10.5030
- Flanged joints - reference Y10.5040
- Screwed joints - reference Y10.5050
- Mechanical joints - reference Y10.5060
- Anchors
- U-bolts - reference Y10.5070A
- Flanges - reference Y10.5070B
- Pipework painting - reference Y10.5090

210.100 WORKMANSHIP, COPPER PIPEWORK:

- Compression joints - reference Y10.6030
- Capillary joints - reference Y10.6040

210.130 WORKMANSHIP:

- Protection of underground pipework - reference Y10.9030
- Protection of buried pipes
- Unmarked - reference Y10.9040A
- Marked - reference Y10.9040B
- Steelwork painting
- Reference Y10.9120A

211.000 PIPELINE ANCILLARIES

211.010 GENERAL:

Comply with work section general clauses reference Y11.1000 and those detailed below.

211.030 STOP VALVES:

- WRAS approved.
- Kitemark certified.
- Pipe material
- To suit copper tube.
- To suit steel tube.
- Stop taps to BS 1010-2
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2010A
- Capillary to BS EN 1254-1 - reference Y11.2010B
- Stop valves to BS EN 1213 for potable water supplies
- Compression ends for copper - reference Y11.2015A
- Compression ends for plastics - reference Y11.2015B
- Capillary - reference Y11.2015C
- Threaded - reference Y11.2015D
- Gate valves to BS EN 12288
- Screwed to BS EN ISO 228-1, or ISO 7-1 - reference Y11.2020A
- Compression to BS EN 1254-2 - reference Y11.2020B
- Flanged to BS EN 1092-3 - reference Y11.2020C
- Loose nut/union end - reference Y11.2020D
- Gate valves to BS EN 1171
- Flanged to BS EN 1092-2 - reference Y11.2030A
- Globe valves to BS 5154
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2040A
- Flanged to BS EN 1092-3 - reference Y11.2040B
- Compression to BS EN 1254-2 - reference Y11.2040C
- Compression to BS EN 1254-3 - reference Y11.2040D
- Globe valves to BS EN 13789
- Flanged to BS EN 1092-2 - reference Y11.2050A
- Ball type, copper alloy to BS EN 13828.
- Lever operated
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080C
- Compression to BS EN 1254-2 - reference Y11.2080D
- Butterfly valves to BS EN 593
- Between flanges to BS EN 1092-2
- Lever operated - reference Y11.2090A
- Gear operated - reference Y11.2090B
- Between mechanical joints
- Lever operated - reference Y11.2090C
- Gear operated - reference Y11.2090D

211.080 TEST PLUGS:

- Valve controlled test points - reference Y11.2670B

211.180 WORKMANSHIP:

- Installation - reference Y11.4010
- Vent cocks - reference Y11.4060
- Discharge connections

- Safety and Relief valves - reference Y11.4080A
- Vent cocks - reference Y11.4080B
- Flexible connections installation - reference Y11.4110
- Terminal unit connections installation - reference Y11.4120

- 211.220 VENT COCKS:
- Kitemark certified.
- Two way gland cock type - reference Y11.2470
- Ball type - reference Y11.2480
- Three way gland cock type - reference Y11.2490

225.000 CLEANING AND CHEMICAL TREATMENT

225.010 GENERAL:

Comply with work section general clauses reference Y25.1000 and those detailed below.

225.020 CLEANING AND CHEMICAL TREATMENT SPECIALIST:

- Reference Y25.2010

225.040 PRELIMINARY CHECKS:

- Reference Y25.2030A

225.050 PROCEDURAL PRECAUTIONS:

- Reference Y25.2040A
- Including taking samples - reference Y25.2040B

225.100 PURGING:

- Testing and purging gas pipework
- Industrial and commercial installation - reference Y25.3020A
- Small low pressure industrial and commercial installations - reference Y25.3020B
- Testing gas pipework to BS EN 12327 - reference Y25.3020C
- Purge each system using either Nitrogen or CO₂.
- This operation is to prove the continuity of the pipework, remove any cutting fluid and ensure that the nozzles are clear.
- Flimsy paper bags are to be attached to all nozzles during the purge and removed upon completion of the purge.

225.150 DOCUMENTATION:

- Reference Y25.3090

251.000 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

251.010 GENERAL:

Comply with work section general clauses reference Y51.1000 and those detailed below.

251.030 STATIC TESTING:

- Pressure testing
- General - reference Y51.2010
- Underground pipework

- 4 hours - reference Y51.2030B
- Gas pipework
- HVCA Guide TR6 - reference Y51.2060A
- To BS EN 12327 - reference Y51.2060B
- To IGE/UP/1 - reference Y51.2060C
- To IGE/UP/1A - reference Y51.2060D
- Provide an air compressor and subject the pipework to sectional testing by air at low pressure (not exceeding .5 bars) before commencing any flushing or testing with water.
- There is to be no loss of pressure for a period of not less than 30 minutes for each test.
- Testing records - reference Y51.2110
- Distribution to WBS

251.040 COMMISSIONING:

- Commissioning codes - reference Y51.3020
- Commissioning
- Gas plant and systems - reference Y51.3055
- Plant items - reference Y51.3080
- Instruments and gauges
- Reference Y51.3090A
- Commissioning records
- Distribution to WBS
- Pre-commissioning - reference Y51.3120
- Plant ready for control system commissioning
- Reference Y51.3130A
- Control system requirements for plant commissioning - reference Y51.3140
- Commissioning - reference Y51.3150

254.000 IDENTIFICATION - MECHANICAL

254.010 GENERAL:

Comply with work section general clauses reference Y54.1000 and those detailed below.

- Provide identification - mechanical as specified in work section

254.020 PIPEWORK IDENTIFICATION:

Reference Y54.2010

254.040 PLANT AND EQUIPMENT IDENTIFICATION:

- Lettering
- Laminated plates, multi-coloured with outer layer removed for lettering - reference Y54.2030B

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.050 VALVE AND COCK IDENTIFICATION:

Reference Y54.2040

254.090 INSTRUMENT IDENTIFICATION:

Reference Y54.2080

254.100 DANGER AND WARNING NOTICES:

Reference Y54.2090

254.110 SYSTEM IDENTIFICATION INSTALLATION CHARTS:

- Perspex sheet glazing with frame - reference Y54.2100A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A
- Non-penetrative support systems for roof mounted equipment - reference Y90.3100#

291.000 OFF-SITE PAINTING AND ANTI-CORROSION TREATMENT

291.010 GENERAL

Comply with work section general clauses reference Y91.1000 and those detailed below.

291.020 PAINT MATERIALS:

- Paint materials
- Reference Y91.2010A
- Paint quality - reference Y91.2020
- Heat resistant paint - reference Y91.2030

291.030 WORKMANSHIP

- General - reference Y91.3010
- Weather and other conditions - reference Y91.3020
- Cleaning and preparing for painting
- Steel surfaces - reference Y91.3030A
- Surfaces - reference Y91.3030B
- Application off-site - reference Y91.3040
- Application - reference Y91.3050
- Cold galvanizing - reference Y91.3060
- Protection of bright machine parts - reference Y91.3070

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S32

300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies (i.e. those with a maximum allowable) certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 REGULATIONS:

Supply and install equipment in accordance with HSE L56 - Safety in the installation and use of gas systems and appliances. Approved Code of Practice and Guidance. Gas Safety (Installation and Use) Regulations 1998.

HSE L81 - Design, construction and installation of gas services pipes. Approved Code of Practice and Guidance. Pipelines Safety Regulations 1996.

300.020 STANDARDS:

- Install gas pipework in buildings in accordance with BS EN 1775.
- Gas supply pipelines for maximum operating pressure up to and including 16 bar to BS EN 12007
- Polyethylene - BS EN 12007-2.
- Steel - BS EN 12007-3.
- Renovation - BS EN 12007-4.
- Low pressure gas supply pipework up to 35mm in domestic premises to BS 6891.
- Installation of gas fired catering appliances for use in all types of catering establishments to BS 6173.
- Gas supply pipelines for maximum operating pressure over 16 bar to BS EN 1594.
- Gas pressure regulating installations on service lines to BS EN 12279.
- Safety and control devices for gas burners and gas-burning appliances - general requirements to BS EN 13611.
- Gas Safety (Installation and Use) Regulations 1998 - Safety in the installation and use of gas systems and appliances, L56.
- Pipelines Safety Regulations 1996 - Design, construction and installation of gas service pipes, L81.
- IGE/TD/4 Gas services.
- IGE/UP/2 Gas installation pipework, boosters and compressors on industrial and commercial premises.
- IGE/UP/11 Gas in educational establishments.
- IGE/GM/4 Flow metering practice.
- IGE/GM/5 The installation and use of electronic gas meter conversion systems.

- IGE/GM/6 Specifications for low pressure diaphragm & rotary displacement meter installations.
- IGE/GM/7 Electrical connections to gas meters.
- IGE/GM/8 Non domestic gas meter installations.

310.000 PRODUCTS/MATERIALS

310.030 SOLENOID OPERATED VALVES:

- Application gas supplies
- Plant rooms:
- Provide an automatic shut-off valve with 24hr battery back up to incoming supply. The valve shall be installed downstream of the manual emergency control valve at gas entry to the building. The valve shall be hard wired and closure shall be by operation of either a thermal link located above each burner, or one of the push buttons located at each exit from the plant room and kitchen. Operation of the valve shall raise an alarm at the central control system. Valve shall also be operated by the fire alarm activation.
- Catering establishments:

Standard - BS 6173

Provide an automatic shut-off valve with 24hr battery back-up and shielded emergency stop buttons, installed in the gas supply to any catering equipment. The stop button shall be readily accessible, near to the exit from the catering area. The valve shall be interlocked with the ventilation to the kitchens (such that the ventilation system operation must be proved before the gas service can be opened by air flow switches).

The valve on the gas supply shall also be fitted with a system to prove closure of all valves prior to establishment or restoration of the gas supply. The system shall be in accordance with BG IM/20.

At all locations where either a manual gas isolation valve is fitted, or where an automatic gas valve system can be reset, a notice shall be affixed stating:

IN THE EVENT OF AN EMERGENCY THE GAS ISOLATION VALVE MUST BE CLOSED. ALL DOWNSTREAM BURNERS AND PILOT VALVES ON APPLIANCES MUST BE TURNED OFF PRIOR TO ATTEMPTING TO RESTORE THE GAS SUPPLY. AFTER EXTENDED SHUT-OFF, PURGE BEFORE RESTORING GAS SUPPLY.

- Valve type
- 2 way safety shut off valve.
- Speed of opening
- Fast.

310.050 MANUALLY OPERATED CUT-OFF PLUG COCKS:

- Standard - BS 1552.
- Connections
- Threaded to BS 21 and BS EN 10226-1.
- Compression to BS EN 1254-2.
- Capillary to BS EN 1254-1.

310.055 MANUALLY OPERATED VALVES FOR GAS INSTALLATIONS IN BUILDINGS:

- Standard - BS EN 331.
- Valve
- Ball valve.
- Closed bottom taper plug valve.

320.000 WORKMANSHIP

320.010 INSTALLATION:

Install equipment in accordance BS EN 1775 and with manufacturer's recommendations.

- Comply with IGE/UP/10 Installation of gas appliances in industrial and commercial premises.

320.020 TESTING AND PURGING:

- Comply with IGE/UP/1 Strength and tightness testing and direct purging of industrial and commercial gas installations.
- Comply with IGE/UP/1A Strength and tightness testing and direct purging of small low pressure industrial and commercial Natural Gas installations.
- Carry out pressure testing in accordance with BS EN 12327.

320.030 COMMISSIONING:

Commission gas fired plant on industrial and commercial premises in accordance with IGE/UP/4.
Commission gas supply systems in accordance with BS EN 12327.

BS APPENDIX

BS 1010-2:1973

Specification for draw-off taps and stopvalves for water services (screw-down pattern). Part 2 Draw-off taps and above-ground stopvalves. Current, obsolescent

BS 1552:1995

Specification for open bottomed taper plug valves for 1st, 2nd and 3rd family gases up to 200mbar

BS 1965-1:1963

Specification for butt-welding pipe fittings for pressure purposes. Part 1 Carbon steel.
Replaced by BS EN 10253-1:1999 but remains current

BS 21:1985

Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).

Partially superseded by BS EN 10226-1:2004

BS 5154:1991

Specification for copper alloy globe, globe stop and check, check and gate valves.
Partially replaced by BS EN 12288:2003

BS 6173:2001

Specification for installation of gas-fired catering appliances for use in all types of catering establishments (2nd and 3rd family gases)

BS 6891:2005

Installation of low pressure gas pipework of up to 35 mm (R1¼) in domestic premises (2nd family gas).

Specification

BS 746:2005

Fittings for installation of low pressure gas meters. Requirements and test methods

BS EN 10226-1:2004

Pipe threads where pressure tight joints are made on the threads. Part 1 Taper external threads and parallel internal threads. Dimensions, tolerances and designation

BS EN 10255:2004

Non-alloy steel tubes suitable for welding or threading. Technical delivery conditions

BS EN 1092-1:2002

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1 Steel flanges

BS EN 1092-2:1997

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 Cast iron flanges

BS EN 1092-3:2003

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 3 Copper alloy flanges

BS EN 1171:2002

Industrial valves. Cast iron gate valves

BS EN 12007-2:2000

Gas supply systems. Pipelines for maximum operating pressure up to and including 16 bar. Part 2 Specific functional recommendations for polyethylene (MOP up to and including 10 bar)

BS EN 12007-3:2000

Gas supply systems. Pipelines for maximum operating pressure up to and including 16 bar. Part 3 Specific functional recommendations for steel

BS EN 12007-4:2000

Gas supply systems. Pipelines for maximum operating pressure up to and including 16 bar. Part 4 Specific functional recommendations for renovation

BS EN 1213:2000

Building valves. Copper alloy stopvalves for potable water supply in buildings. Tests and requirements

BS EN 12279:2000

Gas supply systems. Gas pressure regulating installations on service lines. Functional requirements

BS EN 12327:2000

Gas supply systems. Pressure testing, commissioning and decommissioning procedures. Functional requirements

BS EN 1254-1:1998

Copper and copper alloys. Plumbing fittings. Part 1 Fittings with ends for capillary soldering or capillary brazing to copper tubes.

Replaces BS 864-2:1983 which remains current.

BS EN 1254-2:1998

Copper and copper alloys. Plumbing fittings. Part 2 Fittings with compression ends for use with copper tubes

BS EN 1254-3:1998

Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 13611:2000

Safety and control devices for gas burners and gas-burning appliances. General requirements

BS EN 13789:2002

Industrial valves. Cast iron globe valves

BS EN 13828:2003

Building valves. Manually operated copper alloy and stainless steel ball valves for potable water supply in buildings. Tests and requirements

BS EN 1594:2000

Gas supply systems. Pipelines for maximum operating pressure over 16 bar. Functional requirements

BS EN 1775:1998

Gas supply. Gas pipework in buildings. Maximum operating pressure = 5 bar. Functional recommendations

BS EN 331:1998

Manually operated ball valves and closed bottom taper plug valves for gas installations in buildings

BS EN 593:2004

Industrial valves. Metallic butterfly valves

T31 LOW TEMPERATURE HOT WATER HEATING

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test, commission and demonstrate the low temperature heating system installations serving the building in accordance with the employer's requirement documentation.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

210.000 PIPELINES

210.010 GENERAL:

Comply with work section general clauses reference Y10.1000 and those detailed below.

210.020 STEEL PIPES AND FITTINGS:

- Carbon steel pipes to BS EN 10255
- Medium, black - reference Y10.2010B
- Carbon steel fittings to BS EN 10255
- Reference Y10.2020A
- Carbon steel fittings to BS 1965-1
- Medium weight - reference Y10.2060B
- Malleable cast iron fittings, screwed
- Black - reference Y10.2070A
- Jointing materials
- Circular flanges
- Welding flanges - reference Y10.3010A
- Screwed flanges - reference Y10.3010B
- Jointing rings for circular flanges
- Non-metallic flat for flanges to BS EN 1092-1 - reference Y10.3020A
- Metallic for flanges to BS EN 1092-1 - reference Y10.3020B
- Screwed joints to BS 21 and BS EN 10226-1.
- Paste and hemp and PTFE tape - reference Y10.3030A
- PTFE tape - reference Y10.3030B
- Where chemical cleaning is required - reference Y10.3030C
- Union connections
- Railroad pattern - reference Y10.3040A
- Navy pattern - reference Y10.3040B
- Welding rods
- Reference Y10.3050A

210.030 COPPER PIPES AND FITTINGS:

- Copper pipe, half hard (Class X)
- Uncoated - reference Y10.2270A
- Capillary fittings for copper tubing
- General potable range - reference Y10.2310A
- Compression fittings for copper tubing
- Type A compression fittings - reference Y10.2320A

210.070 PIPEWORK ACCESSORIES:

- Wall, floor and ceiling masking plates
- Chromium plated - reference Y10.3190A.
- Pipework support - reference Y10.4210
- Wire rope suspension system - reference Y10.4215#

210.080 GENERAL WORKMANSHIP

- Appearance - reference Y10.4010
- Spacing - reference Y10.4020
- Gradients - reference Y10.4030
- Air venting requirements
- Air bottles - reference Y10.4040A
- Automatic air vents - reference Y10.4040B
- Drain requirements - reference Y10.4050
- Expansion and contraction - reference Y10.4060
- Pipe fittings
- Bends/swept tees - reference Y10.4070A
- Elbows/square tees - reference Y10.4070B
- Pipes through walls and floors - reference Y10.4110
- Pipes through walls and floors - fire stopping - reference Y10.4110#
- Pipe sleeves
- Reference Y10.4120A
- Insulation carried through - reference Y10.4120B
- Pipe sleeves through fire barriers - reference Y10.4125
- Connections to equipment - reference Y10.4130
- Distribution headers - reference Y10.4140
- Temporary plugs, caps and flanges
- Reference Y10.4150A.
- Flanged joints general - reference Y10.4160
- Dissimilar metals - reference Y10.4170
- Pipe rings and clips - reference Y10.4180
- Anchors - reference Y10.4190
- Slide guides - reference Y10.4200
- Pipe supports - reference Y10.4205
- Support spacing - reference Y10.4220
- Isolation and regulation
- Reference Y10.4230A
- Maintenance and renewal - reference Y10.4240
- Cleaning - reference Y10.4250
- Non-ferrous components - reference Y10.4260

210.090 WORKMANSHIP, STEEL PIPEWORK:

- Welding, general
- Class 1 - reference Y10.5010A
- Class 2 - reference Y10.5010B
- Welded joints - reference Y10.5020
- Painting welded joints - reference Y10.5030
- Flanged joints - reference Y10.5040
- Screwed joints - reference Y10.5050
- Mechanical joints - reference Y10.5060
- Anchors
- U-bolts - reference Y10.5070A
- Flanges - reference Y10.5070B
- Pipework painting - reference Y10.5090

210.100 WORKMANSHIP, COPPER PIPEWORK:

- Compression joints - reference Y10.6030
- Capillary joints - reference Y10.6040
- Anchors
- Flanges - reference Y10.6060A
- Saddle clamps - reference Y10.6060B

210.130 WORKMANSHIP:

- Protection of underground pipework - reference Y10.9030
- Protection of buried pipes
- Unmarked - reference Y10.9040A
- Marked - reference Y10.9040B
- Steelwork painting
- Reference Y10.9120A

211.000 PIPELINE ANCILLARIES

211.010 GENERAL:

Comply with work section general clauses reference Y11.1000 and those detailed below.

211.030 STOP VALVES:

- WRAS approved.
- Kitemark certified.
- Pipe material
- To suit copper tube.
- To suit steel tube.
- Stop taps to BS 1010-2
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2010A
- Capillary to BS EN 1254-1 - reference Y11.2010B
- Stop valves to BS EN 1213 for potable water supplies
- Compression ends for copper - reference Y11.2015A
- Capillary - reference Y11.2015C
- Threaded - reference Y11.2015D
- Gate valves to BS EN 12288
- Screwed to BS EN ISO 228-1, or ISO 7-1 - reference Y11.2020A
- Compression to BS EN 1254-2 - reference Y11.2020B
- Flanged to BS EN 1092-3 - reference Y11.2020C
- Loose nut/union end - reference Y11.2020D
- Gate valves to BS EN 1171
- Flanged to BS EN 1092-2 - reference Y11.2030A
- Globe valves to BS 5154
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2040A
- Flanged to BS EN 1092-3 - reference Y11.2040B
- Compression to BS EN 1254-2 - reference Y11.2040C
- Compression to BS EN 1254-3 - reference Y11.2040D
- Globe valves to BS EN 13789
- Flanged to BS EN 1092-2 - reference Y11.2050A
- Handwheel operated gate type to BS EN 1984
- Flanged to BS EN 1092-1 - reference Y11.2070A
- Threaded - reference Y11.2070D
- Ball type, copper alloy to BS EN 13828.
- Screw driver/key operated

- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080A
- Compression to BS EN 1254-2 - reference Y11.2080B
- Lever operated
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080C
- Compression to BS EN 1254-2 - reference Y11.2080D
- Lockshield
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2080E
- Compression to BS EN 1254-2 - reference Y11.2080F
- Butterfly valves to BS EN 593
- Between flanges to BS EN 1092-2
- Lever operated - reference Y11.2090A
- Gear operated - reference Y11.2090B
- Between mechanical joints
- Lever operated - reference Y11.2090C
- Gear operated - reference Y11.2090D

211.050 DOUBLE REGULATING VALVES:

- WRAS approved.
- Kitemark certified.
- Pipe material
- To suit copper tube.
- To suit steel tube.
- Butterfly type to BS EN 593
- Between flanges to BS EN 1092-2
- Lever operated - reference Y11.2210A
- Gear operated - reference Y11.2210B
- Between mechanical joints
- Lever operated - reference Y11.2210C
- Gear operated - reference Y11.2210D
- Globe valves to BS 7350, section 3.1.
- Copper alloy
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2220A
- Flanged to BS EN 1092-2 - reference Y11.2220B
- Cast iron
- Flanged to BS EN 1092-2 - reference Y11.2220C
- Grooved ends - reference Y11.2220D

211.060 FLOW MEASUREMENT VALVES:

- WRAS approved.
- Kitemark certified.
- Pipe material
- To suit copper tube.
- To suit steel tube.
- Flow measurement devices to BS 7350
- Section 3.2 Type 3
- Copper alloy
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2230A
- Flanged to BS EN 1092-3 - reference Y11.2230B
- Cast iron
- Flanged to BS EN 1092-2 - reference Y11.2230C
- Section 3.2 Type 4
- Copper alloy
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2230E
- Flanged to BS EN 1092-3 - reference Y11.2230F
- Cast iron - reference Y11.2230G

211.080 TEST PLUGS:

- Self sealing test points - reference Y11.2670A

211.090 RADIATOR VALVES TO BS 2767:

- Kitemark certified.
- Type 4 - reference Y11.2260A
- Finish
- Chromium plated.

211.100 PIPELINE STRAINERS:

- Bronze
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2680A
- Flanged to BS EN 1092-3 - reference Y11.2680B
- Compression to BS EN 1254-2
- Reference Y11.2680C
- Cast iron
- Flanged to BS EN 1092-2 - reference Y11.2680D

211.120 TUNDISHES:

- Copper - reference Y11.2690A
- Mild steel, galvanized - reference Y11.2690B

211.140 GAUGES:

- General - reference Y11.2700A
- 150mm black stove enamel finish
- Flush panel mounting - reference Y11.2700B
- Direct mounting - reference Y11.2700C
- Temperature gauges general - reference Y11.2710A
- Mercury in steel - reference Y11.2710B
- Vapour pressure to BS EN 13190
- Direct mounting - reference Y11.2710C
- Pressure and altitude gauges - reference Y11.2720
- Vacuum gauges - reference Y11.2730
- Gauge mounting boards
- Hardwood - reference Y11.2750A

211.150 CONTROL VALVES:

- WRAS approved.
- Kitemark certified.
- Ball control valves
- Open/close - reference Y11.2315A
- Two way - reference Y11.2315B
- Three way - reference Y11.2315C

211.160 LOOSE ITEMS:

- Keys for spindle shank valves - reference Y11.3010A
- Number four

- For drain cocks - reference Y11.3010B
- Number four

211.170 CHECK VALVES:

- WRAS approved.
- Kitemark certified.
- Service fluid
- Water.
- Pipe material
- To suit copper tube.
- To suit steel tube.
- Swing check type to BS 5154
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2320A
- Flanged to BS EN 1092-3 - reference Y11.2320B
- Check valve to BS EN 12334
- Swing check
- Flanged - reference Y11.2330A
- Wafer body - reference Y11.2330B
- Lift check
- Flanged - reference Y11.2330C
- Wafer body - reference Y11.2330D
- Wafer flange fitting type
- Reference Y11.2340A
- Device to prevent contamination of water by backflow to BS 6282
- Combined check and anti-vacuum - reference Y11.2385A
- Anti-back syphonage valve, combined check and anti-vacuum type
- Reference Y11.2390A

211.180 WORKMANSHIP:

- Installation - reference Y11.4010
- Location - reference Y11.4020
- Location of thermostatic radiator valves - reference Y11.4025
- Positioning of components
- Flow/pressure measurement valves - reference Y11.4030
- Double regulating variable orifice valves - reference Y11.4040
- Control components
- Vent cocks - reference Y11.4060
- Valve stuffing boxes - reference Y11.4070
- Discharge connections
- Safety and Relief valves - reference Y11.4080A
- Vent cocks - reference Y11.4080B
- Air bottles - reference Y11.4080C
- Automatic air vents - reference Y11.4080D
- Expansion devices - reference Y11.4090
- Expansion compensators - reference Y11.4100
- Flexible connections installation - reference Y11.4110
- Terminal unit connections installation - reference Y11.4120

211.200 DIRECT ACTING SAFETY VALVES TO BS EN ISO 4126-1:

- Copper alloy
- Single spring - reference Y11.2430A
- Double spring - reference Y11.2430B

- Cast iron

211.210 DRAIN COCKS:

- WRAS approved.
- Kitemark certified.
- Throughway gland cock type
- Reference Y11.2440A
- Screwdown to BS 2879, type 1 - reference Y11.2450
- Ball type - reference Y11.2460

211.220 VENT COCKS:

- Kitemark certified.
- Two way gland cock type - reference Y11.2470
- Ball type - reference Y11.2480
- Three way gland cock type - reference Y11.2490
- Plug valve type
- Wrench operated - reference Y11.2500A
- Gear operated - reference Y11.2500B
- 211.230 AUTOMATIC AIR VENTS:
- Float type
- Reference Y11.2510A

211.260 EXPANSION ARRANGEMENTS/DEVICES:

- Expansion loops
- Steel
- Reference Y11.2610A
- Galvanized after manufacture.
- Copper - reference Y11.2620
- Expansion compensators
- Axial bellows
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2630A
- Flanged to BS EN 1092-1 - reference Y11.2630B
- Articulated bellows
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2630D
- Flanged to BS EN 1092-1 - reference Y11.2630E
- Angular bellows
- Hose compensators
- Flexible connections
- EPDM rubber, up to 100°C
- Screwed to BS 21 and BS EN 10226-1 - reference Y11.2650B
- Chlorobutyl rubber, up to 100°C
- Terminal unit connections
- Heating services

220.000 PUMPS

220.010 GENERAL:

Comply with work section general clauses reference Y20.1000 and those detailed below.

220.060 WORKMANSHIP:

General - reference Y20.4010
Pipeline connections - reference Y20.4020
Mountings - reference Y20.4030
Alignment - reference Y20.4040
Access - reference Y20.4050

- Maintenance requirements for sewage pumps - reference Y20.4060

225.000 CLEANING AND CHEMICAL TREATMENT

225.010 GENERAL:

Comply with work section general clauses reference Y25.1000 and those detailed below.

225.040 PRELIMINARY CHECKS:

- Reference Y25.2030A

225.050 PROCEDURAL PRECAUTIONS:

- Reference Y25.2040A
- Including taking samples - reference Y25.2040B

225.060 CHEMICAL INJECTION AND DOSING METHODS:

- Method of introducing chemicals into closed systems - reference Y25.2060A
- Method of introducing chemicals into open recirculating systems - reference Y25.2060B
- Packaged plant - reference Y25.2060C
- Dosing for closed systems - reference Y25.2060D
- Dosing for open systems - reference Y25.2060E
- Dosing chemicals - reference Y25.2065

225.070 MONITORING AND SAMPLING:

- Monitoring - reference Y25.2070A
- Sampling - reference Y25.2070B
- Sampling kits - reference Y25.2070C
- The contractor shall provide samples for each heating system zone at four different times across the flushing, commissioning and 12 month defects period.

225.080 CHEMICAL PROVISION:

- Standard arrangement - reference Y25.2080A

225.085 AVOIDANCE OF STAGNANT WATER IN PRESSURISATION UNIT EXPANSION VESSELS:

- Reference Y25.2090

225.090 FLUSHING:

- BSRIA Application Guide 1/2001 - reference Y25.3010A
- System filling
- Temporary connection from mains in compliance with the Water Supply (Water Fittings) Regulations 1999, and the Water Supply (Water Fittings) (Amendment) Regulations 1999.
- By installation of temporary tank and pump arrangement.
- Flushing - reference Y25.3010B
- Flush system until discharge water is clear and free from stones or other rubble.

225.110 CHEMICAL CLEANING AND SOLIDS REMOVAL:

- BSRIA Application Guide 1/2001
- Inhibited acid - reference Y25.3030A
- Formulated products - reference Y25.3030B

225.150 DOCUMENTATION:

- Reference Y25.3090

250.000 THERMAL INSULATION

250.010 GENERAL:

Comply with work section general clauses reference Y50.1000 and those detailed below.

250.015 ZERO GLOBAL WARMING POTENTIAL (GWP):

Use insulating materials with a Global Warming Potential (GWP) of zero.

250.017 ZERO OZONE DEPLETION POTENTIAL (ODP):

Use insulating materials with an Ozone Depletion Potential (ODP) of zero.

250.030 MINERAL FIBRE THERMAL INSULATION - PIPEWORK:

- European Classification for Reaction to Fire Performance
- Class A1 - reference Y50.1035A
- Class A2 - reference Y50.1035B
- Class B - reference Y50.1035C
- Class C - reference Y50.1035D
- CFC's and HCFC's - reference Y50.1040#
- Spread of flame as BS 476-7
- Reference Y50.1050A
- Smoke emission characteristics
- Reference Y50.1055A
- Inspection and testing - reference Y50.1090
- Thermal conductivity - reference Y50.2010
- Thermal performance life expectancy
- For plant design life - reference Y50.2015A
- Details - reference Y50.2015B
- Restrictions on use of materials - reference Y50.2020
- Mineral fibre pipe insulation
- Foil faced - reference Y50.2030A
- Vapour barrier permeance
- Adhesives - reference Y50.2190
- Protection
- Polyisobutylene- reference Y50.2200A
- Flat aluminium-zinc coated steel - reference Y50.2200C
- Aluminium sheeting - reference Y50.2200E
- Reinforcement
- Aluminium bands
- 300mm centres - reference Y50.2210A
- Valve and flange insulation
- Thickness table
- Insulation thickness calculation methods - reference Y50.2285
- Non-domestic hot water supply services - reference Y50.2290

- Non-domestic heating installations - reference Y50.2310
- Domestic central heating and hot water systems - reference Y50.2330
- Protection against freezing - reference Y50.2420

250.060 MINERAL FIBRE THERMAL INSULATION - DUCTWORK:

- European Classification for Reaction to Fire Performance
- Class A1 - reference Y50.1035A
- Class A2 - reference Y50.1035B
- Class B - reference Y50.1035C
- Class C - reference Y50.1035D
- CFC's and HCFC's - reference Y50.1040#
- Spread of flame as BS 476-7
- Reference Y50.1050A
- Smoke emission characteristics
- Reference Y50.1055A
- Inspection and testing - reference Y50.1090
- Thermal conductivity - reference Y50.2010
- Thermal performance life expectancy
- For plant design life - reference Y50.2015A
- Details - reference Y50.2015B
- Restrictions on use of materials - reference Y50.2020
- Adhesives - reference Y50.2190
- Protection
- Polyisobutylene- reference Y50.2200A
- Flat aluminium-zinc coated steel - reference Y50.2200C
- Aluminium sheeting - reference Y50.2200E
- Reinforcement
- Aluminium bands
- 300mm centres - reference Y50.2210A
- Thickness table
- Insulation thickness calculation methods - reference Y50.2285
- Environmental thickness on warm air ductwork- reference Y50.2450
- Condensation control on chilled air ductwork - reference Y50.2460

250.090 WORKMANSHIP PIPEWORK INSULATION:

- General - reference Y50.3010
- Installation of foil faced mineral wool insulation - reference Y50.3020
- Installation of protection
- Polyisobutylene (PIB) - reference Y50.3120
- Sheet metal finish
- Reference Y50.3130A
- Aluminium sheeting - reference Y50.3170
- Aluminium-zinc coated steel - reference Y50.3180
- Flanges and valves - reference Y50.3210
- Liners - reference Y50.3220
- Installation where insulation is carried through pipeline support
- Reference Y50.3230A
- Installation where insulation is not carried through pipeline support - reference Y50.3240
- Liquid vapour barriers - reference Y50.3260
- Integrity of vapour barriers - reference Y50.3270

251.000 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

251.010 GENERAL:

Comply with work section general clauses reference Y51.1000 and those detailed below.

251.030 STATIC TESTING:

- Pressure testing
- General - reference Y51.2010
- Water circulating and supply systems and steam and condense lines - reference Y51.2020
- Underground pipework
- 4 hours - reference Y51.2030B
- Provide an air compressor and subject the pipework to sectional testing by air at low pressure (not exceeding .5 bars) before commencing any flushing or testing with water.
- On completion of all cleaning, flushing and air testing operations, recharge each system with clean water and subject them to sectional hydraulic tests of one and a half times the working pressure.
- There is to be no loss of pressure for a period of not less than 30 minutes for each test.
- Testing records - reference Y51.2110
- Distribution to WBS

251.040 COMMISSIONING:

- Commissioning codes - reference Y51.3020
- Commissioning
- Water distribution
- Including BSRIA pre-commissioning check list
- Reference Y51.3030A
- Boiler plant - reference Y51.3050
- Plant items - reference Y51.3080
- Instruments and gauges
- Reference Y51.3090A
- Commissioning records
- Distribution to WBS
- For water systems
- To BSRIA Application Guide 2/89.3 - reference Y51.3100B
- Pre-commissioning - reference Y51.3120
- Plant ready for control system commissioning
- Reference Y51.3130A
- Control system requirements for plant commissioning - reference Y51.3140
- Commissioning - reference Y51.3150

254.000 IDENTIFICATION - MECHANICAL

254.010 GENERAL:

Comply with work section general clauses reference Y54.1000 and those detailed below.

254.020 PIPEWORK IDENTIFICATION:

Reference Y54.2010

254.040 PLANT AND EQUIPMENT IDENTIFICATION:

- Lettering
- Laminated plates, multi-coloured with outer layer removed for lettering - reference Y54.2030B

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.050 VALVE AND COCK IDENTIFICATION:

Reference Y54.2040

254.090 INSTRUMENT IDENTIFICATION:

Reference Y54.2080

254.100 DANGER AND WARNING NOTICES:

Reference Y54.2090

254.110 SYSTEM IDENTIFICATION INSTALLATION CHARTS:

- Perspex sheet glazing with frame - reference Y54.2100A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A
- Non-penetrative support systems for roof mounted equipment - reference Y90.3100#

291.000 OFF-SITE PAINTING AND ANTI-CORROSION TREATMENT

291.010 GENERAL

Comply with work section general clauses reference Y91.1000 and those detailed below.

291.020 PAINT MATERIALS:

- Paint materials
- Reference Y91.2010A
- Paint quality - reference Y91.2020
- Heat resistant paint - reference Y91.2030

291.030 WORKMANSHIP

- General - reference Y91.3010
- Weather and other conditions - reference Y91.3020
- Cleaning and preparing for painting
- Steel surfaces - reference Y91.3030A
- Surfaces - reference Y91.3030B
- Application off-site - reference Y91.3040
- Application - reference Y91.3050
- Cold galvanizing - reference Y91.3060
- Protection of bright machine parts - reference Y91.3070

PART 3 SPECIFICATION CLAUSES SPECIFIC TO T31

300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 SITE DIMENSIONS:

Check dimensions on site prior to ordering.

300.020 TESTING:

Test at manufacturer's works to appropriate British Standard to suit pressure and temperature conditions of system.

310.000 PRODUCTS/MATERIALS

310.020 RADIATORS GENERALLY:

Ensure radiators are manufactured and rated in accordance with BS EN 442.

320.000 WORKMANSHIP

320.010 INSTALLATION:

Install in accordance with manufacturer's recommendations to give a neat appearance, with supports out of view where possible. Ensure equipment is firmly fixed and level.

320.020 BUILDERSWORK:

Mark out positions for battens fixed by others, when fixing equipment to stud walling.

320.030 SECOND FIX:

Allow for removal and second fix of radiators.

320.040 ISOLATION:

Fit an isolating valve on flow and a regulating valve on return unless otherwise indicated.

BS APPENDIX

BS 1010-2:1973

Specification for draw-off taps and stopvalves for water services (screw-down pattern). Part 2 Draw-off taps and above-ground stopvalves. Current, obsolescent

BS 1965-1:1963

Specification for butt-welding pipe fittings for pressure purposes. Part 1 Carbon steel.
Replaced by BS EN 10253-1:1999 but remains current

BS 21:1985

Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).

Partially superseded by BS EN 10226-1:2004

BS 2879:1980

Specification for draining taps (screw-down pattern)

BS 476-7:1997

Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 5154:1991

Specification for copper alloy globe, globe stop and check, check and gate valves.
Partially replaced by BS EN 12288:2003

BS 6282-1:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 1
Specification for check valves of nominal size up to and including DN 54

BS 6282-2:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 2
Specification for terminal anti-vacuum valves of nominal size up to and including DN 54

BS 6282-4:1982

Devices with moving parts for the prevention of contamination of water by backflow. Part 4
Specification for combined check and anti-vacuum valves of nominal size up to and including DN 42

BS 7350:1990

Specification for double regulating globe valves and flow measurement devices for heating and chilled water systems

BS EN 10226-1:2004

Pipe threads where pressure tight joints are made on the threads. Part 1 Taper external threads and parallel internal threads. Dimensions, tolerances and designation

BS EN 10255:2004

Non-alloy steel tubes suitable for welding or threading. Technical delivery conditions

BS EN 1092-1:2002

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1 Steel flanges

BS EN 1092-2:1997

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 Cast iron flanges

BS EN 1092-3:2003

Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 3 Copper alloy flanges

BS EN 1171:2002

Industrial valves. Cast iron gate valves

BS EN 1213:2000

Building valves. Copper alloy stopvalves for potable water supply in buildings. Tests and requirements

BS EN 12334:2001

Industrial valves. Cast iron check valves

BS EN 1254-1:1998

Copper and copper alloys. Plumbing fittings. Part 1 Fittings with ends for capillary soldering or capillary brazing to copper tubes.

Replaces BS 864-2:1983 which remains current.

BS EN 1254-2:1998

Copper and copper alloys. Plumbing fittings. Part 2 Fittings with compression ends for use with copper tubes

BS EN 1254-3:1998

Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 13789:2002

Industrial valves. Cast iron globe valves

BS EN 13828:2003

Building valves. Manually operated copper alloy and stainless steel ball valves for potable water supply in buildings. Tests and requirements

BS EN 1984:2000

Industrial valves. Steel gate valves

BS EN 442-1:1996

Specification for radiators and convectors. Part 1 Technical specifications and requirements

BS EN 442-2:1997

Specification for radiators and convectors. Part 2 Test methods and rating

BS EN 442-3:2003

Specification for radiators and convectors. Part 3 Evaluation of conformity

BS EN 593:2004

Industrial valves. Metallic butterfly valves

U10 GENERAL VENTILATION (including kitchen ventilation)

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test, commission and demonstrate the various ventilation systems proposed for installation within the building in accordance with the employers requirement documents. This general section clauses also cover the toilet ventilation system requirements and any specialist extract systems.

Kitchen ventilation system shall be installed in accordance with DW172.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

230.000 AIR DUCTLINES AND ANCILLARIES

230.010 GENERAL:

Comply with Work Section general clauses reference Y30.1000 and those detailed below.

230.020 INSTALLER SELECTION:

- Use a member of the HVCA specialising in the manufacturing and installing ductwork.

230.030 DUCTWORK AND FITTINGS:

- Design Information

- Class A, positive - reference Y30.2010A
- Class A, negative - reference Y30.2010B
- Ductwork air leakage testing shall be carried out by contractor
- Ductwork strength and air leakage testing, circular sheet metal ductwork - reference Y30.2035
- Ductwork strength and air leakage testing, rectangular sheet metal ductwork - reference Y30.2036.

230.040 SHEET METAL DUCTWORK:

- Material
- Zinc-coated steel - reference Y30.2040A
- Protective finishes
- Construction
- Rectangular - reference Y30.2060A
- Circular - reference Y30.2060B
- Flat oval - reference Y30.2060C

230.070 FIRE RATED AND SMOKE EXTRACT DUCTWORK:

- Fire protection with fire dampers - reference Y30.2110A
- Fire protection with fire resisting enclosures
- Reference Y30.2110B
- Fire rated and smoke extract ductwork - reference Y30.2110C
- Fire rated ductwork - reference Y30.2110D

230.080 INSULATED DUCTWORK:

- Internal thermal/acoustic insulation
- Pre-insulated external thermal/acoustic ductwork
- Reference Y30.2130A

230.090 SUPPORTS:

- Hangers and supports
- Reference Y30.2140A
- Support of air terminal units
- Reference Y30.2150A

230.100 ACCESSORIES:

- Construction and finishes - reference Y30.3010
- Inspection/servicing access openings
- Metal ductwork - reference Y30.3020A
- HVCA TR/17 - reference Y30.3020D
- Test holes
- Metal ductwork - reference Y30.3030A – Access panels at all bends, attenuators, dampers, fans, base of riser and every 6m in straight runs
- Holes for controls/instruments - metal ductwork - reference Y30.3040
- Installation of instruments and controls - reference Y30.3042
- Cleaning access
- Level 3 - reference Y30.3050A
- HVCA TR/17 - reference Y30.3050C
- Flexible ducts
- Coated steel - reference Y30.3100A
- Flexible joint connections

- Reference Y30.3110A

230.110 REGULATING DAMPERS - METAL DUCTWORK:

- Balancing dampers
- Steel multi-blade dampers - reference Y30.3060B
- Control dampers
- Steel multi-blade dampers - reference Y30.3060D

230.130 FIRE DAMPERS:

- General - reference Y30.3075
- Folding curtain
- Steel
- Out of air stream - reference Y30.3070C
- Intumescent - reference Y30.3070I
- Fire damper accessories - reference Y30.3070J
- No. of spare fusible links four

230.140 SMOKE DAMPERS:

- Steel multi-blade - reference Y30.3080B

230.150 COMBINATION SMOKE AND FIRE DAMPERS:

- Steel multi-blade - reference Y30.3090B

230.160 GUARDS:

- Bird wire guards
- Finish
- Plastic coated wire - reference Y30.3120A

230.180 AIR DUCTLINES & ANCILLARIES WORKMANSHIP:

- General - reference Y30.4010
- Ductwork supports - reference Y30.4020
- Component support on pre-insulated aluminium ductwork
- Reference Y30.4025
- Duct support for vapour seal continuity
- Reference Y30.4030A
- External ductwork supports - reference Y30.4040
- Ductwork floor support - reference Y30.4050
- As shown on drawings nos.
- Drainage of ductwork - reference Y30.4060
- Connections to builders work
- Metal ductwork - reference Y30.4070A
- Internal cleanliness
- Basic - reference Y30.4090A
- Method of cleaning
- Weatherproofing
- Flashing plate and cowl - reference Y30.4100A
- Ductwork sleeves
- Flanged - reference Y30.4110B
- Fire rated ductwork sleeves - reference Y30.4120
- Installation of control equipment

- Reference Y30.4130
- Instrument connections - reference Y30.4140
- Fire precautions - reference Y30.4150
- As shown on drawing nos.
- Damper access - reference Y30.4160
- Positioning - reference Y30.4170

240.000 AIR HANDLING UNITS

240.010 GENERAL:

Comply with work section general clauses reference Y40.1000 and those detailed below.

240.020 AIR HANDLING UNITS DUTY AND CONSTRUCTION:

- Air leakage
- To BS EN 1886 - reference Y40.1010B
- To BS EN 1886 for filter bypass - reference Y40.1010C
- Double skin unit
- Manufacturer's standard - reference Y40.2020B
- Air handling unit construction
- Reference Y40.2030A
- Insulation to provide
 - thermal treatment.
 - structural treatment.
 - acoustic treatment.
- Casing thermal and acoustic performance
- Air handling unit access
- Reference Y40.2040A
- External air handling units
- Reference Y40.2060A

240.140 WORKMANSHIP:

- Component assembly
- Reference Y40.4010A
- Access - reference Y40.4020
- Humidifier installation - reference Y40.4030
- Duct connections - reference Y40.4040
- Services connections - reference Y40.4050
- Isolation of units - reference Y40.4060
- Drainage of free water - reference Y40.4070
- Supports
- Reference Y40.4080A

241.000 FANS

241.010 GENERAL:

Comply with work section general clauses reference Y41.1000 and those detailed below.

241.020 FAN:

- Construction and handling
- Reference Y41.2020A
- Testing - reference Y41.2030

- Materials
- Galvanized sheet steel - reference Y41.2050A
- Single fan - reference Y41.2110A
- Twin fan with automatic changeover - reference Y41.2110B
- In line fans
- Single fan - reference Y41.2120A
- Accessories
- Guards
- Reference Y41.3050A
- Connections to duct
- Reference Y41.3060A
- Shutters
- Reference Y41.3100A
- Airflow sensor - reference Y41.3110
- Access
- Reference Y41.3120A
- Mounting - reference Y41.3130
- Speed controller - reference Y41.3140

241.050 WORKMANSHIP

- Location - reference Y41.4010
- Alignment - reference Y41.4030
- Testing - reference Y41.4040

245.000 SILENCERS/ACOUSTIC TREATMENT

245.010 GENERAL:

Comply with work section general clauses reference Y45.1000 and those detailed below.

245.030 SILENCERS:

- Fire properties
- BS 476-7, Class 1 - reference Y45.2010A
- Building Regulations Class O
- Reference Y45.2010B
- Circular silencers - metal
- Casing to DW 144.
- Rectangular silencers - metal
- Casing to DW 144
- Manufacturer's standard ends to splitters
- Connections to match AHU - reference Y45.2040A
- External flanges - reference Y45.2040B
- Internal flanges - reference Y45.2040C
- Low loss fairings
- Acoustic splitters
- To manufacturer's standard - reference Y45.2060A
- With low loss fairings - reference Y45.2060B
- Air transfer/cross talk attenuators
- External flanges - reference Y45.2070A
- Fixing - Interface with building components
- Internal flanges - reference Y45.2070B
- Fixing - Interface with building components
- Spigot ends - reference Y45.2070C
- Fixing - Interface with building components

245.060 ACOUSTIC FLEXIBLE CONNECTORS:

- Fire properties
- BS 476-7, Class 1 - reference Y45.2010A
- Building Regulations Class O - reference Y45.2010B
- Reference Y45.2110

245.090 WORKMANSHIP

- General - reference Y45.3010
- Supports - reference Y45.3040
- Sound power level readings - reference Y45.3060
- Measure sound insulation of building elements - reference Y45.3070

246.000 GRILLES/DIFFUSERS/LOUVRES

246.010 GENERAL:

Comply with work section general clauses reference Y46.1000 and those detailed below.

246.020 GRILLES:

- Electrical bonding terminal - reference Y46.1040
- Fixed blade type
- Reference Y46.2010A
- Adjustable blade type
- Reference Y46.2020A
- Egg-crate type
- Reference Y46.2040A
- Linear type
- Reference Y46.2050A
- Linear floor type
- Reference Y46.2060A
- Non-vision type
- Sightproof - reference Y46.2070A
- Materials
- Galvanized steel - reference Y46.2210A
- Finish
- With epoxy resin powder/hardener coating colour to be advised by architect from standard RAL colour range
- Aluminium - reference Y46.2210B
- Finish
- Etched or buffed to give self colour satin finish.
- With clear lacquer finish.
- Primed to prevent oxidization.
- With epoxy resin powder/hardener coating colour to be advised by architect from standard RAL colour range
- Grille and diffuser construction
- Reference Y46.2220A
- Accessories
- Opposed blade volume control dampers
- Local blade operation - reference Y46.3010A
- Butterfly volume control dampers
- Air flow deflector
- Blanking plates - reference Y46.3070
- Perforated screens - reference Y46.3090

246.040 LOUVRES:

- Quality assurance
- Ensure manufacturers are a firm of Assessed Capability to BS EN ISO 9001 and produce louvre to relevant Quality Assessment schedule.
- Electrical bonding terminal - reference Y46.1040
- External air supply/extract type - reference Y46.2190A
- Materials
- Galvanized steel - reference Y46.2210A
- Finish
 - Primed to prevent rust.
 - With epoxy resin powder/hardener coating colour to be advised by architect from standard RAL colour range
 - Aluminium - reference Y46.2210B
 - Finish
 - Etched or buffed to give self colour satin finish.
 - With clear lacquer finish.
 - Primed to prevent oxidization.
 - With epoxy resin powder/hardener coating colour to be advised by architect from standard RAL colour range
 - Louvre construction
 - Reference Y46.2230A
 - Accessories
 - Louvre access panels and doors
 - Lift out - reference Y46.3120B

246.070 GRILLES/DIFFUSERS/LOUVRES WORKMANSHIP:

- Grille/Diffuser location - reference Y46.4010
- Louvre location - reference Y46.4020
- Accessories - reference Y46.4030
- Connection to ductwork - reference Y46.4040
- Installation in builders work
- Reference Y46.4050A
- Transfer grilles
- Reference Y46.4060A
- With fire damper - reference Y46.4060B

250.000 THERMAL INSULATION

250.010 GENERAL:

Comply with work section general clauses reference Y50.1000 and those detailed below.

250.015 ZERO GLOBAL WARMING POTENTIAL (GWP):

Use insulating materials with a Global Warming Potential (GWP) of zero.

250.017 ZERO OZONE DEPLETION POTENTIAL (ODP):

Use insulating materials with an Ozone Depletion Potential (ODP) of zero.

250.020 INSTALLER SELECTION:

- Use a contractor specialising in the supply and installation of thermal insulation.

250.030 MINERAL FIBRE THERMAL INSULATION - PIPEWORK:

- European Classification for Reaction to Fire Performance
- Class A1 - reference Y50.1035A
- Class A2 - reference Y50.1035B
- Class B - reference Y50.1035C
- Class C - reference Y50.1035D
- Spread of flame as BS 476-7
- Reference Y50.1050A
- Smoke emission characteristics
- Reference Y50.1055A
- Inspection and testing - reference Y50.1090
- Thermal conductivity - reference Y50.2010
- Thermal performance life expectancy
- For plant design life - reference Y50.2015A
- Details - reference Y50.2015B
- Restrictions on use of materials - reference Y50.2020
- Mineral fibre pipe insulation
- Foil faced - reference Y50.2030A
- Vapour barrier permeance
- Reference Y50.2170A
- Adhesives - reference Y50.2190
- Protection
- Polyisobutylene- reference Y50.2200A
- Flat aluminium-zinc coated steel - reference Y50.2200C
- Aluminium sheeting - reference Y50.2200E
- Galvanized sheet steel - reference Y50.2200F
- Reinforcement
- Aluminium bands
- 300mm centres - reference Y50.2210A
- Thickness table
- Insulation thickness calculation methods - reference Y50.2285
- Non-domestic heating installations - reference Y50.2310

250.060 MINERAL FIBRE THERMAL INSULATION - DUCTWORK:

- European Classification for Reaction to Fire Performance
- Class A1 - reference Y50.1035A
- Class A2 - reference Y50.1035B
- Class B - reference Y50.1035C
- Class C - reference Y50.1035D
- CFC's and HCFC's - reference Y50.1040#
- Spread of flame as BS 476-7
- Reference Y50.1050A
- Smoke emission characteristics
- Reference Y50.1055A
- Inspection and testing - reference Y50.1090
- Thermal conductivity - reference Y50.2010
- Thermal performance life expectancy
- For plant design life - reference Y50.2015A
- Details - reference Y50.2015B
- Restrictions on use of materials - reference Y50.2020
- Mineral fibre duct insulation
- Rigid
- Foil faced - reference Y50.2040A
- Flexible
- Foil faced - reference Y50.2050A

- Fire protection insulation
- Flat ductwork
- Mitred joints - reference Y50.2080A
- Butted joints - reference Y50.2080B
- Circular ductwork
- Section - reference Y50.2080C
- PSM - reference Y50.2080D
- Adhesives - reference Y50.2190
- Protection
- Polyisobutylene- reference Y50.2200A
- Flat aluminium-zinc coated steel - reference Y50.2200C
- Aluminium sheeting - reference Y50.2200E
- Galvanized sheet steel - reference Y50.2200F
- Reinforcement
- Aluminium bands
- 300mm centres - reference Y50.2210A
- Thickness table
- Insulation thickness calculation methods - reference Y50.2285
- Environmental thickness on warm air ductwork- reference Y50.2450

250.100 WORKMANSHIP DUCTWORK INSULATION:

- General - reference Y50.3010
- Installation of foil faced semi-rigid slab insulation - reference Y50.3060
- Installation of foil faced flexible insulation - reference Y50.3070
- Installation of foil faced lamella insulation - reference Y50.3080
- Installation of protection
- Polyisobutylene (PIB) - reference Y50.3120
- Sheet metal finish
- Reference Y50.3140A
- Roofing felt - reference Y50.3160
- Aluminium sheeting - reference Y50.3170
- Aluminium-zinc coated steel - reference Y50.3180
- Installation of ductwork fire protection insulation - reference Y50.3200
- Installation where insulation is not carried through ductline support - reference Y50.3240
- Installation where insulation is carried through ductwork support - reference Y50.3250
- Liquid vapour barriers - reference Y50.3260
- Integrity of vapour barriers - reference Y50.3270

251.000 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

251.010 GENERAL:

Comply with work section general clauses reference Y51.1000 and those detailed below.

251.030 STATIC TESTING:

- Pressure testing
- General - reference Y51.2010
- Testing records - reference Y51.2110
- Distribution to WBS
- The ductwork systems shall be pressure tested in accordance with HVCA DW143 and DW144

251.040 COMMISSIONING:

- Cleaning ductwork systems - reference Y51.3010
- Commissioning codes - reference Y51.3020

- Commissioning
- Air distribution
- Including BSRIA pre-commissioning check list
- Reference Y51.3040A
- Instruments and gauges
- Reference Y51.3090A
- Commissioning records
- Distribution to WBS
- For air systems
- To BSRIA Application Guide 3/89.3 - reference Y51.3100A
- Plant ready for control system commissioning
- Reference Y51.3130A
- Control system requirements for plant commissioning - reference Y51.3140
- Commissioning - reference Y51.3150

254.000 IDENTIFICATION - MECHANICAL

254.010 GENERAL:

Comply with work section general clauses reference Y54.1000 and those detailed below.

- Provide identification - mechanical as specified in work section

254.030 DUCTWORK IDENTIFICATION:

Reference Y54.2020

254.040 PLANT AND EQUIPMENT IDENTIFICATION:

- Lettering
- Laminated plates, multi-coloured with outer layer removed for lettering - reference Y54.2030B

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.050 VALVE AND COCK IDENTIFICATION:

Reference Y54.2040

254.080 AIR VOLUME REGULATING AND CONTROL DAMPER IDENTIFICATION:

Reference Y54.2070

254.090 INSTRUMENT IDENTIFICATION:

Reference Y54.2080

254.100 DANGER AND WARNING NOTICES:

Reference Y54.2090

254.110 SYSTEM IDENTIFICATION INSTALLATION CHARTS:

- Perspex sheet glazing with frame - reference Y54.2100A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A
- Non-penetrative support systems for roof mounted equipment - reference Y90.3100#

BS APPENDIX

BS 476-7:1997

Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS EN 1886:1998

Ventilation for buildings. Air handling units. Mechanical performance

BS EN ISO 9001:2000

Quality management systems. Requirements

V12 LV SUPPLY/PUBLIC UTILITY SUPPLY

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall design, install, test, commission and demonstrate the new power supply to the building in accordance with the requirements of this specification document and the employer's requirements documentation.

For workmanship and material standards refer to the information contained within section V20 of this specification.

V20 LV DISTRIBUTION

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor is to design, install, test, commission and demonstrate new submain cabling between the main intake point of the site and distribution boards as required in accordance with this specification document and the employer's requirement documentation.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Comply with work section general clauses reference Y60.1000 and those detailed below.

- Supply conduit and cable trunking as specified in section V20. These standards apply to the whole of this specification.

260.020 CONDUIT SYSTEMS:

- Type - Galvanised steel conduit.
- Application - To provide mechanical protection to cabling and to route cables to points of use where surface is exposed.
- Manufacturer and reference Refer to manufacturers schedule.
 - Or approved equivalent
- Metal
 - Rigid
 - Class 4 - reference Y60.2010B
 - Fittings
 - Reference Y60.2020A
- Support and fixing - reference Y60.2170

260.030 METAL TRUNKING:

- Type - Galvanised trunking
- Application - To provide mechanical protection to cabling as shown on the system drawings.
- Manufacturer and reference- Refer to manufacturers schedule
 - Or approved equivalent
- Cable trunking and fittings
 - Reference Y60.2080A

- Trunking Type
 - Standard cable trunking.
- Installation
 - Surface.
- Trunking
 - Class 1/3 - reference Y60.2090B
- Separate or multi-compartment trunking
 - Reference Y60.2150A
- Support and fixing - reference Y60.2170

260.040 TRUNKING OF INSULATING MATERIAL:

- Type - Dado trunking c/w white finish.
- Application - To provide mechanical protection to cabling as shown on the system drawings
- Manufacturer and reference - Refer to manufacturers schedule
 - Or approved equivalent
- Cable trunking and fittings
 - Reference Y60.2080A
- Trunking type
 - Wall/dado trunking.
 - With compartments.
- Surface trunking
 - PVC general purpose - reference Y60.2130A
- Separate or multi-compartment trunking
 - Reference Y60.2150A
- Wall/Dado Trunking
 - PVC
- Support and fixing - reference Y60.2170

260.050 GENERAL WORKMANSHIP:

- General
 - Reference Y60.3010A
- Layout - reference Y60.3020
- Spacing - reference Y60.3030
- Condensation prevention - reference Y60.3040
- Protection and repair of steel components
 - Reference Y60.3050A
- Equipment connections - reference Y60.3060
- Cleaning before wiring - reference Y60.3070
- Wiring
 - Reference Y60.3080A
- Builderswork - reference Y60.3090

260.070 WORKMANSHIP FOR CONDUIT:

- Draw-in boxes - reference Y60.4010
- Installation of cast in or buried conduit - reference Y60.4020
- Conduit boxes - reference Y60.4030
- Fixing conduit - reference Y60.4040
- Flexible and pliable conduit - reference Y60.4050
- Screwed steel conduit - reference Y60.4060
- Non-metallic conduit
 - Reference Y60.4070A

260.080 WORKMANSHIP FOR TRUNKING:

- Manufacture of trunking - reference Y60.5010
- Access - reference Y60.5020
- Fixing trunking
 - Reference Y60.5030A
- Steel trunking
 - Reference Y60.5040A
- Trunking of insulating material - reference Y60.5060

261.000 HV/LV CABLES AND WIRING

261.010 GENERAL:

Comply with work section general clauses reference Y61.1000 and those detailed below.

- Supply HV/LV cables and wiring as work section V20. These standards apply to the whole of this specification. Also refer to the distribution board schedules for specific details

261.020 STANDARD FLEXIBLE CORDS AND INDUSTRIAL CABLES:

- Manufacturer and reference refer to manufacturers schedule.
 - Or approved equivalent
- LSOH sheathing - reference Y61.2005

261.040 MINERAL INSULATED WIRING AND POWER CABLES:

- Manufacture and reference Refer to manufacturers schedule.
 - Or approved equivalent
- Light duty mineral insulated cables
 - Thermoplastic outer covering - reference Y61.2040A
 - LSF outer covering - reference Y61.2040B

261.050 STANDARD WIRING AND POWER CABLES:

- Manufacturer and reference refer to manufacturers schedule.
 - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Standard power supply cables
 - Thermosetting insulation and copper conductors
 - Sheathed - reference Y61.2020A
 - Sheathed and armoured - reference Y61.2020B
 - LSF sheathed and armoured - reference Y61.2020E
- Standard wires for conduit and trunking
 - LSF insulated, with copper conductors - reference Y61.2020G

261.060 CONTROL AND AUXILIARY CABLES:

- Manufacturer and reference refer to manufacturers schedule.
 - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Paired UTP unarmoured control cables - reference Y61.2050A
- Paired UTP armoured control cables - reference Y61.2050B
- Paired STP unarmoured control cables - reference Y61.2050C
- Paired STP armoured control cables - reference Y61.2050D
- Multi-core unarmoured auxiliary cables - reference Y61.2050E

- Multi-core armoured auxiliary cables - reference Y61.2050F
- Multi-core unarmoured LSF sheathed auxiliary cables - reference Y61.2050G
- Multi-core armoured LSF sheathed auxiliary cables - reference Y61.2050H
- Control and auxiliary cables with definite fire performance - reference Y61.2050I
- Fire Alarm cables - reference Y61.2050K

261.080 STANDARD COMMUNICATIONS CABLES:

- Manufacturer and reference Refer to manufacturers schedule.
 - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Standard filled communications cables, for outdoor and underground - reference Y61.2070A
- Standard communications cables, for indoor use - reference Y61.2070B

261.090 STANDARD COAXIAL CABLES:

- Manufacturer and reference Refer to manufacturers schedule.
 - Or approved equivalent
- For broadcast receiving - reference Y61.2080A

261.110 INFORMATION TECHNOLOGY CABLES:

- Manufacturer and reference Refer to manufacturers schedule and specific details included in later sections of this specification.
 - Or approved equivalent
- Structured wiring - reference Y61.2100A

261.130 CABLE GLANDS:

- Manufacturer and reference Refer to manufacturers schedule.
 - Or approved equivalent
- Unarmoured cables, indoors - reference Y61.3010A
- Unarmoured cables, outdoors - reference Y61.3010B
- Armoured cables, dry indoors - reference Y61.3010C
- Armoured cables, indoors - reference Y61.3010D
- Armoured cables, outdoors - reference Y61.3010E

261.140 CABLE SEALS AND GLANDS - MINERAL INSULATED CABLES:

- Manufacturer and reference Glands are to be of the same manufacturer as the cabling used.
- Light duty mineral insulated cables - temperatures up to 105°C - reference Y61.3020D

261.160 CABLE TERMINATING AND JOINTING SOCKETS:

- Reference Y61.3040A

261.170 INSULATING TAPE:

- LSF insulating tape - reference Y61.3050A

261.180 CABLE JOINTS AND TERMINATIONS:

- Reference Y61.3060A

261.200 CONNECTORS FOR COAXIAL CABLES:

- Reference Y61.3080A

261.230 CABLE DUCTS:

- Application Provide cable ducts as indicated on the system drawings for the installation of external cables. Spacing and depth to be as indicated on the system drawings.
- Reference Y61.3110A

261.240 CABLE SLEEVES:

- Application Provide cable sleeves where external cables enter the building. To be routed at a minimum of 100mm above the finished floor and sealed once the cable installation works are complete.
- Reference Y61.3120A

261.250 CABLE COVERS AND MARKERS:

- Reference Y61.3130A

261.260 WORKMANSHIP

- Cable installation - general - reference Y61.4010
- Cable installation in low temperatures - reference Y61.4020
- Installation of LSF cable - reference Y61.4030
- Installation of unarmoured cables - reference Y61.4040
- Cable trenches.
 - Reference Y61.4050A
- Cable installation in trenches - reference Y61.4060
- Cable ducts.
 - Reference Y61.4070A
- Cable installation into ducts - reference Y61.4080
- Cable installation in conduit and trunking.
 - Reference Y61.4090A
- Cable installation on tray and rack - reference Y61.4100
- Cable surface installation.
 - Reference Y61.4110A
- Cable embedded installation.
 - Reference Y61.4120A
- Cable installation - mineral insulated cables
 - Reference Y61.4130A
- Cable installation - flexible cords - reference Y61.4140
- Cable jointing and terminating generally.
 - Reference Y61.4150A
- Cable jointing and terminating - elastomer and plastic insulated cables - reference Y61.4170
- Terminating - mineral insulated cables.
 - Reference Y61.4180A
- Cable joints - mineral insulated cables.
 - Reference Y61.4190A
- Communications coaxial, optical fibre and IT cable installation, jointing and terminating.
 - Reference Y61.4200A
- Cable sleeves - reference Y61.4210

263.000 SUPPORT COMPONENTS - CABLES

263.010 GENERAL:

Comply with work section general clauses reference Y63.1000 and those detailed below.

263.020 CABLE SUPPORT AND FINISHES:

- Cable supports and finishes
 - Reference Y63.2010A

263.030 CABLE SUPPORT SYSTEM:

- Manufacturer and reference refer to manufacturers schedule.
 - Or approved equivalent
- Perforated tray - reference Y63.2020A
- Cable rack - reference Y63.2020B
- Cable cleats - reference Y63.2020C
- Proprietary cable ties - reference Y63.2025A
- Cable clips - reference Y63.2025B
- Two way saddles - reference Y63.2025C
- Cable basket - reference Y63.2025D

263.040 WORKMANSHIP

- Cable tray installation - reference Y63.3010
- Cable cleats, ties, saddles and clips installation
 - Reference Y63.3020A

271.000 LV SWITCHGEAR AND DISTRIBUTION BOARDS

271.010 GENERAL:

Comply with work section general clauses reference Y71.1000 and those detailed below.

- Supply switchboards and distribution boards as shown on the drawings and as detailed in the distribution board schedules.

271.030 SWITCHBOARD:

- Type MCCB Panel board
- Application to provide main intake and distribution of electrical supply throughout the building.
- Manufacturer and reference refer to schedule of manufacturers.
 - Or approved equivalent
- Electrical supply
 - Three phase - reference Y71.1020A
 - Single phase - reference Y71.1020B
- LV switchgear and controlgear assembly
 - Cubicle switchboard - reference Y71.2010A
 - Details of equipment
 - As shown on drawing/schedules refer to tender drawings.
- Assembly construction
 - Wall mounted - reference Y71.2020B
 - Access for cabling - Front, top, bottom or rear
 - Front, top, or bottom to suit location installed. Rear entry cables will not be possible due to panel being wall mounted.
- Enclosures finish
 - Reference Y71.2030A

- Type tests
 - Reference Y71.2040A
- Site built assemblies - reference Y71.2060
- Site modification - reference Y71.2070

271.050 CIRCUIT BREAKERS, TRANSFER SWITCHES AND CONTROL AND PROTECTIVE SWITCHES:

- Type - All
- Manufacturer and reference refer to manufacturers schedules.
 - Or approved equivalent
- Characteristics of circuit breakers, transfer switches and control and protective switches:
 - As shown on drawings/schedules refer to distribution board schedules.
 - Number of poles - As indicated on drawings and distribution board schedules.
 - Rated operational, current (Amps) As indicated on drawings and detailed in DB schedules.
 - Short-circuit characteristics, rated service short-circuit breaking current (Amps) MCCBs shall be 25KA minimum & MCBs shall be 15KA minimum.

271.060 SWITCHES, DISCONNECTORS AND FUSE COMBINATION UNITS:

- Type wall mounted switch fuse c/w proprietary cable spreader box top and bottom. Metering to be provided to outgoing side of the switch fuse .
- Application to provide main building supply isolation and to protect sub main cabling serving main building, located at the intake position adjacent new substation.
- Manufacturer and reference refer to schedule of manufacturers
 - Or approved equivalent
- Switch-disconnector - reference Y71.2100A
- Fuse combination unit - reference Y71.2100B
- Details of equipment
 - As shown on drawings/schedules refer to tender drawings.

271.110 INSTRUMENTS AND METERS:

- Application - Instrumentation & metering shall be as indicated in this document
- Reference Y71.2150A
- Details as shown on drawings/schedules refer to tender drawings.

271.170 DISTRIBUTION BOARDS:

- Application - Refer to drawings for location of distribution boards. All boards to be metal clad, with lockable front cover and typed circuit reference chart and integral sub-meter.
- Manufacturer and reference Refer to the manufacturers schedule.
 - Or approved equivalent
 - Electrical supply
 - Three phase - reference Y71.1020A
- Reference Y71.2210A
- Provide spare ways
 - As indicated on distribution board charts.

271.180 CONSUMER UNITS:

- Application - Refer to drawings for location of distribution boards. All boards to be metal clad, with lockable front cover and typed circuit reference chart and integral sub-meter.
- Manufacturer and reference Refer to the manufacturers schedule.
 - Or approved equivalent
- Electrical supply

- Single phase - reference Y71.1020B
- Reference Y71.2220A

271.190 MINIATURE CIRCUIT BREAKERS:

- Type - Suitably rated circuit breakers in line with distribution charts. To be rated at a minimum of 15KA
- Reference Y71.2230A

271.200 RESIDUAL CURRENT DEVICE:

- Type - Suitably rated RCDs to protect all power circuits and where necessary lighting circuits in line with the new 17th Edition IEE Regulations..
- RCCD's
 - Reference Y71.2240A
- Residual current monitors - reference Y71.2242
- RCBO's - reference Y71.2245

271.210 CABLE TERMINATIONS:

Reference Y71.2250

271.270 WORKMANSHIP

- Fixing - reference Y71.3010
- Mounting height - reference Y71.3020
- Access - reference Y71.3030
- Marking and drawing
 - Reference Y71.3040A
- Cable terminations - reference Y71.3050
- Installation and commissioning
 - Reference Y71.3060A

272.000 CONTACTORS AND STARTERS

272.010 GENERAL:

Comply with work section general clauses reference Y72.1000 and those detailed below.

272.020 CONTROL PANEL:

- Application - As detailed on contract drawings
- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B

272.050 ISOLATING SWITCHES:

- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B
- Reference Y72.2070A

272.060 CONTROL SELECTOR SWITCHES:

- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B
- Reference Y72.2080A

272.070 IN-BUILT PUSH BUTTONS:

- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B
- Reference Y72.2090A

272.080 INDICATOR LIGHTS:

- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B
- Reference Y72.2100A

272.090 CONTACTOR CONTROL RELAYS:

- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B
- Reference Y72.2110A

272.100 CONTROL AND INDICATOR LIGHT CIRCUIT FUSES:

- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B
- Reference Y72.2120A

272.110 MOTOR STARTERS:

- Electrical supply
 - 3 phase - reference Y72.1010A
 - Single phase - reference Y72.1010B
- General
 - Motors below 0.37kW - reference Y72.2130A
 - Motors above 0.37kW - reference Y72.2130B
- Current limiting type - reference Y72.2140
- Direct-on-line type - reference Y72.2150
- Star delta type - reference Y72.2160
- Auto-transformer type
 - Reference Y72.2170A
- Stator rotor type
 - Reference Y72.2180A
- Inverter type
 - Control panel - reference Y72.2190A
 - Motor control centre - reference Y72.2190B

272.180 STARTER AND CONTROL PANEL INTERNAL WIRING:

- Reference Y72.2260A

272.190 COMPONENT MOUNTING:

- Reference Y72.2270A

272.200 CONTROL SYSTEM FUNCTION CHARTS:

- Reference Y72.2280A

272.210 WORKMANSHIP:

Reference Y72.3010

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Comply with work section general clauses reference Y74.1000 and those detailed below.

274.020 SAMPLES:

Provide samples of the following items all items which will be on general view.

274.030 ACCESSORIES COMMON REQUIREMENTS:

- Type
Within all areas use white insulated plastic. Within plantrooms and storerooms to be metalclad.
To be fixed to recessed metal clad enclosures in all areas apart from on dado trunking where they will be insulated.
Switch boxes minimum depth of 25mm
Power outlet boxes minimum depth of 35mm
Power outlet boxes on skirting or dado trunking minimum depth of 25mm

Recessed accessories shall be in exact position relative to the finished face surface when installed to allow for the cover plate to be fixed accurately and correctly aligned without gaps between the plate and the finished wall surface. They shall not be recessed too deeply into the wall finish.

Provide CPC between earth lug on metal box and accessory except for plastic accessories.
Ensure there is no damage to accessories during installation.
Protect surface mounted accessories from painting. Install front plates of flush mounted accessories after painting.
Align accessories to building finishes. Mount grouped accessories in line, parallel and equidistant.
- Manufacturer and reference MK - Logic Plus in all areas apart from plantrooms where they shall be metalclad.
To be standard throughout the contract.
 - Or approved equivalent
- White plastic plates, flush installation - reference Y74.2010A
- Matt finish metal plates, flush installation - reference Y74.2010B
- White plastic plates, embedded cables, surface installation - reference Y74.2010C
- Metal clad plates, surface steel conduit installation - reference Y74.2010D
- Surface, steel conduit, weatherproof installation - reference Y74.2010E
- Surface, plastic, weatherproof installation - reference Y74.2010F
- Bronze finish metal plates, flush installation - reference Y74.2010G
- Accessories details

274.040 INTERIOR LIGHTING SWITCHES:

- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- General purpose moulded plastic - reference Y74.2020A
- Grid moulded plastic - reference Y74.2020B
- Pull cord - reference Y74.2020C
- General purpose secret key - reference Y74.2020D
- General purpose dimmer - reference Y74.2020E
- Grid secret key - reference Y74.2020F
- Switch details
 - As indicated on drawings/schedules refer to tender drawings

274.050 EXTERIOR LIGHTING SWITCHES:

- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- Metal clad rotary - reference Y74.2030A
- Sealed rocker bar - reference Y74.2030B
- Switch details
 - As indicated on drawings/schedules refer to tender drawings

274.060 TIME SWITCHES:

- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- 24 hour - reference Y74.2040A
- 7 day - reference Y74.2040B

274.070 LUMINAIRE CONNECTORS:

- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- General and emergency lighting - reference Y74.2050A
- General lighting - reference Y74.2050B
- Cord grip general and emergency lighting.
Reference Y74.2050C
 - Luminaire supporting coupler to as shown on drawings/schedules

274.100 FUSE CONNECTION UNITS:

- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- Switched - reference Y74.2080A
- Unswitched - reference Y74.2080B
- Details
 - As indicated on drawings/schedules refer to tender drawings

274.110 SOCKET-OUTLETS:

- Application All sockets to be wired so they comply with the 17th Edition equivalent of section 607 of the 16th Edition of the Wiring Regulations complete. All sockets to be complete with separate earths in compliance with section 607 of the Regulations. This also applies at each distribution board where separate earth terminals shall be provided.
- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- Single, switched - reference Y74.2090A

- Single with integral RCD, switched.
Reference Y74.2090B
- Double, switched - reference Y74.2090C
- Single, unswitched - reference Y74.2090D
- Single with integral RCD, unswitched - reference Y74.2090E
- Details
 - As indicated on drawings/schedules refer to tender drawings.

274.120 COOKER CONTROL UNIT

- Application To serve cookers as indicated on the drawings. to be complete with low level cooker outlet plate served by recessed conduit from the cooker control unit. Works to include the final connection of the cookers provided by the end user.
- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- With integral socket - reference Y74.2100A

274.130 CORD OUTLETS:

- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent

274.190 AERIAL SOCKETS:

- Manufacturer and reference refer to manufacturers schedule
 - Or approved equivalent
- TV and FM aerals - reference Y74.2170A
- Single TV aerals - reference Y74.2170B

274.240 WORKMANSHIP:

- Earthing - reference Y74.3010
- Protection - reference Y74.3020
- Fixing - reference Y74.3030
- Measuring mounting heights - reference Y74.3040
- Accessories mounting heights
 - Standard - reference Y74.3050
 - For the disabled - reference Y74.3070
- to be co-ordinated and confirmed prior to installation. for tender purposes the above schedules are to be used.

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

- Supply earthing and bonding components as specified in section V20. These standards apply to the whole of this specification.

280.030 EARTH ELECTRODES:

- Application For the serving of the lightning protection system.
- Earth electrodes for lightning protection systems.
 - Rod - reference Y80.2040A
 - Building or structural element - reference Y80.2040C

- Earth electrodes for system earthing.
 - Rod - reference Y80.2040B
 - Building or structural element - reference Y80.2040D
- Earth electrode clamps
 - Reference Y80.2060A
- Earth electrode inspection facilities
 - Reference Y80.2070A
- Earth electrode tank penetration seal
 - Reference Y80.2080A

280.040 EQUIPOTENTIAL BONDS:

- Main equipotential bonds
 - Reference Y80.2090A
- Supplementary equipotential bonds
 - Reference Y80.2100A

280.050 EARTHING:

- Circuit protective conductors
 - Reference Y80.2110A
- Earthing clamps - reference Y80.2120
- Earth busbars
 - Reference Y80.2130A
- Test links - reference Y80.2140
- Lugs/tags - reference Y80.2150
- Protective cable terminations - reference Y80.2160
- Protective conductor warning notices/labels
Reference Y80.2170
- Main earth conductor - reference Y80.2180
- Earth bar label - reference Y80.2190

280.060 WORKMANSHIP:

- Clean earth distribution - reference Y80.3010
- Dissimilar metals - reference Y80.3020
- Tape joints
 - Copper - reference Y80.3030A
- Stranded conductor joints - reference Y80.3040
- Protective cable terminations
 - Reference Y80.3050A
- Earth electrodes
 - Reference Y80.3060A

281.000 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Comply with work section general clauses reference Y81.1000 and those detailed below.

- Carry out testing and commissioning of electrical services as section V20. These standards apply to the whole of this specification.

281.020 TESTING AND COMMISSIONING:

- Incorporated equipment characteristics

- Reference Y81.2010A
- Prospective short circuit current (I_p)
 - Reference Y81.2020A
- Initial verification
 - Reference Y81.2030A
- Test equipment and consumables
 - Reference Y81.2040A
- Testing
 - Reference Y81.2050A
- Continuity of protective conductors
 - ac or dc - reference Y81.2060A
- Earth fault loop impedance (ZS)
 - Reference Y81.2070A
- Settings and adjustments - reference Y81.2080
- Standby generators
 - Reference Y81.2090A
- HV and LV switchgear
 - Reference Y81.2100A
- HV power transformers
 - Reference Y81.2110A
- Specialist installations
 - Fire detection and alarm systems.
Reference Y81.2120A
 - Lightning protection - reference Y81.2120B
 - Fire protection of electronic data processing installations - reference Y81.2120C
 - Emergency lighting installations
Reference Y81.2120E
- Calibration - reference Y81.2130
- Certification and reporting
 - Reference Y81.2140A
- Completion certificates
 - Reference Y81.2150A
- Records - reference Y81.2160

281.030 WORKMANSHIP:

- Conductive parts - reference Y81.3010
- Phase sequence - reference Y81.3020
- High voltage tests
 - Reference Y81.3030A
- Cables
 - LV buried cables - reference Y81.3040A
 - LV and HV buried cables - reference Y81.3040B
- Conduit, trunking and ducting - reference Y81.3050

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Comply with work section general clauses reference Y82.1000 and those detailed below.

- Supply identification - electrical as specified in section V20. These standards apply to the whole of this specification.

282.020 LABELS AND NOTICES:

- Reference Y82.2010A

282.030 LABELS AND NOTICES MATERIALS:

- Material
 - Reference Y82.2020A
- Fixing
 - Reference Y82.2030A
- Arrangement
 - Reference Y82.2040A
- Lettering and size of labels and notices
 - Reference Y82.2050A

282.040 CONDUCTOR ARRANGEMENT:

- Reference Y82.2060A

282.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

- Reference Y82.2085

282.050 EQUIPMENT SIGNS AND LABELS:

- Safety signs
 - Reference Y82.2070A
- Plant and equipment labels
 - Reference Y82.2080A
- Maintenance notices - reference Y82.2090
- Colour corrected light fittings - reference Y82.2100
- Motors and starters labels
 - Reference Y82.2110A
- Engraved accessory plates
 - Reference Y82.2120A
- Switchgear
 - Reference Y82.2130A
- Distribution boards - reference Y82.2140

282.055 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y82.2085

282.090 CONDUIT AND TRUNKING COLOUR CODING:

- Reference Y82.2180A

282.100 CABLE IDENTIFICATION:

- Cable identification
 - Reference Y82.2190A
- Terminal marking and conductor identification
 - Reference Y82.2200A
- Underground cable identification
 - Reference Y82.2210A

- Cable conductor colour coding
 - Reference Y82.2220A
- Cable jointing and termination - reference Y82.2230
- Cable sheath identification - internal
 - Reference Y82.2240A
- Cable sheath identification - external
 - Reference Y82.2250A
 - Scotland - reference Y82.2250B

282.110 ADDITIONAL SAFETY SIGNS:

- Reference Y82.2260A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

- Carry out fixing to building fabric as specified in work section V20. These standards apply to the whole of this specification.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
 - Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
 - Reference Y90.3070A
- Fixing to metalwork
 - Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
 - Reference Y90.3090A

V21 GENERAL LIGHTING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall design, install, test, commission and demonstrate the lighting installation within the new building in accordance with this specification document and the employer's requirement documents.

100.040 CONTROL REQUIREMENTS

The lighting system is to be complete with an automated control system with manual override and is to include the facility for user dimming and daylight dimming.

- Dimming
 - Ensure dimming system reduces rather than diverts the energy supply.
 - Provide dimming photoelectric lighting controls to all areas where daylighting levels are sufficient to provide a significant proportion of the required design illuminance levels. Ensure that the sum of daylight and electric lighting always reaches the design level by sensing the total illuminance in the controlled area and adjusting the level of artificial light to meet the design requirements.
 - The system is to be an absence based addressable system, wired from area controllers.

100.045 LIGHTING SYSTEMS EMC:

Ensure that all elements of the lighting systems, including lamps, luminaires and control components are fully compatible with all other electrical, electronic and radio frequency installations.

- Provide documentary evidence of compatibility.
- Carry out site tests and demonstrate compatibility in co-operation with other system suppliers as necessary.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

273.000 LUMINAIRES AND LAMPS

273.010 GENERAL:

Comply with work section general clauses reference Y73.1000 and those detailed below.

- Supply luminaires and lamps as schedule reference V21 and shown on the luminaire schedule.

273.050 LAMPS:

- Manufacturer and reference Osram
 - Philips
 - Sylvania
 - Or approved equivalent
- Types of high efficiency lamp for non-daylight areas
 - Reference Y73.2165
- Tungsten filament lamps
 - Reference Y73.2170A
- Fluorescent lamps
 - Reference Y73.2180A
- Tungsten halogen lamps - reference Y73.2185A
- High pressure mercury vapour lamps - reference Y73.2190
- Metal halide lamps - reference Y73.2195
- High pressure sodium vapour lamps - reference Y73.2200
- Low pressure sodium vapour lamps - reference Y73.2210
- Transformers for LV luminaires - reference Y73.2220A
- Lamp manufacturer - reference Y73.2230

273.060 SUPPORT SYSTEM:

- Type

- Application Refer to the luminaire schedule for specific application.
- Conduit
 - Steel - reference Y73.2240A
 - Installation
 - Support from conduit - reference Y73.4120
 - Suspension - reference Y73.4160
 - Connections to luminaires - reference Y73.4220
 - Direct to conduit
 - Terminal box - reference Y73.4230A
 - At luminaire - reference Y73.4230B
 - Conduit suspension - reference Y73.4270
- Rod
 - Cadmium plated steel - reference Y73.2250A
 - Installation
 - Suspension - reference Y73.4160
 - Suspension by rod - reference Y73.4170
 - Connections to luminaires - reference Y73.4220
 - Rod or chain suspension - reference Y73.4280
- Chain
 - Cadmium plated steel - reference Y73.2260A
 - Installation
 - Suspension - reference Y73.4160
 - Suspension by chain - reference Y73.4180
 - Connections to luminaires - reference Y73.4220
 - Rod or chain suspension - reference Y73.4280
- Flexible cord
 - Reference Y73.2270A
 - Installation
 - Suspension - reference Y73.4160
 - Suspension by flexible cord - reference Y73.4190
- Wall brackets
 - Reference Y73.2280A
 - Installation
 - Installation of wall mounted fittings - reference Y73.4050
 - Height 2M to centre line.
- Ball and socket - reference Y73.2290
 - Installation
 - Suspension - reference Y73.4160
 - Suspension by ball and socket - reference Y73.4200
- Wire rope - reference Y73.2295
 - Installation
 - Suspension - reference Y73.4160

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Comply with work section general clauses reference Y74.1000 and those detailed below.

- Supply accessories for electrical services in accordance with schedule reference V20 and as found in the appendices of this specification

PART 3 SPECIFICATION CLAUSES SPECIFIC TO V21

300.000 GENERAL

300.030 ELECTROMAGNETIC COMPATIBILITY:

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the systems and with any other systems installed in the same location.

300.040 LIGHTING CONTROL SYSTEM:

- Type
- Supply and install the following systems from Simmtronic using the Specs 3 lighting control system:-

Independent lighting control systems to the areas shown on the system drawings comprising of:-

- 1) Lighting control modules (LCM's) for the easy connection of luminaires.
- 2) Combined presence/photocell detectors suitable for absence detection and regulating photocell.
- 3) Push to make switches in the positions shown on the drawings, capable of overriding the presence/ photocell detectors and dimming the luminaires to the preferred level.
- 4) 4 button scene setting panels providing 2 presets and on/ off facility.
- 5) Area controllers
- 6) Commissioning by Simmtronic using a laptop to commission the area controllers.

Prior to installation, the contractor is to verify that the proposed lighting control system is compatible with the ballasts installed in the fittings, this is to be a final check to ensure no changes in manufacturing information have occurred between the specification being written and the order for equipment being placed.

300.060 LIGHTING EQUIPMENT SCHEDULES:

Supply lighting equipment in accordance with

- Schedule located on Waterman Building Services lighting drawing reference WBS-63-GD-E01

310.000 PRODUCTS/MATERIALS

310.010 LIGHTING CONTROL EQUIPMENT:

- Manufacturer and reference refer to manufacturers schedule.
 - Or approved equivalent

320.000 WORKMANSHIP

320.010 WORK ON SITE:

Ensure that all building works are completed and service connections are provided,

- By the electrical contractor.

320.020 INSTALLATION:

Install, commission and set to work lighting control equipment in accordance with manufacturer's recommendations and BS 7671. Install infra-red transmission systems and co-ordinate the installation of infra-red systems in the same area in accordance with BS 7693.

320.030 QUALITY CONTROL:

Handle, store and install equipment and components of the lighting control system in accordance with the manufacturer's recommendations.

- Obtain all equipment and components from a single source.

Inspect all equipment and components on delivery, before fixing and after installation, and reject and replace any that are defective.

Record all commissioning, measurements and tests.

V22 GENERAL LV POWER

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test, commission and demonstrate an LV power distribution system within the new building in accordance with this specification and the employer's requirement documentation.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Comply with work section general clauses reference Y60.1000 and those detailed below.

- Supply conduit and cable trunking as specified in section V20 These standards apply to the whole of this specification.

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Comply with work section general clauses reference Y74.1000 and those detailed below.

- Supply accessories for electrical services in accordance with schedule reference as found in the appendices of this specification

V40 EMERGENCY LIGHTING

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test, commission and demonstrate an emergency lighting scheme for the new building in accordance with BS 5266, this specification document and the employer's requirement documents.

100.040 CONTROL REQUIREMENTS

The emergency lighting is to be controlled for testing utilising secret key type switches located adjacent to the relevant distribution board.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

273.000 LUMINAIRES AND LAMPS

PART 3 SPECIFICATION CLAUSES SPECIFIC TO V40.

300.000 GENERAL

300.010 EMERGENCY LIGHTING SYSTEM:

- Type
Self contained luminaires as defined in the luminaire schedule and as shown on the system drawings.

300.020 ILLUMINATION OF SIGNS:

- Application all illuminated exit signs.
Illuminate exit, emergency exit and escape route signs so that they are legible at all times, by
 - lamps contained within sign.

320.000 WORKMANSHIP

320.010 INSTALLATION:

Install, test and commission emergency lighting system in accordance with BS 5266-1 and BS EN 50172.

320.020 SELF-CONTAINED LUMINAIRES:

Ensure self-contained luminaires are not installed where temperatures are likely to exceed manufacturers recommended maximum.
Ensure fluorescent luminaires are not used at temperatures below that specified by manufacturer.

320.030 EQUIPMENT:

Install equipment in accordance with manufacturer's recommendations.

V41 STREET/AREA/FLOOD LIGHTING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall install, test, commission and demonstrate the new external lighting scheme for the building and the external areas affected by this contract so provide lighting to the surrounding areas and security lighting to the building, in accordance with this specification document and the employer's requirement documents.

100.030 SYSTEM DESCRIPTION

The lighting is to be provided by a combination of building mounted luminaires, columns and bollards

100.040 CONTROL REQUIREMENTS

The external lighting is to be controlled via a timeclock, photocell and contactor arrangement so that the lighting can be programmed to come on between defined periods and when there is insufficient daylight present.

The contactor is to be located adjacent to the distribution board serving the external lighting. The timeclock is to be a Sangamo solar quartz self adjusting timeclock with override facility, located next to the contactor.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

273.000 LUMINAIRES AND LAMPS

273.010 GENERAL:

- Supply luminaires and lamps

273.070 COLUMNS AND BOLLARDS:

- Type Columns to be complete with fused cut out unit at the base of the column, suitable for the looping in of cables between columns.
Manufacturer and reference refer to match the existing on site.
 - Or approved equivalent
- Steel - reference Y73.2300A
- Aluminium - reference Y73.2300C
- Columns and bollards installation
 - Reference Y73.4210A

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

280.040 EQUIPOTENTIAL BONDS:

- Supplementary equipotential bonds
 - Reference Y80.2100A

310.000 WORKMANSHIP

310.010 INSTALLATION:

Install equipment for street, area or flood lighting in accordance with manufacturer's instructions.

V51 LOCAL ELECTRIC HEATING UNITS

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

Supply and install the handriers within all toilet drawings as indicated on the architects drawings. The contractor shall design, install, commission and demonstrate the supplies to the local electric heater units. The supplies shall be switch fused spur at ceiling level and install a recessed conduit to the handrier position terminating onto a stop end box. Fix the handrier to the stop end box with back entry cable installation using heat resistant cable. The handriers are to generally comprise of the following:-

Manufacturer and reference

Wandsworth HD2 moulded case infra red unit.

Or approved equivalent

Duty

Heating element rating 2KW

Style

Hand drier.

Casing

Material White moulded case

Controls

Operation by infrared detector.

Timed cut-out.

Safety cut-out.

Mounting

Surface mounted.

Method of removal for maintenance To be fixed to back entry recessed conduit, which in turn is to be served from the adjacent switch fused spur.

Characteristics
Safety to BS EN 60335-2-23.

W10 TELECOMMUNICATIONS

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test and commission, then demonstrate the new telecommunications system in the new building. The contractor will be responsible for liaising with BT for the installation of the telephone services to the lift. The works will include the arranging of the installation of the duct services inline with the agreed contract programme.

The works shall include the provision of dedicated BT Internal lines as shown on the system drawings.

W15 FACILITIES FOR THE DISABLED

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION:

The contractor shall design, install, test, commission and demonstrate the disabled facilities within the building. As such the contractor shall provide disabled toilet alarms linked back to the indicator panel unit at reception.

100.040 CONTROL REQUIREMENTS:

The system should clearly identify which disabled alarm has been activated. It shall be impossible to reset or silence the alarm without entering the disabled toilet the alarm was triggered in. Each of the disabled toilets will have a local overdoor buzzer and sounder so as to indicate to people nearer than the main reception.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W15

300.000 GENERAL:

300.010 ELECTROMAGNETIC COMPATIBILITY:

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the systems and with any other systems installed in the same location.

310.010 DISABLED ALARM CONTROL:

- Manufacturer and reference refer to manufacturers schedule.
 - Or approved equivalent
- Method of displaying calls
 - Individual lamp for each call point.
 - remote indication is also to be provided at the main reception desk area of the College.
- Audible warning of calls is to be provided both locally and at the remote station.

310.020 DISABLED ALARM CONTROL POWER SUPPLY UNIT:

- Output
 - to be complete with battery back up so as to enable operation in the event of mains failure.

320.000 WORKMANSHIP:

320.010 WORK ON SITE:

Ensure that all building works are completed and service connections are proved,

- By others.
- By the electrical contractor

320.020 INSTALLATION:

Install, commission and set to work facilities for the disabled in accordance with the manufacturer's recommendations and the appropriate standard.

320.030 QUALITY CONTROL:

Handle, store and install equipment and components of the facilities for the disabled in accordance with the manufacturer's recommendations.

- Obtain all equipment and components from a single source unless otherwise instructed.
- Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.
Record all commissioning measurements and tests.

W20 CCTV

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall design, install, test, commission and demonstrate a CCTV system within the new building in accordance with this specification and the employer's requirement documents.

Scope of Work

To design, supply and install a high quality CCTV system in accordance with the following information.

The system shall include all materials, equipment and wiring required to install the complete CCTV System. The system shall include but not be limited to one or more digital video recorders, cameras, mounts, monitors, data protection signage and audit trail pack

The installation shall include the laying of all cables required for connection of the cameras, recording and control equipment and other devices along with connections to the power supply as appropriate to the design. All cabling shall conform to the requirements and recommendations of the CCTV equipment manufacturer. Any openings /chasing in walls, ceilings or floors shall be made good.

All equipment and materials used shall be standard components, regularly manufactured, regularly utilized in the manufacturer's system.

All systems and components shall have been thoroughly tested and proven in actual use.

All systems and components shall be provided with the availability of a toll free 24-hour technical support phone number from the manufacturer. The phone number shall allow for immediate technical assistance for either the dealer/installer or the end user at no charge.

All systems and components shall be provided with an explicit manufacturer warranty

The new system shall match and be compatible with the existing CCTV installation.

The new system will be set up so the cameras can be monitored on the existing system within the ball building.

Standards & Specialist

The contractor shall employ an approved specialist to undertake the installation of the complete CCTV system. This contractor shall be same contractor who installed and/or maintains the existing system.

The contractor must be NACOSS approved and the design and installation of the system shall comply with NACOSS requirements and all relevant British Standards and Codes of Practice.

System Design

The CCTV system shall be designed, installed and commissioned in accordance with, and all elements shall meet the requirements of NACP20, any variations in design shall be identified at tender stage, no additional costs will be accepted for variations not identified at this stage.

Recording Schedule

All cameras shall be recorded continuously at 3fps, and on motion at 3fps during the remainder of the day. All recording shall be stored for 14 days.

Digital Video Recorder

The digital video recording, management and transmission system shall be designed to meet the requirements of business and government surveillance applications. The system shall offer network connectivity to other family components and provide all video and control data over the Ethernet network to other recorders and workstations. The number of network-connected components is only limited to the number of assigned IP addresses.

The system shall offer multiple continuously recorded digital video channels onto a hard drive medium. The system shall employ proprietary software run on a Microsoft® Windows 7 Embedded® platform. The software shall employ a proprietary optimized MPEG4 compression algorithm in the video digitizing scheme. The networked system shall be comprised of recorders and workstations. This specification shall refer to the recorder's performance. The recorder, without any degradation to frame rates or resolution, shall simultaneously offer:

- 1) 16-channel continuous video recording.
- 2) 16-channel continuous video playback.
- 3) 16-channel continuous video transmission to the Ethernet network.
- 4) User selectable video archiving of pre-existing recording.

The recorder shall offer features including the simultaneous display, playback, distribution and archive of multiple channel video. The recorder shall collect up to 16 channels of analogue video and digitize them for the purpose of display, archive and requested distribution across the Ethernet network. Cameras shall be the primary analog input devices. Each channel of video data shall have the capability of being displayed, played back, distributed and archived locally. The recorder shall also have full WAN and Internet capability, offering expandability beyond a corporate LAN. The recorder shall employ a compression algorithm based on:

- 5) Optimized MPEG4 and JPEG.
- 6) User selectable resolution not requiring a need to restart the application recorder. It shall be selectable using a 4-position bar, from the Main Screen. There shall be 4 levels of resolution (Frame, Field, CIF, HCIF) with 2 levels of compression (Normal, Full) comprising 8 quality levels total, which shall be accessible from the Setup menu selections.

Kollector Elite shall use an MD5 type video authentication algorithm. MD5 is a standard authentication that is based on a 128-bit message used to verify data integrity.

The local recorder shall have a 30, 60, 120 and 240 fps version. All versions shall, by default, divide the total fps by the actual number of camera inputs. The actual fps rate shall have the ability to be set, by camera. The recorder shall have external RAID device connection capability to extend the total recording time beyond the limits of the specific internal hard drive.

The 240 fps version shall have a daily hard drive usage of 2 to 128 GB. This usage shall be based on Quality settings ranging from Q1 to Q8, 24 hours per day of activity ranging from Low to Very High, 50% of time movement detection and Normal compression (optimized MPEG4). Typical hard drive usage normal scene activity under the same conditions shall range from 2 to 64 GB per day.

The 120 fps version shall have a daily hard drive usage of 2 to 64 GB. This usage shall be based on Quality settings ranging from Q1 to Q8, 24 hours per day of activity ranging from Low to Very High, 50% of time movement detection and Normal compression (optimized MPEG4). Typical hard drive usage normal scene activity under the same conditions shall range from 2 to 32 GB per day.

The 60 fps version shall have a daily hard drive usage of 2 to 32 GB. This usage shall be based on Quality settings ranging from Q1 to Q8, 24 hours per day of activity ranging from Low to Very High, 50% of time movement detection and Normal compression (optimized MPEG4). Typical hard drive usage using normal scene activity under the same conditions shall range from 2 to 16 GB per day.

The 30 fps version shall have a daily hard drive usage of 2 to 16 GB. This usage shall be based on Quality settings ranging from Q1 to Q8, 24 hours per day of activity ranging from Low to Very High, 50% of time movement detection and Normal compression (MPEG4). Typical hard drive usage using normal scene activity under the same conditions shall range from 2 to 8 GB per day.

A line of "V" models shall be available to support audio recording and playback. The recorder's audio data storage rate shall be approximately 0.4 GB/12 hour day/microphone.

The networked system shall be comprised of:

- 1) The software platform.
- 2) Recorders.
- 3) Workstations.

The software installed in all recorders and workstations shall be similar in:

- 4) Graphical User Interface, therefore an operator shall need to learn only one interface for both control and programming of the system.
- 5) Functions, offering the ability to be remotely configured from any recorder or workstation.

The recorder shall also offer a full multi-user authorization login application. This application shall offer levels of authorization based on defined sites and functions. In addition, a full setup utility shall be available for the Administrator to configure authorizations. The login window shall consist of a User Name and Password field. A user shall be able to login as an Administrator or Guest. Guest authorization shall be configurable for specific system operations. The software shall offer a full multi-user authorization process as follows:

- 7) User groups shall be created once globally and shall appear in all recorders and workstations connected to the network.
- 8) Users shall be created once globally and shall be given rights to particular groups.
- 9) Groups shall be authorized and given specific access to each server, permitting "function-specific" profiles.

- 10) Users created and authorized for each machine shall be able to login to any recorder and workstation and automatically have their group rights for that machine follow them.
- 11) There shall be no virtual limit on the amount of Groups and Users that can be authorized in the software.
- 12) The local recorder shall allow for each group to be authorized or denied access, per component, to:
 - a. Login.
 - b. Logout.
 - c. Setup:
 - 1) Network Setup & Site Name.
 - 2) User and Group Management.
 - 3) Site Authorization.
 - 4) Auto Login.
 - 5) Macro Create-Edit.
 - 6) Alarm Setup.
 - 7) Authentication Settings.
 - 8) Camera, Microphone and Device Setup.
 - 9) Pre & Post Alarm.
 - 10) Storage Database Utilities.
 - 11) Auto Record.
 - 12) Exit to OS.
 - 13) RS-232/422/485 Setup.
 - 14) Picture Quality and Resolution Setup.
 - 15) Registration
 - 16) Manual Record and Playback Setup
 - 17) Central Failure Notification
 - 18) Recording Verification
 - 19) Auto/Manual FPS Setup
 - 20) LTU Setup
 - 21) Map Sets
 - 22) Reset Nucleus
 - 23) Backup and Restore
 - 24) Settings Summary
 - 25) Scheduler for Macros
 - 26) Reports.
 - 27) Device Status
 - 28) Alarm History
 - 29) Recording Status
 - 30) Audit Log
 - 31) RVS Log
 - 32) CFN Log
 - 33) Save Logs
 - 34) Scheduler/Macro
 - 35) Run Macro
 - 36) Stop Macro
 - 37) Stop all Macro & Scheduler
 - 38) Resume Scheduler
 - 39) Show Macro
 - 40) Shutdown
 - g. Manual Record
 - h. Stop
 - i. Quality
 - j. Change FPS
 - k. Change LowBandWidth
 - l. Site Map
 - m. Picture
 - n. Audio
 - o. Controls

- p. Matrix
- q. Export
- r. Print
- s. Live View
- t. Controls.
- u. PTZ
- v. Playback

All users created shall be able to login to the local system. A user, given appropriate access, shall be able to completely configure the local recorder. The programming shall include the complete operation of the recorders, including but not limited to:

- a. Camera titles.
- b. Alarm conditions.
- c. System reports.
- d. PTZ control.
- e. Relays.
- f. Alarms.

The recorder shall also offer a GUI capable of complete configuration and operation. This capability is comprised of monitoring, recording and playback. Sub-features such as defined areas for video display and control, toolbars, site and device trees, video controls, and dialog areas shall be provided.

Configuration of the system shall include setup of:

- 13) Network Settings and Site Name.
- 14) Site Authorization.
- 15) Auto Login.
- 16) Storage Database.
- 17) Registration.
- 18) Camera, Microphone, Detector, Relay, Speaker.
- 19) Macro Editor.
- 20) Schedule for Macros.
- 21) Alarms.
- 22) Pre and Post Alarm.
- 23) Auto Record.
- 24) Manual Record and Quality Buttons on Screen.
- 25) Recording Verification.
- 26) Picture Quality and FPS Priority.
- 27) Auto/Manual FPS.
- 28) Authentication.
- 29) Map Sets.
- 30) RS232/422/485 Controls.
- 31) LTU

The Nucleus-Specific parameters are:

- a. Reset Nucleus.
- b. User & Group Management.
- c. Central Failure Notification.

The Main Window shall provide a multi-channel display area containing up to 16 connected cameras, a Site and Device Tree, a Navigator Window, a Control Dialog Display Area, a Toolbar, a Display Mode Control Area, a Function Control Area, a Video Display Controls Area and an Other Controls Area. Each area shall contain the necessary controls to operate and setup the system.

The Main Window shall provide the following:

- 32) Site and Device Tree depicting all cameras.
- 33) A multiscreen display area that allows for screen displays of:
- 34) Single camera.

- 35) Quad.
- 36) 3 × 3.
- 37) 4 × 4.
- 38) 6 way.
- 39) Full screen of any of the above selected multiscreen displays shall allow for the viewing of the particular multiscreen in full screen mode by hiding the graphical user interface.
- 40) Access to all Programming menus.
- 41) User selectable resolution shall include capture sizes of:
 - 42) 360 x 122 pixels, 432 x 146, PAL.
 - 43) 360 x 244 pixels, 432 x 293, PAL.
 - 44) 720 x 244 pixels, 864 x 293, PAL.
 - 45) 720 x 480 pixels, 864 x 586, PAL.
 - 46) Normal MPEG4 type (periodic refresh).
 - 47) Continuous recording JPEG.
 - 48) On demand recording of video currently viewed shall allow for the recording of any local camera.
 - 49) Viewing of live cameras shall be performed by:
 - 50) Clicking on the desired camera.
 - 51) "Drag-and-Drop" operations of cameras from the Site and Device Tree to the appropriate multiscreen quadrant.
 - 52) "Drag-and-Drop" operation of the recorder from the Site and Device Tree to the appropriate multiscreen.
 - 53) All recorders shall provide video for duplicate and simultaneous recording over the network by all remote recorders and workstations.
 - 54) All recorders shall be able to simultaneously record, view and send:
 - 55) All cameras physically connected to recorders at the specified resolution (depending on recorder utilized) without any reduction in quality.
 - 56) All recorders shall be able to be viewed by remote recorders.

The Site and Device Tree shall provide a physical list of all known locally connected cameras and PTZ cameras. The cameras and PTZ cameras shall be represented by graphical symbols. Components in the Site and Device Tree shall be selectable and configurable. PTZ controls shall operate as follows:

- 57) When a dome camera is selected, an operator shall be able to:
 - 58) Control pan, tilt, zoom, iris and focus.
 - 59) Execute preset positions.
 - 60) Program preset positions.
 - 61) Complete programming of menus embedded in the selected dome.
 - 62) All PTZ programming and control shall be local.
 - 63) PTZ control shall be performed on the video screen without the need for an operator to click on any arrows depicting direction of the device to be moved.
 - 64) The PTZ control shall be fully variable and shall permit an operator to obtain higher pan and tilt speeds by simply clicking-and-dragging the mouse cursor on the video screen.

The Navigator Window shall graphically display recorded video. It shall contain all function buttons necessary to access the video on-screen. The Navigator Window shall depict, in a notepad style, the following:

- 65) All cameras connected to the recorder.

Video retrieval shall be performed by:

- a. Selecting the cameras to be played back.

- b. By "drag-and-drop," similar to the live view, selected cameras shall be inserted into the multiscreen displays so that an operator can view a mix of previously recorded cameras and live video on the same screen.
- c. When cameras are selected for playback, the notepad shall provide a graphical interface depicting bars that indicate video previously recorded as well as all alarmed video.
- d. The playback interface shall offer the ability to playback cameras:
 - e. One by one.
 - f. Time synchronized (exact time line that the cameras were recorded in).
 - g.. As recorded episodes using the Museum Search feature.
 - h. Record them as avi files to the storage location.

The Control Dialog Display Area shall provide a space to work in conjunction with the Other Controls Area. When one of the Other Controls is selected, the corresponding button palette shall appear in this area.

The Toolbar shall provide access to all major functionality of the system. The Schedule/Macro, Reports, Setup, Logout and Shutdown buttons shall be accessible in this area. The Schedule/Macro button allows the running of preconfigured combinations of camera, sensor and PTZ programmed routines.

The Reports button shall allow the viewing of system status reports. The Setup button shall allow configuration of the system components, authorizations, sites, authentication, utilities and schedules/macros. The Logout button shall allow leaving the system without closing the software. Access to programming and more advanced screens shall be done by means of an immobile, permanently-docked toolbar located on the top Live screen.

There shall be a Recording Verification System (RVS) used to identify and log any recording errors encountered during normal system operation. The log shall be manually reviewed for possible video segment errors earmarked with a Recording Site, Device Name, Date/Time, Verified Site, Macro Name and Error Description stamp.

There shall be a Central Failure Notification (CFN) System used to identify all possible site errors. The CFN shall be accessible from only the Nucleus unit. The log shall be in a time/date order and be manually reviewed for errors.

There shall be a Microsoft Windows Personal Firewall feature installed to provide system security against viruses, hacking and other malicious intent against the system. The firewall shall be fully configurable and also have the ability to be disabled, if desired.

There shall be a Site Map feature. It shall allow the installation and configuration of a custom screen map used to identify and access site-installed components (recorders, cameras, microphones, etc.). The ideal map shall be a jpg image format in the size of 980 x 735 pixels. In addition, text boxes and sub-maps shall be added to maps, further defining the layout. The utility shall also provide full installation, configuration and editing of maps. Maps of smaller sizes shall have the ability to be moved anywhere on the screen.

There shall be a Language Translation Utility (LTU). It shall allow a manual translation of the entire GUI into any language that uses varying alpha-numeric character sets. The utility shall also store files for simple changing from one language to another.

The Other Controls Area shall provide a palette of buttons that only become active when a valid device is selected from the Site and Device Tree. When active, the selection of these buttons shall cause the Control Dialog Display Area to display

additional control information. The Other Controls are Playback, PTZ, Controls, Print, Export and Picture.

There shall be several high-level configuration features allowing custom setup of the system.

The System Configuration feature shall be comprised of a Main Settings Menu. This menu shall allow setup of the network and sites, macros, devices, authorization, Alarms, Auto Login, Schedules, Auto Record, Storage Database Utilities, Authentication, Protocol Controls, Manual Record, Registration and Picture Quality.

The network and sites configuration shall be performed using a dedicated set of screens. The network portion of this setup shall allow setup of a system Nucleus and Backup Nucleus. The Nucleus shall act as the coordinator of all running system applications. The Backup Nucleus shall act as the hot stand-by Nucleus in the event that the primary Nucleus goes offline, providing uninterrupted system functionality. The network portion of this setup shall also allow all appropriate networking features including each server IP, Subnet and Gateway.

Macro configuration shall be performed using a dedicated set of screens. Macros can be defined for recorded or displayed/played cameras, command duration, local recording location, local viewing, device ID, picture quality, refresh mode, recording rate (fps) and related devices (sensors). Macros shall allow an authorized user to create and schedule software commands that shall include but not be limited to:

- 1) Sequencing cameras, including multiscreen displays, in the recorder.
- 2) Record various cameras at various frame rates.
- 3) Receive alarm condition from any recorder and workstation on the network.
- 4) An authorized user shall be able to program and execute macros locally.
 - 5) The Schedule/Macro button shall allow the running of preconfigured combinations of camera, PTZ camera, sensor and PTZ programmed routines. The Reports button shall allow the viewing of system status reports. The Setup button shall allow configuration of the system components, authorizations, sites, authentication, utilities and schedules/macros. The Logout button shall allow leaving the system without closing the software.
- 6) Macro scheduling shall include but not be limited to:

Day of the week when the particular macro is active.

Start and end time for when a macro is active. If a macro is to run continuously or not. A macro shall be able to run every:

- 1) 1. 5 min, 10 min, 1/4 Hour, 1/2 Hour, 3/4 Hour, 1 Hour, 2 Hours, 3 Hours, 4 Hours, 6 Hours, 8 Hours, 12 Hours.
- 2) A macro shall be able to be scheduled to run for 1-256 cycles.

Device configuration shall have the ability to configure system recognition and operation. Valid devices shall be cameras (with PTZ), and sensors. All devices shall be assigned a unique ID number and title descriptor. Devices shall also be setup for RS-422 protocol and supported with existing manufacturer's drivers where applicable.

Authorization rights setup shall be performed using the Site Authorization screen. Group and user rights shall be available to configure, by specific site. Rights shall provide authority to perform all system functions.

Alarm configuration shall be performed using system macros. Alarms shall be programmed to annunciate under the conditions specified in the macro. Alarms

shall be triggered by physical sensors, detected video loss, detected video motion, or messages received over the network.

Storage Database Utilities shall allow setup and usage of detected hard disks locally. Any local hard drive shall be a candidate to add to the storage database. Once established, certain recorders shall use established local hard disks for recording data.

Authentication shall be configured using the Authentication Settings screen. Authentication display shall be established by site and affect the destination video. A check box shall be available to enable the video authentication symbol (A). This symbol shall verify that the video generated is authentic.

Operation of the system shall be facilitated by the use of a monitoring screen whereby a security operator can perform a full scope of surveillance duties on the recorder using a mouse and keyboard.

The recorder shall use an Intel Core i5 processor (minimum) for the 120 and 240 fps recorders and an Intel Core i3 processor (minimum) for the 30 and 60 fps units running Microsoft Windows XP Embedded. There shall be a variety of hard disk sizes from 120 to 1200 GB. The front panel shall contain a key locked user door making accessible a CD-RW drive, power switch, keyboard port and mouse port.

The recorder shall also be equipped in a standard 19 in. (482 mm) rack mount with carry handles. The rear panel shall contain 16 video input ports, power switch, 4 USB connectors, 1 serial port, relay screw terminal block, sensors screw terminal block, PTZ screw terminal block, (optional) audio input screw terminal block, VGA monitor port, (optional) 4-channel analog video matrix output, network port and 2 16-channel video looping ports.

The rack to house the CCTV recording equipment will be provided by the contractor and housed within the security office area.

The recorder shall have a nominal system live, playback and transmission video rate of 30, 60, 120 or 240 fps, based on selected model. This rate shall be divided, by configuration, among the total camera inputs. It shall have 4 levels of resolution with 2 levels of compression comprising 8 quality levels. The maximum displayed resolution shall be 720 × 480 (864 × 586, PAL) pixels per image, scalable for speed and quality. The supported, and automatically detected, video formats shall be NTSC, PAL, EIA and CCIR.

The 30, 60 and 120 fps recorder models shall be 7.0 inches (178 mm) high (4 RU), 19.0 inches (482 mm) wide and 22.0 inches (559 mm) deep. The 240 fps recorder models shall be 7.0 inches (178 mm) high (4 RU), 19.0 inches (482 mm) wide and 24.25 inches (616 mm) deep. All dimensions exclude rack handles and connectors. They shall weigh 50 lb (22.6 kg). They shall have a screened steel case construction and be finished in black color.

The recorder shall be Vicon Industries base models KP30, KP60, KP120 and KP240 and audio models KP30V, KP60V, KP120V and KP240V.

Cameras

Fixed Position Domes

- a) The fixed camera dome shall incorporate a fixed camera/lens combination. The camera domes shall be available for indoor in-ceiling mounting or surface-mount configurations. The colour cameras shall be super-high-resolution (550 TVL) or high-resolution (480 TVL); the high-resolution version shall offer wide dynamic range. The cameras shall include an isolated power input. A clear lower dome shall be included.
- b) The camera position shall have a three direction adjustment, allowing for adjustment of pan, tilt and lens rotation (roll), for any angle of view required. The cameras shall accept 12 VDC/24 VAC. The colour cameras shall be a 1/3-inch format and shall have 0.03 fc (0.3 lux) sensitivity. Both cameras shall have electronic shutter. Cameras shall be available with a 3.3 - 12 mm auto iris Varifocal lens

PTZ Cameras

- a) The PTZ dome cameras shall have a similar performance criteria to the fixed cameras, but be suitable external environments and be complete with demister and heater facilities.

They shall be located to monitor each external façade of the building and the car park area.

They shall either be wall mounted or column mounted dependent on location and area to be covered.

Monitors

One 19" TFT monitors shall be provided, one to be installed to the security office adjacent to the recording equipment, monitors to comply with the following;

19" TFT LCD screen, 1280 x 1024 (SXGA), input sources; analogue RGB, S-video, composite video – 2x in and 2x out. 100-240vac 50/60Hz, PAL or NTSC.

Testing and Commissioning

The testing and commissioning of the system is to comply with the NACOSS codes of practice.

Wiring & Cable management Systems

The cameras shall be wired using coaxial cable with separate power supplies.

The wiring shall be enclosed throughout on the cable management systems, provided for each category of cable.

W41 SECURITY DETECTION AND ALARM

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall design, install, test, commission and demonstrate an intruder detection and alarm system in accordance with this specification and the employer's requirements documents.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W41

300.010 SYSTEM REQUIREMENTS:

Select security detection components and equipment, suitable to meet system objectives requirements.

300.020 INTRUDER ALARM SPECIALIST:

Use a security detection specialist for design development, supply, installation and testing and commissioning of complete security installation. It is suggested that the current site utilised security specialist should be invited to tender and be vetted as being proficient by the contractor.

300.090 ELECTROMAGNETIC COMPATIBILITY:

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the system and with any other systems installed in the same location, in accordance with BS EN 50130-4.

300.110 SOCIAL ALARM SYSTEM MANAGEMENT:

Ensure system is properly set to work to suit management arrangements. Instruct management and staff in system maintenance and operating procedures.

300.120 APPROVAL:

Ensure low power radio devices comply with the regulations issued under current legislation, and obtain any licences required.

- Ensure such devices comply with:
 - ETSI EN 300 330.
 - ETSI EN 300 220-1.

310.300 ALARM TRANSMISSION:

- Type
Redcare line as detailed earlier.
- Standard
 - BS EN 50131-1.
 - BS EN 50131-5-3.

320.000 WORKMANSHIP**320.010 INSTALLATION:**

Install, commission and set to work equipment in accordance with manufacturer's recommendations and

- BS EN 50131-1.
- BS EN 50134-1.
- BS EN 50134-2.
- BS EN 50134-3.
- HTM 2015.

320.030 QUALITY CONTROL:

Handle, store and install equipment and components of the security detection and alarm systems in accordance with the manufacturer's recommendations. Obtain all equipment and components from a single source unless otherwise instructed.

Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.

Record all commissioning measurements and tests.

320.040 DOCUMENTATION:

Provide full documentation to comply with

- BS EN 50131-1.

- BS EN 50134-1.
- BS EN 50134-2.
- BS EN 50134-3.

320.050 MAINTENANCE:

Prepare maintenance agreement and

- Submit for user acceptance.
- Implement for defects liability period.
- Implement until Final Certificate issued.
- Standard
 - BS EN 50131-1.
 - BS EN 50134-1.
- Emergency maintenance response to time
 - 4 hours.
- Resetting after alarm
 - From remote control centre.
 - 4 hours.

320.060 CABLE INSTALLATION:

Install cables as required. Protect cables from mechanical damage.

- Standard
 - BS EN 50131-1.
 - The protection against mechanical damage using cable containment is to be provided by the electrical contractor.
- Jointing - no joints permitted.
- Terminations
 - Crimped.
- Support intermediate wiring in,
 - Conduit.
 - Steel trunking.
 - All cable containment shall be hidden from view.

320.070 PARTIAL OPERATION:

Commission and set to work before handover of the complete system those parts and areas of the system defined in:

- Contract drawings

320.080 INSTALLATION SUPERVISOR:

Nominate the individual to be completely responsible for the installation, commissioning and setting to work. Provide such details on this individual as required.

W50 FIRE DETECTION AND ALARM

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall design, install, test, commission and demonstrate the fire alarm installation to the building in full accordance with this specification and the employer's requirement documents. The contractor shall be responsible for providing full cable sizing calculations for the fire alarm system.

All fire alarm systems will be recommissioned when the work is complete.

Wiring to be in Prysmian FP Plus enhanced cable.

100.040 CONTROL REQUIREMENTS

The fire alarm panel is to be programmed with a detailed cause and effect matrix which will be developed in conjunction with the appointed specialist and the relevant licensing bodies. The cause and effect is to be demonstrated to all relevant parties at the end of the contract and the electrical contractor is to allow for this to be demonstrated fully on a minimum of two separate occasions. The electrical contractor is to witness and document the operation of all devices on the fire alarm system and is to forward copies of this documentation prior to the system being offered for witnessing.

The system is to be fully commissioned in line with BS5839 and this will also include the recording of all audibility levels on a set of as fitted drawings, for inclusion within the O&M manual. The specialist contractor will provide a commissioning certificate similar to that detailed in BS5839 prior to handover for inclusion in the manual. A service engineers handwritten certificate or similar will not be deemed acceptable.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W50.

300.000 GENERAL

300.010 TYPE OF SYSTEM:

- Type Analogue Addressable
- Standard
 - BS 5839-1.
 - Category L - Protection of life.
 - L1: systems installed throughout the protected building.

300.020 CONNECTION TO LOCAL AUTHORITY FIRE BRIGADE:

- Private line

300.030 DETECTION ZONES:

- Show the location of zones by:-
 - specially prepared plan of building, permanently mounted adjacent to the indicator panel.
 - mimic diagram permanently mounted adjacent to indicator panel.

300.035 ALARM ZONES:

- Show the location of zone by:
 - Specially prepared plan of build, permanently mounted adjacent to the indicator panel.
 - Mimic diagram mounted adjacent to indicator panel.

300.040 CONTROL SYSTEM:

- Standard
 - BS 5839-6 Annex B.
 - BS EN 54-2 and BS EN 54-4.
- Analogue addressable.

300.060 MONITORING:

Provide all end of line and other circuit elements to ensure the system is fully monitored to comply with BS 5839.

300.080 REMOVAL OF TRIGGER DEVICE:

Provide precautions against removal of trigger devices.

- Use trigger devices wired on circuits separated from manual call points.
- Route wiring so that manual call points precede trigger devices in circuit.
- Use trigger devices that are removed only by a special tool.

- Use trigger devices with bases that provide circuit continuity with trigger device removed. Ensure that, where alarm sounders use same wiring as trigger device, removal of trigger device does not affect operation of alarm sounder.

300.110 FIRE ALARM SPECIALIST:

Engage a specialist to supply, install, commission and set to work the fire alarm system.

310.000 PRODUCTS/MATERIALS

310.010 MANUAL CALL POINTS:

- Standard
 - BS EN 50130-4.
 - BS EN 54-11.
- Protection against accidental operation - To be complete with perspex cover to protect against accidental operation.
- Mounting
 - Flush.
 - Surface.
 - Hinged cover.
 - Refer to drawings for specific mounting detail.
- Switch contact
 - Break.
- Operation
 - MCP activation response within
 - 1 second.
 - Field programmable to trigger alert or evacuate alarms.
 - Addressable.
 - Monitored.
 - Manual operation
 - Break glass.
 - Anti-fragmentation film.
 - Thumb pressure.

310.020 AUTOMATIC DETECTORS

Provide automatic fire detectors from the same manufacturers and with common facilities.

- Standard - BS EN 50130-4.
- Standard - BS ISO 7240-15.
- Plug in bases.
- Common base for all detector types.
- Addressable detector base.
 - 2 way.
 - 3 way or T.
- Detectors locking.
- Communicate detector status & address at all times
 - Monitoring of sensing elements
 - Change of response to be provided
 - Sensitivity adjustment to be provided
- Visible activation indicator.
- Visible remote indication for detectors concealed.
- Visible indication
 - Fault.
 - Standby.
- Label detector and bases with address number.
- Colour of devices - White
- Position all detectors taking into account any possible air movement.

310.030 HEAT DETECTORS:

- Type
To be heat detectors where indicated on the drawings.
- Point type
 - Standard
 - BS 5446-2.
 - BS EN 54-5.
- Types
 - Grading performed by CIE software.
 - Analogue addressable.
 - Combined sounder/sensor are to have
 - Separate addresses.
 - Removal of sensor not to inhibit sounder.
- Accessories
 - Fit line monitor device.

310.040 SMOKE DETECTORS:

- Type
To be smoke detectors only as indicated on the drawings.
- Detector type
 - Optical.
 - Point type.
 - Standard
 - BS 5446-3.
 - BS EN 54-7.
 - BS EN 14604.
 - BS ISO 7240-15.
 - Analogue addressable.
 - Sensitivity
 - Sensitivity set by CIE software.
 - Combined sensor/sounder
 - Separate addresses.
 - Removal of sensor not to inhibit sounder.
- Accessories
 - Line monitor device.
 - Anti-insect screens.
 - Anti-thunder fly fin structure.

310.070 SOUNDERS:

- Standard - BS EN 54-3
- Standard - BS 8456
- Sounder types
 - First coincidence
 - Electronic sounder.
 - Second coincidence
 - Electronic sounder.
 - Addressable.
 - Combined sensor/sounder
 - Separate addresses.
 - Wall mounted sounders
- Sounder characteristics
 - Sound power output (dBA) - Above 100 at one metre
- Colour
 - Fire red.

- Finish
 - Protection to BS EN 60529
 - Internal.

310.080 FIRE ALARM CONTROL AND INDICATING EQUIPMENT:

- Standard
 - BS 5839-1.
 - BS EN 54-2 and BS EN 54-4.
 - BS EN 50130-4.
- Functional requirements
Standard functions.
 - operation of other functions to be provided.
 - battery state indicator to be provided.
 - battery reverse polarity protection.
- Mounting
 - Flush.
- Assembly Construction
 - Material of Enclosure - metal
 - Display components
 - Behind hinged front panel.
- Degree of Protection to BS EN 60529
 - IP 43.
- Accessibility
 - By special tool
- Enclosure Finish Brushed stainless steel
- Power supply
 - Integral.
- Indication of origin of alarms
Zone indication
 - Alphanumeric display
 - LCD screen to be provided.
- General
 - One man test and commissioning to be provided.
 - Monitoring circuit to be provided.
 - Configuration data.
 - Non-volatile memory.
 - Volatile memory.
 - Alterable memory.
 - Programmable at
 - Level 2
 - Manual action at Level 3 before data change
 - Automatic check
 - 1 hour
 - 24 hours
 - Maximum addressable points controlled by a single processor.
 - 200.
 - Key switch, positions
 - Normal, key free Level 1.
 - Normal, key trapped Level 1.
 - Enable Level 2.
 - Test display.
 - Scroll.
 - Silence.
 - Sound alarm.
 - Sound alert.
 - Reset.

- Disable gas control valves and mechanical shutdown interfaces.
- Remote inputs to CIE
 - Evacuate.
 - Silence Alarm.
 - Reset.
 - Alert.
 - Programmable 2 number inputs to be provided as a minimum
- System Configuration
 - Capable of operating
 - Analogue addressable detectors.
 - One fault not to disable more than 32 detectors.
 - Capacity of addressable loop
 - Minimum 99 devices.
 - Fault protection by line isolators.
 - At each addressable device.
 - Line isolator operation time.
 - Within 2 seconds of fault.
 - Allocation of addresses independent of physical arrangement of loops.
- Basic System Functions
 - Monitor status
 - All devices on addressable loops.
 - Short circuit and Open circuit faults.
 - Incorrect addressing.
 - Unauthorised device removal or exchange.
 - Pre alarm condition.
 - Detector contamination.
 - Internal connections.
 - Interfaces.
 - Chargers.
 - Battery.
 - Remote signalling.
 - Visual Indicator Lamps
 - Power on - Green.
 - Quiescent condition manufacturers standard
 - Fire Alarm - Red.
 - Fault Warning - Yellow.
 - Disabled/Isolated - Yellow.
 - Fire zones - Red per zone.
 - Test condition - Yellow.
 - Output to fire alarm routing equipment - Red.
 - Output to fire protection equipment - Red.
 - Output to fault warning routing equipment - Yellow.
 - Push Button or Switch Controls
 - Sound Alarms/Evacuate.
 - Silence Alarm
 - Audible signal if not reset.
 - Silence Control Sounder.
 - Test Alarms.
 - Reset fire.
 - Level 1.
 - Combined with control sounder silence at Level 2.
 - Lamp Test.
 - Cancel Fault Buzzer.
 - Keypad.
 - Zone status indicators
 - Alarm.

- Fault.
 - Isolated.
- Supervision and Fault Reporting
 - Faults to be reported
 - Short circuit and Open circuit
 - Loops.
 - Sounder cables.
 - Conventional detector circuits.
 - MCP circuits.
 - Ancillary devices circuits.
 - Voice alarm system.
 - Repeat or Secondary indicators.
 - Unconfigured device.
 - Addressable device failure.
 - Device not responding.
 - Double address.
 - Incorrectly configured device.
 - Detector condition.
 - Detector removed.
 - Repeater or Remote printer failure.
 - Repeat or Secondary indicators fault.
 - Earth fault to loop
 - Main Power fault.
 - Standby Power fault.
 - PSU fault.
 - Charger fault.
 - Battery fault.
 - Battery critical.
 - Mains failure.
 - Auxiliary PSU failure.
 - Total loss of power alarm to activate
 - Fuse failure.
 - Relay Output fault.
 - System fault to indicate and buzzer to sound
 - Signalling fault.
 - Scanning or interrogation failure.
 - Processor failure.
 - Memory check error.
 - Memory configuration data loss.
 - Processor failure
 - Re-initialise, record and reset.
 - Re-initialise, reset and indicate fault.
 - Fault sounder to be provided
 - Fault indicator to be provided
 - Silence fault warning
 - Level 1.
 - Reset
 - Automatic.
 - Manual level 1
 - Test message to define and locate fault.
 - Monitor status of auxiliary units to be provided
 - Fault response time
 - Less than 100 sec.
 - Delay generation of event
 - Normal de-bounced contacts 6 seconds.
 - Fluctuating contacts (e.g. sprinkler valve flow switches) 40 seconds.

- System Management System, available at Levels as required by BS EN 54-2.
 - Management Facilities
 - Isolate and re-connect.
 - Addressable point.
 - Detector zone.
 - Sounder zone.
 - Remote centre signalling.
 - Walk-test of zones to verify detectors and sounders.
 - Interrogate sensor
 - Cleanliness.
 - Condition.
 - Display on alphanumeric display via menu system.
 - Alarm status
 - Alarm log
 - First zone alarm top field to be provided
 - Most recent zone alarm to be provided
 - Total number of alarms to be provided
 - Alarm scrolling to be provided
 - Alarm display reversion to be provided
 - System events to be recorded and printed
 - Event log capacity.
 - Loop map connections.
 - Enabled and disabled sensors.
 - Fire plan configuration.
 - Address locations.
 - Fault status to be provided and printed
 - Fault log.
 - Disablement to indicate as a fault
 - Point isolated status.
 - Zone isolated status to be indicated as a fault
 - Non-fire event status to be printed and recorded
 - Non-fire log.
 - Zone alarm status.
 - Zone fault status.
 - Clear display function for non-fire events.
 - Print, via menu system
 - Alarm status
 - Alarm log.
 - System events all
 - Event log.
 - Event log capacity 500
 - Current fault and warning logs 500
 - Weekly system audible and visible warning test (BS 5839-1).

310.140 LINE ISOLATOR MODULE

- Standard
 - BS EN 54-2.
 - BS EN 50130-4.
- Derive power from addressable loop.
- Visible LED indicator that module has tripped.
- Maximum of 15 devices per short circuit device.
- Maximum of 7 units per loop.

310.145 SHORT CIRCUIT ISOLATORS:

- Standard

- BS EN 54-17
- Visual indicator.

310.150 VISIBLE ALARMS:

- Standard
 - BS EN 54-2.
 - BS EN 50130-4.
- Audio visual alarm unit to be provided as indicated on tender drawings
- Flashing.
- Loop powered
 - Analogue addressable.

320.000 WORKMANSHIP

320.010 QUALITY CONTROL:

Handle, store and install equipment and components of the fire detection and alarm system in accordance with BS 5839 and the manufacturer's recommendations.

- Obtain all equipment and components from a single source.
- Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.
- Record all commissioning tests and provide the certification required by BS 5839-1.
- Provide manufacturer's certificates of equipment design to an approved quality management system and CIE component selection.

320.020 SMOKE DETECTOR INDICATORS:

Fit smoke detector indicators external to doors, where zone is divided into rooms.

320.030 MANUAL CALL POINTS:

- Where manual call points are sited in zones.
 - Wire into detector circuit for fire zone.
 - Wire into separate circuits to conform with detector zones.
- Wire manual call points sited on staircase landings
 - as a separate zone.

320.040 RECORD DRAWINGS AND OPERATING INSTRUCTIONS:

Provide instructions on use of installation to person responsible for use of premises. Supply the user with a logbook and certificate of installation and commissioning, in accordance with BS 5839-1, Appendix B and D.

Provide record drawings to user for maintenance and record purposes.

Show position of various items of equipment, junction boxes, etc. and sizes and routes of cables and wires. Include wiring diagrams of junction boxes and distribution cases.

- Provide circuit diagrams of fire alarm system and its components.

320.050 CABLE INSTALLATION:

Plan and install all fire detection and alarm system cables in accordance with BS 5839-1 and the cable manufacturer's recommendations.

- Run cables point to point without tees or spurs.
- Design loop load to not exceed 80% of cable capacity.
- Mark terminals at every point of connection

W51 EARTHING AND BONDING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall design, install, test, commission and demonstrate the earth bonding system to enable the automatic disconnection of electrical supplies in the event of a fault occurring, in accordance with this specification and the employer's requirement documents.

100.030 SYSTEM DESCRIPTION

Earthing to be provided in accordance with BS7671

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

280.040 EQUIPOTENTIAL BONDS:

- Main equipotential bonds
 - Reference Y80.2090A
- Supplementary equipotential bonds
 - Reference Y80.2100A

280.050 EARTHING:

- Circuit protective conductors
 - Reference Y80.2110A
- Earthing clamps - reference Y80.2120
- Earth busbars
 - Reference Y80.2130A
- Test links - reference Y80.2140
- Lugs/tags - reference Y80.2150
- Protective cable terminations - reference Y80.2160
- Protective conductor warning notices/labels
Reference Y80.2170
- Main earth conductor - reference Y80.2180
- Earth bar label - reference Y80.2190

280.060 WORKMANSHIP:

- Clean earth distribution - reference Y80.3010
- Dissimilar metals - reference Y80.3020
- Tape joints
 - Copper - reference Y80.3030A
 - Aluminium - reference Y80.3030B
- Stranded conductor joints - reference Y80.3040
- Protective cable terminations
 - Reference Y80.3050A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W51

300.000 GENERAL

300.010 STANDARDS:

Carry out electrical system earthing work in accordance with BS 7671 (IEE wiring regulations), BS 7430, Electricity, Safety, Quality and Continuity Regulations and Local Electricity Supply Authority Requirements.

- Comply with the requirements of BS EN 50310.

300.040 EXISTING INSTALLATIONS:

Check earth continuity conductors and loop impedance values of existing installation. Report defects and elements not in accordance with BS 7671 (IEE Regulations) before connecting new or modified installations to existing supply.

300.050 SOIL TESTS:

Carry out soil tests in accordance with BS 1377 to establish soil electrical resistivity and

- Redox potential (V).
- Moisture content (%).
- Dissolved salts
 - Chloride.
- pH.
- Organic acids.

300.060 RISE IN POTENTIAL IN TELECOMMUNICATIONS

Ensure the potential rise in telecommunications circuits due to power system earth faults is limited, as BS 6701

300.070 EXCHANGE OF INFORMATION:

Consult with the electricity supply company regarding the earthing arrangements of the installation. Construct the earthing system to the requirements of electricity supply company. Ensure any part of the earth fault current path provided by the electricity supply company or others is suitable for the operation of the earth fault protection to be installed. Obtain the agreement and permission of undertakings providing services which are to be bonded to the earthing system.

310.000 PRODUCTS/MATERIALS

310.020 MAIN EARTH TERMINAL:

Provide earth bar at incoming electrical service position, for each switchboard.

- Bond earth terminals and metallic structure of switch and control gear and plant.
- Connect each earth terminal to all other earth terminals by a ring conductor sized as BS 7430 and BS 7671.
- Location
 - Adjacent to main LV switch panel.
- Mounting
 - Mount earth bar on insulated supports located at 300mm centres for 25mm bar and 450mm centres for 50mm bar, giving 30mm clearance at rear of bar.
- Drill clearance holes, one for each cable plus 30% spare holes (two minimum) at 50mm minimum centres through bar for connection of cable lugs. Ensure clearance holes are minimum necessary size to maintain adequate lug/bar contact.

310.030 MAIN EARTH TERMINAL CONNECTIONS:

Connect main earth conductors and main equipotential bonding conductors to main earth terminals. Terminate circuit protective conductors on switchboard earthing bar.

Terminate conductors with

- compression type lugs suitable for bolting direct to bar.
- Extend protective conductor from incoming main cable gland direct to main earth terminal.
- Extend separate protective conductor from main earth terminal to main switch/switch panel served by incoming main cable.
- When main cable is provided by electrical supply Company, extend separate protective conductor from Main Cable armouring gland or direct earth terminals or PME earth installed by supply Company to main earth terminal.
- Bond all main equipment and plant to an earth terminal, connected to the bonding ring conductor.
- Connect telecommunications and data equipment in accordance with BS 6701.

310.070 CLEAN EARTH BAR:

- Application to provide a functional earth for comms equipment.
- Location
 - comms room
- Mounting
 - Mount earth bar on insulated supports located at 300mm centres for 25mm bar and 450mm centres for 50mm bar, giving 50mm clearance at rear of bar.
- Insulators
 - Mount busbar on
 - impact resistant moulded plastic.
 - Terminations
 - Connect each conductor and tape separately and allow spare holes (minimum two) for future connections.
- Connect telecommunications and data equipment in accordance with BS 6701.
- bond all racks, ceiling and floor grids and any exposed metalwork.

310.100 MICS CABLE TERMINATIONS:

Provide manufacturer's seals incorporating protective conductors at each termination, where glands are used or not, and connect conductors to conduit box, adaptable box or equipment box earth terminals.

310.110 FRAME EARTH LEAKAGE:

Where frame earth leakage devices are used for phase to earth protection, connect two earthing conductors as BS 7430, one to the framework of the switchgear and main earth bar via current transformer or other devices, the other to cable sheaths and earthing devices, insulated where necessary.

310.130 CEILING SUPPORTS:

- Application
 - Bond main supports to non-current metallic parts of Electrical Installation.
- Conductor
 - Use LSF insulated copper cable, sized 4mm csa as a minimum.
- Holes
 - Drill or punch holes in main supports in positions indicated to receive terminal screws.
 - Use holes in main supports for terminal screws.
- Terminals
 - Connect bonding conductors to supports through holes with tinned copper cable lugs or tags secured to support with brass screws, washers, nuts and locking device.
- Connection
 - Connect bonding conductors to supplementary bonding conductors in cable trunking:-
 - using crimp type connectors.

310.150 TELECOMMUNICATIONS FUNCTIONAL EARTH:

Provide functional earth in accordance with BS 6701 and BS 7430.

320.000 WORKMANSHIP

320.010 INSTALLATION OF EARTHING SYSTEM:

Carry out installation of earthing system in accordance with BS 7671 (IEE Regulations) and BS 7430.

320.040 MAIN AND SUPPLEMENTARY EQUIPOTENTIAL BONDING:

Bond in accordance with BS 7430 and BS 7671 to main earth terminal all extraneous conductive parts of the installation.

- Ensure the following services are bonded.
 - Main water pipes.
 - Main gas pipes.

- Air ductlines.
- Heating pipework.
- Chilled water pipework.
- Exposed metallic parts of building structure.
- Thermal insulation metallic cladding.
- Metallic cable sheaths of all cables except British Telecom.
- Lightning protection systems.

Bond with supplementary equipotential bonds to protective conductor system, all simultaneous accessible conductive.

- Ensure the following areas are bonded to BS 7671, Section 601.
 - bathrooms and shower rooms.
 - boiler houses.
 - all other plantrooms.
 - wet and damp process areas.
 - kitchens and laundries.
- Bond to non-current carrying parts of Electrical Installation in associated spaces to BS 7671 and BS 7430.
- Use clamps to BS 951 for bonding of pipes.

320.060 LOW VOLTAGE SHEATHS AND ARMOUR:

Bond the sheaths and armour of low voltage cables solidly to earth,

- Single core cables
 - At both ends.
 - Single point, with separate circuit protective conductors.

320.070 METALLIC FENCING:

Bond to earth any metallic fencing enclosing earth electrical system in accordance with BS 7430.

320.080 IDENTIFICATION:

Use numbered and/or lettered plastic cable sleeves to indicate circuit numbers and phases of corresponding phase conductors.

Ensure conductors are connected to earth bar in same sequence as phase and neutral conductors. Identify at substation, switchboard and building earth bars each protective, bonding and earthing conductor. Provide labels on bars adjacent to each conductor.

320.130 EARTHING OF CONSTRUCTION SITE ELECTRICAL SYSTEMS:

Earth construction site electrical systems to BS 7430, BS 4363 and BS 7375.

320.160 EARTHING OF ELECTRICALLY SUPPLIED STREET FURNITURE:

Install earthing to street furniture in accordance with BS 7430 and BS 7671.

- TN-S systems. Use cable with separate phase neutral and protective conductors to supply street furniture. Ensure on the load side of the protective device separate phase, neutral and protective conductors are used. Bond conductive parts of the street furniture to the earthing terminal within the equipment. Connect the supply protective conductor to the same earthing terminal.
- TN-C-S systems. Use a combined neutral and earth (CNE) cable to supply street furniture. Use separate conductors for phase, neutral and protection on the load side of the protective device. Bond exposed conductive parts of the street furniture using a 10mm², or the size of the neutral if smaller, cable. Do not bond small items not likely to come into contact with exposed or extraneous conductive parts or earth. On circuits feeding more than one item of street furniture, provide an earth electrode of 20ohm or less resistance at the last or pen-ultimate item of furniture on the circuit. Where an electrode resistance of 20ohm cannot be achieved, provide earth electrodes at each item of furniture.
- TN-C where the supplier's earth terminal is not used or TT systems. Install a protective earth electrode system at the source of supply. Use cable with separate phase neutral and protective conductors to supply the street furniture, with the protective conductor connected to the earth electrode. Ensure on the load side of the protective device separate phase, neutral and protective are used. Bond conductive parts of the street furniture to the earthing terminal within the

equipment. Connect the supply protective conductor to the same earthing terminal.

320.170 EARTHING OF ELECTRICAL SYSTEMS IN HAZARDOUS AREAS:

Install earthing of electrical systems in hazardous areas to BS 7430 and BS EN 60079. Use the recommendations in HS(G)41 at petrol filling stations.

- Use the recommendations in HS(G)41 in hazardous areas.
-

W52 LIGHTNING PROTECTION

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall design, install, test, commission and demonstrate a lightning protection systems to provide a lightning protection system to the building in accordance with this specification and the employer's requirement document.

PART 2 SELECTIONS SCHEDULES FOR REFERENCE SPECIFICATIONS

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

280.020 CONDUCTORS:

- Conductors for lightning protection system
 - Horizontal air terminations - reference Y80.2010A
 - Covering colour To be provided and agreed with the Architect
 - Self supporting air terminations - reference Y80.2010B
- Conductors for earthing systems.
Reference Y80.2010C
- Conductor joints
 - Lightning protection - reference Y80.2020A
 - Earthing systems - reference Y80.2020B
- Tape fixing devices
 - Reference Y80.2030A

280.030 EARTH ELECTRODES:

- Earth electrodes for lightning protection systems.
 - Rod - reference Y80.2040A
 - Building or structural element - reference Y80.2040C
- Earth electrodes for system earthing.
 - Rod - reference Y80.2040B
 - Building or structural element - reference Y80.2040D
- Earth electrode clamps
 - Reference Y80.2060A
- Earth electrode inspection facilities
 - Reference Y80.2070A
- Earth electrode tank penetration seal

280.040 EQUIPOTENTIAL BONDS:

- Main equipotential bonds
 - Reference Y80.2090A
- Supplementary equipotential bonds
 - Reference Y80.2100A

280.050 EARTHING:

- Circuit protective conductors
 - Reference Y80.2110A
- Earthing clamps - reference Y80.2120
- Earth busbars
 - Reference Y80.2130A
- Test links - reference Y80.2140
- Lugs/tags - reference Y80.2150
- Protective cable terminations - reference Y80.2160
- Protective conductor warning notices/labels
Reference Y80.2170
- Main earth conductor - reference Y80.2180
- Earth bar label - reference Y80.2190

280.060 WORKMANSHIP:

- Clean earth distribution - reference Y80.3010
- Dissimilar metals - reference Y80.3020
- Tape joints
 - Copper - reference Y80.3030A
 - Aluminium - reference Y80.3030B
- Stranded conductor joints - reference Y80.3040
- Protective cable terminations
 - Reference Y80.3050A
- Earth electrodes
 - Reference Y80.3060A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
 - Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
 - Reference Y90.3070A
- Fixing to metalwork
 - Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
 - Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W52

300.000 GENERAL

300.010 STANDARDS:

- Provide lightning protection system in accordance with BS 6651.
- Provide lightning protection connection components complying with BS EN 50164-1 and BS EN 50164-2.
- Provide lightning protection system for churches in accordance with the recommendations of the English Heritage and Ecclesiastical Insurance Group, Lightning Protection for Churches.

300.020 USE OF BUILDING ELEMENTS:

Ensure that building and structural elements used as items in or bonded to the lightning protection system are designed and erected in accordance with BS 6651 as well as their appropriate constructional specification or code of practice. Ensure that all connections to building and structural elements are waterproof and corrosion protected to a degree appropriate to their exposure.

300.030 LIGHTNING PROTECTION SPECIALIST:

Engage a lightning protection specialist to carry out the following elements of the lightning protection system.

- Design.
- Installation.
- Testing.
- Commissioning.

The tenderer must name their preferred contractor within their tender return.

300.060 BONDING OF SERVICES:

Bond or isolate all metallic services in or on the structures in accordance with BS 6651 and as indicated in the Schedules and Drawings.

300.070 PROTECTION OF ELECTRONIC EQUIPMENT:

Protect electronic equipment in buildings in accordance with BS 6651 Appendix C.

- Equipment transient design level (Volts)
- Transient Control level (Volts)

Protect telecommunication lines in accordance with BS EN 61663.

310.000 PRODUCTS/MATERIALS

310.010 TEST JOINTS:

- Application
Provide test joints at the connection to the test rod.
- Conductor
 - Material
 - Copper rod
- Test and Junction Clamp to vbe provided
- Corrosion inhibitor used on disconnecting joints at all relevant locations

310.030 LIGHTNING PROTECTION SYSTEM BONDS:

- Rigid.
- Provide purpose made bonding clamp
 - to suit location required
- Bond material
 - Form

- Strand.
- Material
 - Copper
 - BS EN 60228.
- Connectors to down conductor or air terminal
 - Test and Junction to be provided

310.050 SURGE PROTECTION DEVICES:

- Application
 - Supply and install surge protection at the main intake position
- Standard - BS 6651.
- Location category
 - C (data lines).
- System exposure
 - Medium.
- Transient performance
 - Mode of protection
 - Line - earth.
 - Line - neutral.
 - Neutral - earth.
 - Line - line (data).
 - Line - earth (data).

320.000 WORKMANSHIP

320.010 INSTALLATION:

Install the lightning protection system and its element in accordance with the manufacturer's recommendations and BS 6651 and BS 7430.

320.020 WORK ON SITE:

Ensure that all building works are completed and service connections are provided,

320.030 QUALITY CONTROL:

Handle, store and install all equipment and components of the lightning protection system in accordance with the manufacturer's recommendations and

- BS 6651.
- BS 7430.

Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.

Test and commission the system in accordance with BS 6651 and as specified.

Record all test measurements.

320.040 BONDING:

Bond or isolate building structural elements and metallic services as BS 6651, including,

- Steel structural frame.
- Reinforcement bars in concrete.
- Metallic roof coverings.
- Services
 - Television and radio aerials and supports.
 - Metal flues and flue lining.
 - Dry risers.
 - Water services.
 - Air ductlines.
 - Gas services.
- Flag-masts.
- Roof level plant rooms.

- Water tanks.

320.050 LABELLING:

Provide and fix system labels as required by

- BS 6651.

320.060 INSTALLATION RECORDS:

Prepare system records, including the following items:

- To BS 6651.
- As installed drawings.
- Nature of soil
 - Earth resistivity measurement.
 - Earth electrode resistance.
- Details of earth electrodes
 - Type to be noted
 - Location to be noted
 - Reference electrode to be indicated
- Alterations to system to be indicated

Hand over the system records:

- to main contractor for incorporation into manuals.

320.070 MAINTENANCE:

Carry out maintenance as required by BS 6651 for the defects liability period and provide proposal for continuing maintenance to

- CA.
- Building owner.

W53 ELECTROMAGNETIC SCREENING

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

The contractor shall design, install, test, commission and demonstrate so that all systems have suitable electromagnetic screening.

60 CENTRAL CONTROL/BUILDING MANAGEMENT

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION:

The contractor shall employ a specialist controls subcontractor to provide the central control system for the mechanical plant. The specialist controls contractor shall install, test, commission and demonstrate the control system in accordance with the drawings, specification and the technical schedules.

NOTE:

Gas knock off push buttons to be surrounded type to avoid false activation.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

251.000 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

251.010 GENERAL:

Comply with work section general clauses reference Y51.1000 and those detailed below.

251.020 SPECIALIST:

Use one of the following specialist commissioning engineers

1. Matrix Control Solutions Ltd, Suite 7, Advantage House, 156 Oxford Street West, Ashton Under Lyne, Lancs, OL7 0NB Contact: Alan Watkinson tel 0161 371 0111 or 07838 150 707

251.040 COMMISSIONING:

- Commissioning codes - reference Y51.3020
- Commissioning
- Automatic control systems - reference Y51.3070
- Plant items - reference Y51.3080
- Instruments and gauges
- Reference Y51.3090A
- Commissioning records
- Distribution to WBS
- BMS commissioning
- Control system specification details required for commissioning - reference Y51.3110
- Pre-commissioning - reference Y51.3120
- Plant ready for control system commissioning
- Reference Y51.3130A
- Control system requirements for plant commissioning - reference Y51.3140
- Commissioning - reference Y51.3150

254.000 IDENTIFICATION - MECHANICAL

254.010 GENERAL:

Comply with work section general clauses reference Y54.1000 and those detailed below.

254.040 PLANT AND EQUIPMENT IDENTIFICATION:

- Lettering
- Laminated plates, multi-coloured with outer layer removed for lettering - reference Y54.2030B

254.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y54.2035

254.050 VALVE AND COCK IDENTIFICATION:

Reference Y54.2040

254.090 INSTRUMENT IDENTIFICATION:

Reference Y54.2080

254.100 DANGER AND WARNING NOTICES:

Reference Y54.2090

254.110 SYSTEM IDENTIFICATION INSTALLATION CHARTS:

- Perspex sheet glazing with frame - reference Y54.2100A

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Comply with work section general clauses reference Y60.1000 and those detailed below.

260.020 CONDUIT SYSTEMS:

- Drawing reference
- Schedule reference
- Metal
- Rigid
- Class 2 - reference Y60.2010A
- Fittings
- Reference Y60.2020A
- As drawings/schedules - reference Y60.2020B
- Reference Y60.2020#
- Class 4 - reference Y60.2010B
- Fittings
- Reference Y60.2020A
- As drawings/schedules - reference Y60.2020B
- Non-metallic
- Support and fixing - reference Y60.2170

260.030 METAL TRUNKING:

- Cable trunking and fittings
- To BS 4678 - reference Y60.2080A
- To BS EN 50085 - reference Y60.2080#
- Trunking Type
- Standard cable trunking.
- With Compartments.
- Installation
- Surface.
- Flush.
- Trunking
- Class 1/3 - reference Y60.2090B
- Separate or multi-compartment trunking
- Reference Y60.2150A
- Support and fixing - reference Y60.2170
- Wire rope suspension system - reference Y60.2175#

260.050 GENERAL WORKMANSHIP:

- General
- Reference Y60.3010A
- Layout - reference Y60.3020
- Spacing - reference Y60.3030
- Condensation prevention - reference Y60.3040
- Protection and repair of steel components
- Reference Y60.3050A

- Equipment connections - reference Y60.3060
- Cleaning before wiring - reference Y60.3070
- Wiring
- Reference Y60.3080A
- Builderswork - reference Y60.3090

260.070 WORKMANSHIP FOR CONDUIT:

- Draw-in boxes - reference Y60.4010
- Installation of cast in or buried conduit - reference Y60.4020
- Conduit boxes - reference Y60.4030
- Fixing conduit - reference Y60.4040
- Flexible and pliable conduit - reference Y60.4050
- Screwed steel conduit - reference Y60.4060
- Non-metallic conduit
- Underground installation - reference Y60.4080

260.080 WORKMANSHIP FOR TRUNKING:

- Manufacture of trunking - reference Y60.5010
- Access - reference Y60.5020
- Fixing trunking
- Reference Y60.5030A
- Steel trunking
- Reference Y60.5040A

261.000 HV/LV CABLES AND WIRING

261.010 GENERAL:

Comply with work section general clauses reference Y61.1000 and those detailed below.

261.020 STANDARD FLEXIBLE CORDS AND INDUSTRIAL CABLES:

- Standard ordinary flexible cords - multi copper cores - reference Y61.2010D

261.040 MINERAL INSULATED WIRING AND POWER CABLES:

- Light duty mineral insulated cables
- LSF outer covering - reference Y61.2040B
- Heavy duty mineral insulated cables

261.050 STANDARD WIRING AND POWER CABLES:

- Standard power supply cables
- Thermosetting insulation and copper conductors
- PVC insulation and copper conductors
- LSF sheathed and armoured - reference Y61.2020E
- Standard wires for conduit and trunking
- LSF insulated, with copper conductors - reference Y61.2020G
- Standard flat cables 2-core or 3-core, with copper conductors; with or without CPC
- LSF insulated, sheathed - reference Y61.2020J
- Standard power supply cables, LSF insulation, sheathed - reference Y61.2020K
- Standard cables with definite fire performance - reference Y61.2020M
- Standard cables where penetration by sharp objects is a high risk - reference Y61.2020N

261.060 CONTROL AND AUXILIARY CABLES:

- Paired STP unarmoured control cables - reference Y61.2050C
- Multi-core unarmoured LSF sheathed auxiliary cables - reference Y61.2050G

261.110 INFORMATION TECHNOLOGY CABLES:

- Structured wiring - reference Y61.2100A

261.130 CABLE GLANDS:

- Unarmoured cables, indoors - reference Y61.3010A
- Unarmoured cables, outdoors - reference Y61.3010B
- Armoured cables, dry indoors - reference Y61.3010C
- Armoured cables, indoors - reference Y61.3010D
- Armoured cables, outdoors - reference Y61.3010E

261.140 CABLE SEALS AND GLANDS - MINERAL INSULATED CABLES:

- Heavy and light duty mineral insulated cables - protected 'e' for hazardous areas - reference Y61.3020B

261.150 VOLTAGE SURGE SUPPRESSORS FOR CABLES:

- Reference Y61.3030A

261.170 INSULATING TAPE:

- LSF insulating tape - reference Y61.3050A

261.230 CABLE DUCTS:

- Reference Y61.3110A

261.240 CABLE SLEEVES:

- Reference Y61.3120A

261.250 CABLE COVERS AND MARKERS:

- Reference Y61.3130A

261.260 WORKMANSHIP

- Cable installation - general - reference Y61.4010
- Cable installation in low temperatures - reference Y61.4020
- Installation of LSF cable - reference Y61.4030
- Installation of unarmoured cables - reference Y61.4040
- Cable trenches.
- Reference Y61.4050A
- Cable installation in trenches - reference Y61.4060
- Cable ducts.
- Reference Y61.4070A
- Cable installation in conduit and trunking.
- Reference Y61.4090A
- Cable surface installation.
- Cable embedded installation.
- Reference Y61.4120A

- Cable installation - mineral insulated cables
- Reference Y61.4130A
- Cable installation - flexible cords - reference Y61.4140
- Cable jointing and terminating generally.
- Reference Y61.4150A
- Cable jointing and terminating - paper insulated cables.
- Terminating - mineral insulated cables.
- Reference Y61.4180A
- Cable joints - mineral insulated cables.
- Reference Y61.4190A
- Communications coaxial, optical fibre and IT cable installation, jointing and terminating.
- Reference Y61.4200A
- Cable sleeves - reference Y61.4210

263.000 SUPPORT COMPONENTS - CABLES

263.010 GENERAL:

Comply with work section general clauses reference Y63.1000 and those detailed below.

263.020 CABLE SUPPORT AND FINISHES:

- Cable supports and finishes
- Reference Y63.2010A

263.030 CABLE SUPPORT SYSTEM:

- Perforated tray - reference Y63.2020A
- Cable rack - reference Y63.2020B
- Cable cleats - reference Y63.2020C
- Proprietary cable ties - reference Y63.2025A
- Two way saddles - reference Y63.2025C
- Cable basket - reference Y63.2025D

263.040 WORKMANSHIP

- Cable tray installation - reference Y63.3010
- Cable cleats, ties, saddles and clips installation
- Reference Y63.3020A

272.000 CONTACTORS AND STARTERS

272.010 GENERAL:

Comply with work section general clauses reference Y72.1000 and those detailed below.

272.020 CONTROL PANEL:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Surge suppressors
- Installer fitted - reference Y72.1020B
- Transient suppressors
- Manufacturer fitted - reference Y72.1030A
- Controlgear assembly

- Reference Y72.2010A
- Assembly construction
- Reference Y72.2020A
- Enclosure finish
- Manufacturer's standard - reference Y72.2030A
- Site modification - reference Y72.2040

272.030 LV CONTACTORS AND MOTOR STARTERS:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- LV contactors
- Continuous - reference Y72.2050C

272.040 CONTROL CIRCUIT DEVICES:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2060A

272.050 ISOLATING SWITCHES:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2070A

272.060 CONTROL SELECTOR SWITCHES:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2080A

272.070 IN-BUILT PUSH BUTTONS:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2090A

272.080 INDICATOR LIGHTS:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2100A

272.090 CONTACTOR CONTROL RELAYS:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2110A

272.100 CONTROL AND INDICATOR LIGHT CIRCUIT FUSES:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2120A

272.110 MOTOR STARTERS:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- General
- Motors below 0.37kW - reference Y72.2130A
- Motors above 0.37kW - reference Y72.2130B
- Direct-on-line type - reference Y72.2150
- Star delta type - reference Y72.2160
- Auto-transformer type
- Stator rotor type
- Inverter type
- Control panel - reference Y72.2190A
- Motor control centre - reference Y72.2190B

272.120 AUTOMATIC CHANGEOVER FOR RUN/STANDBY DUTY:

- Single power supply - reference Y72.2200
- Provide system malfunction audible alarm.
- Dual power supply - reference Y72.2210
- Provide system malfunction audible alarm.

272.130 CONTROL CIRCUIT TRANSFORMERS:

- Reference Y72.2220

272.140 SWITCHING AND INDICATION:

- Reference Y72.2230A

272.150 AUDIBLE ALARMS:

- Reference Y72.2240

272.160 PROGRAMMABLE LOGIC CONTROLLERS:

- Electrical supply
- 3 phase - reference Y72.1010A
- Single phase - reference Y72.1010B
- Reference Y72.2250A

272.180 STARTER AND CONTROL PANEL INTERNAL WIRING:

- Reference Y72.2260A

272.190 COMPONENT MOUNTING:

- Reference Y72.2270A

272.200 CONTROL SYSTEM FUNCTION CHARTS:

- Reference Y72.2280A

272.210 WORKMANSHIP:

Reference Y72.3010

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Comply with work section general clauses reference Y74.1000 and those detailed below.

274.020 SAMPLES:

Provide samples of the following items

1. Sensors
2. Gas knock off push buttons

274.240 WORKMANSHIP:

- Earthing - reference Y74.3010
- Protection - reference Y74.3020
- Fixing - reference Y74.3030
- Measuring mounting heights - reference Y74.3040

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

- Supply earthing and bonding components as specified in section

280.040 EQUIPOTENTIAL BONDS:

- Main equipotential bonds
- Reference Y80.2090A
- Supplementary equipotential bonds
- Reference Y80.2100A

280.050 EARTHING:

- Circuit protective conductors
- Reference Y80.2110A
- Earthing clamps - reference Y80.2120
- Earth busbars
- Reference Y80.2130A
- Test links - reference Y80.2140
- Lugs/tags - reference Y80.2150
- Protective cable terminations - reference Y80.2160
- Protective conductor warning notices/labels
- Reference Y80.2170

- Main earth conductor - reference Y80.2180
- Earth bar label - reference Y80.2190

280.060 WORKMANSHIP:

- Clean earth distribution - reference Y80.3010
- Dissimilar metals - reference Y80.3020
- Stranded conductor joints - reference Y80.3040
- Protective cable terminations
- Reference Y80.3050A

281.000 TESTING AND COMMISS

ONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Comply with work section general clauses reference Y81.1000 and those detailed below.

281.020 TESTING AND COMMISSIONING:

- Incorporated equipment characteristics
- Reference Y81.2010A
- Prospective short circuit current (IP)
- Reference Y81.2020A
- Initial verification
- Reference Y81.2030A
- Test equipment and consumables
- Reference Y81.2040A
- Testing
- Reference Y81.2050A
- Continuity of protective conductors
- ac or dc - reference Y81.2060A
- Earth fault loop impedance (ZS)
- Reference Y81.2070A
- Settings and adjustments - reference Y81.2080
- Calibration - reference Y81.2130
- Certification and reporting
- Reference Y81.2140A
- Completion certificates
- Reference Y81.2150A
- Records - reference Y81.2160

281.030 WORKMANSHIP:

- Conductive parts - reference Y81.3010
- Phase sequence - reference Y81.3020
- Conduit, trunking and ducting - reference Y81.3050

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Comply with work section general clauses reference Y82.1000 and those detailed below.

282.020 LABELS AND NOTICES:

- Reference Y82.2010A

282.030 LABELS AND NOTICES MATERIALS:

- Material
- Reference Y82.2020A
- Fixing
- Reference Y82.2030A
- Arrangement
- Reference Y82.2040A
- Lettering and size of labels and notices
- Reference Y82.2050A

282.040 CONDUCTOR ARRANGEMENT:

- Reference Y82.2060A

282.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

- Reference Y82.2085

282.050 EQUIPMENT SIGNS AND LABELS:

- Safety signs
- Reference Y82.2070A
- Plant and equipment labels
- Reference Y82.2080A
- Maintenance notices - reference Y82.2090
- Equipment
- Colour corrected light fittings - reference Y82.2100
- Motors and starters labels
- Reference Y82.2110A
- Engraved accessory plates
- Reference Y82.2120A

282.090 CONDUIT AND TRUNKING COLOUR CODING:

- Reference Y82.2180A

282.100 CABLE IDENTIFICATION:

- Cable identification
- Reference Y82.2190A
- Terminal marking and conductor identification
- Reference Y82.2200A
- Underground cable identification
- Reference Y82.2210A
- Cable conductor colour coding
- Reference Y82.2220A
- Cable jointing and termination - reference Y82.2230
- Cable sheath identification - internal
- Cable sheath identification - external

282.110 ADDITIONAL SAFETY SIGNS:

- Reference Y82.2260A

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W60

300.000 GENERAL

300.010 SYSTEM REQUIREMENTS:

Select control components and equipment, suitable to meet system objective requirements. Ensure that system safety complies with BS EN 954-1.

- Where necessary comply with BS EN 61508.
- Comply with BS EN ISO 16484-2.
- Comply with BS EN ISO 16484-3.

300.030 CONTROLS SPECIALIST:

Use a controls specialist to design, supply, install, test and commission complete controls installation.

300.060 CONTROL COMPONENTS MANUFACTURER:

Unless otherwise indicated use control components and equipment from one manufacturer throughout.

300.130 INTEGRATED SYSTEM:

Provide integrated system in accordance with BS 7807 the following sub-systems:

- Fire detection and alarm.
- Building management system.
- Heating and ventilation.

310.020 GENERAL REQUIREMENTS - ELECTRICAL SAFETY:

Ensure that the BMS complies with the following EC Directives

Low Voltage Directive 73/23/EEC and amendment 93/68/EEC. Construction Products Directive 89/106/EEC and amendment 93/68/EEC.

General Product Safety Directive 92/59/EEC.

Ensure that the BMS installation complies with BS 7671 Electrical Installations in Buildings.
Ensure that control panels comply with BS EN 60439-1 Low-voltage Switchgear and Control Assemblies.

310.030 GENERAL REQUIREMENTS - ELECTRICAL SUPPLY:

Ensure that the BMS can operate when supplied with electricity conforming to BS EN 50160 - Voltage characteristics of electricity supplied by public distribution systems.

310.040 GENERAL REQUIREMENTS - EMC:

Ensure that the BMS complies with the Electromagnetic Compatibility (EMC) Directive 89/336/EEC.
Ensure that the BMS complies with BS EN 61000-6-3 Generic emission standard, BS EN 61000-6-1 and BS EN 61000-6-2 Generic immunity standard.

Ensure that the BMS meets the EMC requirements of prEN 13646.

310.050 GENERAL REQUIREMENTS - EMERGENCY RESTORATION PROCEDURES:

- Ensure that the BMS fully restores all control and monitoring functions following an emergency shut down period.
- Ensure that the start delay times can be adjusted according to the magnitude of the load.

310.060 GENERAL REQUIREMENTS - UNINTERRUPTIBLE POWER SUPPLY FACILITY:

- Uninterruptible power supply facility requirements
- As work section V32.

310.070 GENERAL REQUIREMENTS - TIME SYNCHRONISATION:

Ensure that all time-dependent BMS components are time synchronised via the operator workstation.
Ensure that the BMS can automatically change between British Summer Time (BST) and Greenwich Mean Time (GMT).

Ensure that the BMS can accommodate leap years.

310.080 GENERAL REQUIREMENTS - SYSTEM SECURITY:

- Provide, as a minimum, password-protected operator access for the following levels.

- Level 1 - Ability to display all point data.
- Level 2 - Ability to display all point data and to initiate data logging functions.
- Level 3 - Ability to display all point data; to initiate data logging functions; and to change set points and time schedules.
- Level 4 - Ability to display all point data; to initiate data logging functions; to change set points and time schedules; and to change control strategies and schematic/graphics functions and password assignment.
- Ensure that password-protected operator access is set up for both operator workstations and field controllers which have an operator interface.
- Ensure that passwords permit at least 6 alpha/numeric characteristics.
- Ensure that the BMS software is protected from unauthorised entry.
- Ensure that the BMS, and its operation performed under any maintenance contract, complies with BS ISO/IEC 27001 and BS ISO/IEC 17799 Code of practice for information security management.

310.090 GENERAL REQUIREMENTS - SYSTEM SOFTWARE:

Ensure that IT industry standard operating systems are used.

Ensure that copies of all BMS vendor-specific software are held by an independent third party and that this software can be released to the client.

Ensure that the ESCROW Agreement is completed and signed.

Ensure that licences to use software applications are owned by the Client.

- Use communications protocol to BS EN 14908.
- Provide application software written in accordance with BS 7649.

310.093 GENERAL REQUIREMENTS - CHOICE OF CONTROL STRATEGY:

Ensure that the selected control strategies are appropriate for the building services systems and their intended application.

Ensure that selected control strategies are robust and not over complex.

Where a novel control strategy is to be implemented, ensure that testing/evaluation is performed to confirm its suitability.

Ensure that wherever possible selected control strategies are those provided in the BSRIA Library of System Control Strategies: AG 7/98.

310.095 GENERAL REQUIREMENTS - DESIGN FOR COMMISSIONABILITY:

Ensure that the BMS specification details required for commissioning are made available to the BMS commissioning engineer.

Ensure that all field controllers, sensors and controlled devices are easily accessible and can be removed for testing and future maintenance.

Liaise with the mechanical contractor to ensure that air handling units are provided with appropriate access doors.

Ensure that access is available to all control devices.

Ensure that the requirements of the following documents are met:

Space and Weight Allowances for Building Services Plant - Inception Stage Design. BSRIA. TN 9/92.
Space Allowances for Building Services Distribution Systems - Detailed Design Stage. BSRIA. TN

10/92.

Ensure that sensors are installed correctly in order to give representative readings.

Ensure that reference labels are attached to each control device.

310.096 GENERAL REQUIREMENTS - FUTURE SYSTEM EXPANSION:

Ensure that the BMS is capable of dealing with a future 20% increase in the number of points without compromising the system's functionality or speed of operation.

310.097 GENERAL REQUIREMENTS - DESIGN FOR MAINTAINABILITY:

Ensure that a full O&M manual is prepared which reflects any system changes made during the installation and commissioning stages.

Ensure that adequate access to BMS equipment and components is provided.

Ensure that all components and wiring are identified by a consistent numbering system.

310.100 GENERAL REQUIREMENTS - SYSTEM SUPPORT:

Ensure that a viable strategy is in place to fully support the BMS for a minimum of 10 years from the date of practical completion.

310.175 FIELD CONTROLLERS - GENERAL:

- Standard BS EN ISO 16484-2.
- Mounting
- In control panel.
- Casing material
- Rigid plastic.
- Rigid plastic with die cast aluminium finish.

310.180 FIELD CONTROLLERS - MODES OF OPERATION:

- Ensure that the field controllers perform all control actions independently of the operator workstation.
- Ensure that all field controllers can operate independently and in real time following a failure of the BMS communication network.
- Ensure that field controllers can operate with the loss of shared data through the use of default values and final data reading before the loss of network communications.

310.190 FIELD CONTROLLERS - PHYSICAL CONSTRUCTION:

- For internal plant room applications, construct field controller enclosures to give a minimum degree of protection to IP54 in accordance with BS EN 60529. Where the field controller is fitted inside a control panel that is protected to IP54 then the field controller protection can be reduced to IP41. For external applications, construct field controller enclosures to IP65.
- Where an enclosure is to be provided ensure that field controller enclosures are lockable.
- Ensure that modular construction is used for field controllers. Ensure that this allows the removal and replacement of devices without the need for rewiring of field wiring.

310.200 FIELD CONTROLLERS - TERMINATIONS:

Use terminals of the screw down clamp-type fixed to purpose made mountings.

Segregate into groups terminals carrying different voltages (in accordance with BS 7671).

310.210 FIELD CONTROLLERS - FUTURE EXPANSION

:

Make provision for a future 20% increase.

310.260 FIELD CONTROLLERS - ENVIRONMENTAL CONDITIONS:

- Ensure that field controllers are suitable for operating normally within the following environmental ranges:
- Temperature 0 to 50oC
- Relative humidity 10% to 90% non-condensing.
- Ensure that the field controllers will operate in the electrical environment associated with building services plant rooms.
- Ensure that the EMC requirements specified in W60 are met.
- Ensure that the field controllers are protected against the effects of moisture, dust, dirt and gases.

310.270 FIELD CONTROLLERS - INTERNAL POWER BACKUP:

- Ensure that a rechargeable battery or capacitor, if specified, can hold the controller's volatile memory for a minimum period of 72 hours.
- Ensure that a non-rechargeable battery, if specified, can maintain the controller's clock function for a period of two years.
- Ensure that the battery is easily replaceable.
- Ensure that the interval between battery maintenance inspections is not less than 12 months.
- Ensure that any battery monitoring functions defined in the Particular Inspection can be met.

310.280 FIELD CONTROLLERS - MEANS OF CONFIGURATION:

- Ensure that the field controllers can be fully configured directly via a laptop type computer and via the operator workstation.
- Ensure that the field controllers can be configured through the use of a configuration interface with full upload and download capability.
- Ensure that configuration details can be easily altered by system operators.
- Ensure that access to make configuration alterations is restricted to operators with access authority through the use of passwords.

310.290 FIELD CONTROLLERS - USER INTERFACES:

- Ensure that all field controllers can be accessed through the use of portable computers.
- Ensure that access allows the display of all configuration details associated with the field controller along with:

 Password protection for access with a minimum of two access levels.

 Ability to display all point data (both hard and soft).

 Ability to initiate and display logged data.

 Ability to display and alter set-points and time schedules.

 Ability to make alterations to control strategies.

- Ensure that field controllers incorporate a panel-mounted operator interface. Ensure that the interface includes the ability to:

 Provide password protection for access with a minimum of two access levels.

 Display all physical point data.

 Display and alter set-points and time schedules.

Display the current date and time.
Review and acknowledge alarms.
Access logged data.

310.295 DEDICATED CONTROLS - OPTIMISERS:

- Standard - BS EN 12098-2.

310.296 DEDICATED CONTROLS - COMPENSATORS:

- Standard
- BS EN 12098-1.
- BS EN 12098-3

310.297 DEDICATED CONTROLS - TIME SWITCHES:

- Standard BS EN 60730-2-7.
- Provide time switches with minimum of 24 hours mains failure reserve facility.

310.330 CONTROL FUNCTIONS AND ROUTINES - GENERAL:

Provide a facility to automatically cycle selected actuators through their full range of movement outside normal operating periods with a periodicity set by the operator (in addition to normal automatic or manual control). Ensure that the cycle finishes as one complete operation. Ensure that any alarm conditions raised during the operation are inhibited as necessary.

Provide a facility to drive actuators to their open or closed positions at the end of plant operating periods.

310.400 CONTROL FUNCTIONS AND ROUTINES - OPTIMUM START/STOP FOR HEATING SYSTEMS:

- Provide an optimum-start routine for the heating system to compute the daily minimum pre-heat period necessary to achieve target comfort conditions at the start of occupation. Provide an optimum-stop routine to compute the earliest time for the heat source to be shut down in order to retain minimum target comfort conditions in the zone at the end of occupation.
- Ensure that the optimum start/stop routines have access to the system real time clock, calendar facility and time programme to define the occupation periods.
- Ensure that it is possible to apply optimum start/stop control both to individual zones and overall plant operation.
- Ensure that the routines operate the heating and ventilation plant as necessary to achieve the required target conditions, and that the heating and cooling systems do not conflict in any controlled zone.
- Provide independently adjustable start and stop comfort conditions.
- Ensure that weather compensation control can be inhibited during pre-heat periods.
- Ensure that the heating plant goes into full heating mode with full re-circulation of air (if relevant). Ensure a return to normal fresh air control following the optimum start period.
- Provide the optimum start/stop routines with an automatic self-learning process that seeks to reduce any error in achieving the target conditions at the target time.
- Provide the operator with the facility to adjust the following parameters:
 - Target temperature for optimum start.
 - Maximum pre-heat period.
 - Target temperature for optimum stop.
 - Minimum space temperature for out-of-hours periods.
 - Enable/disable the self adaption function.
- The default limit time for handover to the weather compensation routines after the start of occupation.
- Ensure that the internal and external air temperature sensors associated with the optimiser are positioned correctly in order to provide representative readings.

310.420 CONTROL FUNCTIONS AND ROUTINES - WEATHER COMPENSATION:

- Provide weather compensation routines to control the heating system in relation to external weather conditions. Provide the operator with the option to adjust temperature and flow-rate settings for the heating system to re-define the weather compensation.
- Provide automatic adjustment to the weather compensation by comparing measured and required space temperatures with the outside conditions, and provide the facility to correct the compensation where a significant difference between the two space temperatures occurs.
- Ensure that abrupt changes in the heating system performance or space temperature shall not adversely affect the automatic adaptive compensation process.
- Provide a single weather compensation curve for each zone irrespective of the number of temperature sensors provided in the zone.
- Ensure that the routines respond to the reset signals arranged to achieve boost, night set-back and boiler safety.
- Ensure that air temperature sensors associated with the compensator are positioned correctly in order to provide representative readings.

310.605 AIR DIFFERENTIAL PRESSURE SWITCHES:

- Type
- Application
- Adjustment range for trip pressure
- Maximum operating pressure
- Electrical rating
- Ambient temperature limits
- Reset differential
- Maximum differential pressure overload

310.610 AIR THERMOSTATS - ROOM TYPE:

- Standard
- BS EN 60730-2-9.
- Position
- Wall mounted.

310.615 AIR SENSOR - INSERTION TYPE:

- Use proportional type insertion sensor.
- Sensor
- Averaging type temperature sensor for mounting overface of air flow in an air-handling unit or in ductwork adjacent to a heating coil.
- thermistor type temperature sensor, minimum stem length 200mm for mounting in the air flow or distribution ductlines.

310.640 AIR THERMOSTATS - FROST PROTECTION TYPE:

- Standard
- BS EN 60730-2-9
- BS EN 14597
- For space mounting use frost protection thermostats with temperature range of 0-200C and with SPST switching action and electrical rating of 20 amps resistive.
- For heater battery protection use frost protection thermostats consisting of a gas filled sensing element and a bulb, a directly adjustable set point and switching differential.
- For compensated systems use external frost type thermostats with proportional type sensor, the whole unit being weather-proofed.

310.645 WATER IMMERSION THERMOSTATS:

- Standard
- BS EN 60730-2-9
- BS EN 14597
- Use proportional type immersion thermostats with rigid sensing elements ensuring 50mm minimum length is immersed. Use separable pockets, screwed 15mm BSP.
- Pocket material
- Copper.
- Corrosion resistant bronze.
- Stainless steel.

310.700 ACTUATORS:

- Include position feedback devices suitable for connection to the BMS.
- Ensure that actuators incorporate a disconnection device to allow manual operation of the valve or damper in the event of actuator failure.
- Where line voltage actuators are used, provide local means of isolation by manual isolator or plug and socket connection.

310.800 VALVES AND DAMPERS:

310.805 MOTORISED VALVES:

- Standard
- BS EN 60730-2-8.

310.900 DAMPERS:

310.905 MOTORISED DAMPERS:

Use motorised control dampers manufactured and installed in accordance with DW 144.

320.000 INSTALLATION:

320.050 FIXING AND CONNECTION - CABLING INSTALLED AS PART OF THE BMS CONTRACT:

Plan and install all building management monitoring systems cables in accordance with the cable manufacturer's recommendations.

Label and record all monitoring cables in accordance with

- General
- This part of the specification covers extra-low voltage wiring (as defined by BS 7671), i.e. signal and data communications wiring.
- Install all cabling in accordance with BS 6701 and BS EN 50174.
- All cabling must be adequately protected from the environment through which it passes to avoid the possibility of mechanical damage or electromagnetic interference.
- Install cabling and conduits associated with sensors in a manner that prevents spurious transfer of moisture and heat etc from external sources to sensing devices.
- Ensure that all wiring is carried out in a neat manner by skilled operatives. Clip wiring to form a loom and route it to avoid interference with the correct operation or maintenance of other components.
- Cable type and application
- Ensure that the types of cable installed do not prejudice satisfactory operation of the BMS.
- Ensure that the type of cables, installation and planning comply with the BMS manufacturers recommendations and the project's electrical specification.
- Ensure that the cross-sectional area of cables is sufficient to ensure that sensor circuit resistance limits are not exceeded.

- Ensure that the method of installation and routing of cables does not compromise the satisfactory operation of the BMS.
- Ensure that the following minimum separation distances (in mm) between data/analogue signal cables and power cables are adhered to (not required if data/signal cables are in steel conduit or trunking).
- Table 7 Minimum separation distances between signal cables and power cables
- Signal cable Power cable Power cable
- Unscreened Armoured steel wire
- Plain 150 mm 125 mm
- Unscreened
- Twisted pair 75 mm 50 mm
- Screened 0 mm 0 mm
- Identification
- Ensure that all cables have identification sleeves at their terminations which combine the requirements of BS 7671 with those for specific circuit identification. Ensure that the identification is consistent with the relevant wiring diagrams.

320.070 FIXING AND CONNECTION - CONNECTION TO PLANT AND CONTROL EQUIPMENT:

- General
- Provide all devices and terminals necessary to connect the BMS to items of plant and control equipment.
- Take account of any existing services that have to remain in continuous operation. Agree with the Project Supervisor the method by which the BMS equipment can be installed without disrupting the operation of the building services.
- Where plant and control equipment are supplied by others, provide the Project Supervisor with adequate details of installation requirements. Provide this information in time and in sufficient detail to enable any other installers and their suppliers to incorporate the BMS connection facilities before delivering their equipment to site.
- Where plant is subject to warranty by others, obtain clearances in writing from those concerned that the proposed modifications do not invalidate the warranties.
- Ensure that modifications carried out as a result of the contract are fully documented and do not affect the satisfactory operation of safety devices connected to any plant or systems affected directly or indirectly by the BMS works. Carry out proving tests to the satisfaction of the Project Supervisor.
- Ensure that the use of existing relays, contactors, starters and switches as part of the BMS installation is fully documented.
- Safety interlocks
- Provide interlocks as scheduled to establish and maintain safe/pre-determined plant conditions under all modes of operation including loss, reduction and restoration of power.
- Ensure that all safety hard-wired interlocks are wired to failsafe on loss of power, or on relay coil failure, or on open circuit, eg cable breakage.
- Ensure that all interlocks use voltage-free contacts and 24v AC or DC relays and field wiring.
- Complete all wiring and testing of all hard-wired safety interlocks to ensure safe and/or sequenced operation of the plant before the BMS is set to work. Arrange interlocks to prevent unsafe or out of sequence operation of the plant by the BMS.
- Ensure that plant does not operate using the BMS until all interlocks have been tested to the satisfaction of the Project Supervisor.
- Manual control
- Provide manual control facilities to enable plant maintenance/facilities staff to operate essential plant in the event of BMS failure and for routine test purposes. Ensure that the facilities include:
- Start/stop operation of the plant.
- Automatic operation of motorised control devices such as valves and dampers, etc if the BMS is operating.
- Manual setting of motorised control devices such as valves and dampers, etc if the BMS has failed.
- Ensure that the manual control facilities do not override safety devices or hard-wired interlocks.
- Volt-free contacts

- Ensure that the contact materials are suitable for use in the installation and at the required voltages and currents.
- Use screw down or locking spade terminals for electrical connections to volt-free contacts.
- Relays
- Use demountable relays of the totally enclosed type.
- Use screw down clamp or locking spade-terminals, and ensure they are shrouded.
- Signalling from starters
- Control equipment
- Obtain advice from the relevant supplier when additional facilities are to be fitted to control equipment supplied by others.
- Use the knockouts, cable routes and terminals, etc incorporated into the design of control devices.
- Packaged plant
- Ensure that connections to packaged plant are made within the packaged plant control panel. Fit an additional enclosure where this is not possible. Ensure that all connections between the BMS and packaged plant are 24v maximum.

320.100 FIXING AND CONNECTION - CONTROL PANELS:

- Control panel design
- Ensure that the requirements of prEN 13646 are met.
- Ensure that the layout of control panels reflects the layout of the plant being served. Ensure that indicators and controls for associated plant are grouped.
- Ensure that all doors on panels containing exposed dangerous voltages are provided with interlocked isolators such that the door cannot be opened except with the isolator in the 'off' position. Ensure that isolation complies with BS 7671.
- Ensure that equipment that requires on-line adjustment and testing by non-electrically qualified personnel is accessible and usable without interrupting the supply or overriding safety interlocks. Ensure that in general, field controllers are not located within control panels where isolation is necessary to gain access.
- Design panels to maintain all components within their environmental tolerance limits taking into account ambient environmental conditions. Install fans with thermostatic control and air extract grilles and air intake grilles with replaceable filters where mechanical ventilation is required to control the environmental conditions. Ensure that the specified ingress protection (IP) ratings are maintained.
- Control panel construction
- Construct control panels to IP54. Construct the panels using sheet steel, folded and seam welded to form a rigid self-supporting structure. Ensure that bracing and stiffening is used as necessary to take the weight of internal components and control assemblies. Ensure that no sharp corners are present.
- Ensure that control panels weighing more than 50 Kg including installed components are fitted with eyebolts to facilitate delivery and installation.
- Ensure that panels are provided with adequate undrilled and/or detachable gland plates of sufficient size and strength to accept glands for all types of cable conduits and cable trunking intended for termination within the panel.
- Arrange all wiring within the panel in looms and/or perforated trunking. Ensure that all cables are run continuously from terminal to terminal without intervening joints.
- Ensure that all terminations are fully shrouded, recessed or otherwise protected against accidental contact.
- Ensure that where live equipment cannot be isolated it is covered with a Perspex shield carrying appropriate warning labels in addition to specified shrouding.
- Ensure sufficient spare capacity in cable ways and trunking to comply with BS 7671.
- Ensure that flexible looms are used to connect door mounted to interior-mounted components such that wires will not weaken or break with repeated door openings. Arrange the loom to avoid pinching or looping when the door is closed and ensure that it is fully supported at each end.
- Control panel labelling
- Ensure that all panels and individual panel sections are provided with exterior labels to BS 5499-5 indicating the voltage within the panel along with clear warnings of risk and instructions for isolation. Display requirements for informing the BMS supervisor and/or disabling alarms prior to

isolation of control circuits.

- Label all switches, controls and indicators on control panels as to function and associated plant.
- Fix a notice to the front of the panel warning of the need for isolation elsewhere if the panel does not totally control the electricity supply to associated plant.
- Identify all cables with permanently fixed ferrules. Ensure that the numbering corresponds to the numbers fixed to the terminals. Ensure that identification and coding matches that used on the design drawings, schematics and schedules.

320.110 SENSORS - GENERAL:

- Ensure that sensors can be removed for testing and maintenance.
- Ensure that a tight-sealing test hole is provided adjacent to every duct sensor. Ensure that Binder test points, or similar, are provided for pipe sensors.
- Provide a sufficient length of spare cable so that the sensor can be removed without disconnecting the wiring.
- Mark and record the location of concealed sensors (e.g. in false ceilings and shafts, etc).
- Provide a labelling plate for each sensor.
- Take account of the active and inactive sections of a sensor probe.
- Take into account the effects of orientation on the functioning of the sensor.
- Take into account:
 - Minimum/maximum ambient temperature.
 - Ambient humidity.
 - Vulnerability to spray water and/or vibration.
 - Explosion protection.
 - External influences.

320.120 TEMPERATURE SENSORS:

- Pipe-mounted immersion sensors
- Ensure that the full active length of the sensor is immersed in water.
- Install sensors against the direction of flow.
- Install at the correct angle.
- The sensor should be installed diagonally in a bypass pipe or in a bend if the active length of the sensor probe is longer than the diameter of the pipe.
- Allow an adequate space between the sensor and the obstruction so that the sensor can be removed from the immersion pocket.
- Ensure that immersion pockets are made from stainless steel of the appropriate pressure rating.
- Ensure that immersion pockets are filled with a heat conducting compound.
- A test point or an additional immersion pocket, adjacent to the sensor, should be provided for test purposes.

- An adequate distance (10 x pipe O) between the mixing point and the sensor should be provided when mixing water at different temperatures to take account of stratification.
- Surface temperature sensor - water
- Ensure a smooth clean contact surface and fill the space between the sensor and the pipe with a heat conductive compound to improve thermal conductivity.
- Immersion sensors for air (ducts)
- The full active portion of the sensor probe should be exposed to the air flow.
- Ensure that the active portion of the probe is located central to the airflow.
- A test hole should be provided adjacent to every sensor with plug when not in use.
- Probe-type sensors should not be used in areas where stratification can occur, eg downstream of heating and cooling coils, etc (see averaging sensors).
- Sensors which are positioned near to coils should be shielded against the radiative heat transfer.
- Return air duct sensors should be located near to the occupied space to avoid heat gain or loss and radiant effects influencing readings.
- Sensors must be positioned in an area of representative air flow. This applies to all duct sensors but particularly the return air sensor which may be located in the ceiling plenum.

- The likely cleanliness of the air should be considered when selecting sensors.
- Sensors representing zone temperature should be offset to account for heat gains e.g. space temperature stratification or if light fixtures are used as the return air path.
- Sensors should only be used in return air ducts where air is continuously extracted.
- Capillary sensors with probes
 - The device head must be higher than the sensor probe.
 - The sensor probe should be tilted downwards.
 - The ambient temperature at the device head must always be higher than the temperature to which the sensor probe is exposed.
 - The sensor element must always point downwards. The capillary should not form a U-shape.
 - The capillary should not be bent too tightly (radius of bend >50mm).
- Averaging sensor (for use in ducts/AHU)
 - Allow a distance of at least 50 mm between any heat exchanger and the sensor.
 - The entire length of an averaging sensor must be fully inside the air-duct.
 - The sensor element must be evenly distributed over the full cross-section and adequately secured to prevent vibration.
 - The sensor element should be installed in the air flow, downstream of the eliminator plate when air washers are used for humidification.
- Frost protection thermostat
 - Leave a spare capillary loop of 20 cm to enable sensor testing outside the duct/unit.
 - The measuring head and the test loop of the thermostat must be located inside the ductwork and downstream of the heat exchanger if the ductwork is outdoors or in an unheated space.
 - The capillary should be installed in the air flow, downstream of the first heating coil exposed to frost. The capillary must be installed diagonal to the heat exchanger pipes or in a serpentine manner at right angles to the pipes.
- Room sensor
 - Sensors should be installed at a height of 1.5 m in occupied spaces and at least 50 cm from any adjacent walls.
 - The sensor should be located in an area representative of the entire control zone.
 - The sensor should be located away from heat sources, e.g. office IT equipment.
 - The sensor should be located in the area it controls.
 - Sensor locations near air currents generated by diffusers or openable windows, for example, should be avoided.
 - The sensor must not be exposed to direct solar radiation.
 - Avoid external walls except where unavoidable. Use insulated backplates.
 - Avoid recesses and alcoves.
 - The conduit entry points to the sensor wall box should be sealed where there is a risk of air from another zone flowing over the sensor element.
 - Do not install near or under lamps or above radiators.
 - Avoid chimney walls.
 - Do not install directly adjacent to doors.
 - Do not install behind curtains.
 - Do not fit to walls concealing hot-water pipes.
- Outdoor air temperature sensors
 - Do not install on facades affected by significant rising heat, or facades which will be heated by solar radiation (fix sensors to a north-facing wall or use solar shields).
 - Avoid chimney walls and other walls subject to high internal heat gains.
 - Do not install under eaves.
 - Do not install above windows.
 - Do not install above ventilation extracts.
- Ensure accessibility for inspection/verification
- An alternative to an external mounting is to locate the sensor in the AHU intake duct. This should ideally be upstream of the intake damper. Where this is not possible it must be a suitable distance before re-circulated air and mechanical devices to avoid their effects.

320.140 PRESSURE SENSORS:

- Pressure - general
- Pressure sensors are affected by orientation.
- The pressure tubes must be provided with a binder point near the device head for test purposes.
- The connection must be fitted with a bypass with a stop valve to avoid overload on one side when manipulating the sensors and to enable zero calibration. Isolating valves should also be fitted.
- The sensor should be installed on a vibration-free surface or vibration-proof base.
- The pressure-tapping point must not be located in turbulent air flow. Provide 6 x O/D upstream and 6 x O/D downstream of straight duct or pipe without obstructions.
- Pressure - air
- Probes for measuring static pressure should be installed parallel to the flow.
- The differential pressure measuring tube should be correctly sized.
- The tapping point should not be located where it will be affected by obstructions to the flow.
- Pressure - liquids
- Use a damping coil to avoid transferring vibrations (horizontal loops to avoid trapped air bubbles and condensate).
- The device must always be installed in a location which is lower than the sensing point.
- Do not measure at the top of a pipe (trapped air, bubbles) or at the bottom (dirt).
- Pressure - gases
- When measuring vapour gases the device must always be installed in a location which is higher than the sensing point.
- Measure at the top of the pipe to prevent condensate from entering the pressure tube.

320.160 INDOOR AIR QUALITY SENSORS:

- CO2 and mixed-gas sensors - room mounted
- Ensure that the sensor is located in a representative location, e.g. on an open wall 1.5 to 3 m above the floor.
- Ensure that the sensor is not mounted in niches or bookshelves or behind curtains.
- Ensure that the sensor is not located where people are continuously present (within 1 or 2 metres).
- CO2 and mixed-gas sensors - duct mounted
- Ensure that the sensor is located in the return air duct as close as possible to the room extract point(s).
- Ensure that the sensor is located in the vertical position.
- Ensure the correct orientation of the duct probe with respect to the airflow.
- Ensure that the sensor is not installed in a vertical position with the head at the bottom.

320.170 ACTUATORS:

- Securely mount actuators to rigid members, free from vibration or distortion in accordance with manufacturer's recommendations. Select mounting positions to require minimum linkages, and to avoid angular drive to operating levers. Allow access for servicing and replacement.
- Ensure that actuators and linkages for valves and dampers operate smoothly from fully open to fully closed without binding and with adequate torque to overcome the resistance of the actuator mechanism and the flow and to provide the specified close off ratings.
- Ensure that linkages are clearly marked with the clamping position such that after maintenance or replacement the mechanism is able to operate correctly.
- Fit actuators with visual position indication.
- Ensure that there is sufficient space above the actuator so that it may be removed for testing or maintenance.
- Include position feedback devices suitable for connection to the BMS.
- Ensure that actuators incorporate a disconnection device to allow manual operation of the valve or damper in the event of actuator failure.
- Ensure that actuators are electrically and mechanically protected from the effects of valve or damper seizure.

- Use 24v actuators wherever possible. Where line voltage actuators are used, provide local means of isolation by manual isolator or plug and socket connection.
- Ensure that, during commissioning, valve actuators are fitted in a fully closed/bypass position where they are being fitted to valves which push against a spring.

320.180 VALVES:

- General
- Ensure that valves have the correct authority without excessive pressure drop.
- Ensure that valve bodies are suitable for the medium, the temperature and the pressure of the fluid system.
- Ensure that valves will pass the required flow at a pressure drop within the maximum differential pressure rating of the valve.
- Check for out-of-balance forces, particularly during operation of a three-port valve.
- Where possible ensure that valves are not installed with their spindles in the horizontal position. If valves cannot be installed with their spindles in the vertical position ensure that they are as near as possible to the vertical.
- Ensure that valves are not installed with the actuator at the bottom.
- Modulating valves
- The following additional considerations apply for modulating valves:
 - Ensure system operating pressures, test pressures, pump heads and pressure drops through heat exchangers and associated pipework are known before control valves are selected.
 - Select valves to provide an authority of 0.3 to 0.5 for diverting applications and 0.5 for mixing applications.
 - Select valves with port characteristics appropriate for the intended function.
 - Ensure that all modulating control valves are selected for equal percentage or linear characteristics according to system type, to provide near linear characteristics between the valve position and heating/cooling power as delivered to the air or water-based system.
 - Ensure that the range ability of the selected valves is large enough to provide stable control under low load conditions.

320.190 VALVE SIZING REQUIREMENTS:

- All types of valves and applications
- Parameter - Body pressure rating.
- Requirements - To exceed system test pressure.
- All 2-port valves
- Parameter - Close-off pressure rating.
- Requirements - To exceed pump or system full differential pressure.
- All 3-port valves
- Parameters - Close-off pressure rating.
- Requirements - To exceed out of balance pressures
- All types of valves and applications
- Parameters - Maximum leakage coefficient.
- Requirements - 0.05% KV.
- 2-port isolation valves
- Parameters - Pressure drop at full flow.
- Requirements - Select at line size for minimal pressure drop.
- 2-port modulating valves
- Parameters - Pressure drop at full flow.
- Requirements - Select KV value for pressure drop within an agreed range.
- 3-port modulating valves
- Parameters - Pressure drop at full flow.
- Requirements - Select KV value for 30% - 50% authority against coil or circuit pressure drop.
- Isolation valve
- Parameter - Characteristic.
- Modulating valves (plant valves and zone reheater coil valves)

- Parameters - Characteristic.
- Requirements - Equal percentage.
- Modulating valve (fan coil units)
- Parameters - Characteristic.
- Requirements - Equal percentage (preferred) or linear.
- Modulating valves (independently pumped mixing and injection circuits)
- Parameter - Characteristic.
- Requirements - Linear.

320.200 DAMPERS:

Provide visual position indicators on all damper actuators installed so that they can be seen from the plantroom floor.

Ensure that damper characteristics are as linear as possible.

Ensure that modulating dampers are sized correctly to give adequate authority.

320.210 COMMUNICATION NETWORKS - GENERAL:

- Ensure that all addressable control devices can be addressed over the communications network.
- Ensure that the bandwidth and subsequent speed of communications is sufficient to meet the requirements of
- Ensure that no cross corruption of data occurs when the BMS shares a communication network with other IT-based systems. Ensure that permission has been given by the IT manager to connect BMS components onto the IT network.
- Ensure that network testing, identification and documentation comply with BS EN 50174.
- Ensure that all network devices such as routers and bridges are compatible with the network and are capable of operating such that the required throughput of data is achieved.

320.220 COMMUNICATION NETWORKS - STRUCTURED CABLING:

- Ensure that the selected BMS components are suitable for operating on the structured cabling system.
- Ensure that the selected BMS topology (star wired, chained or bus-based) is appropriate for the structured cabling system.
- Ensure that each addressable BMS device can be addressed over the structured cabling system.
- Where BMS components are specified to be powered from the structured cabling system ensure that the power available is sufficient. Ensure that overheating of the structured cabling system will not occur.
- Ensure that any changes to the structured cabling system are reflected in updated documentation.

320.230 COMMUNICATION NETWORKS - INTRANET AND INTERNET APPLICATIONS:

Ensure that the BMS devices to be directly connected onto the Intranet/Internet are TCP/IP compatible.

Ensure that the data security requirements of BS ISO/IEC 27001 and BS ISO/IEC 17799 are met.

320.240 COMMUNICATION NETWORKS - MAINS-BOURNE SIGNALLING:

Comply with the requirements of BS EN 50065-1.

Provide the necessary equipment to ensure that there is no mutual interference between the signalling system of the electricity utility and mains-borne signalling of the BMS.

320.260 INTEGRATION WITH FIRE DETECTION SYSTEMS - GENERAL:

- Ensure approval from the relevant Fire Prevention Officer or Building Control Officer.
- Ensure that the requirements of BS 5839-1 are not compromised.
- Ensure that the fire detection system can operate autonomously and will not be affected by any failure of the BMS.
- Ensure that the BMS will not be affected by any failure of the fire detection system or fails safe as appropriate.
- Ensure that the loss of electrical power to the BMS will have no adverse effects on the fire detection system.
- Ensure that a full cause and effect testing programme is developed in conjunction with the fire alarm company.
- Ensure that the integrated system is fully commissioned.
- Ensure that the contractual responsibilities of the various parties responsible for the integrated system are fully defined.

320.280 INTEGRATION WITH FIRE DETECTION SYSTEMS - INTEGRATION FOR CONTROLS:

- Provide fail-safe, hard-wired interlocks using volt-free contacts between the BMS field controllers and items of plant listed
- Use volt-free contacts and 24v AC or DC interlocks.
- Use relay logic and/or microprocessor-based logic.
- Ensure that building services control actions operate correctly in response to the status of the fire detection system.

340.000 WORKMANSHIP:

340.010 GENERAL:

Install pipeline control components in accordance with manufacturer's instructions.

Install ductline control components in accordance with DW 144 and manufacturer's instructions.

Install control components in accordance with manufacturer's recommendations, in positions indicated.

340.020 APPEARANCE:

Arrange, support and clip all control wiring, pneumatic tubes and capillaries to present a neat appearance, with other services and the building structure.

340.030 INSULATION:

Where control components are incorporated in insulated pipelines, ductlines or equipment, provide details for approval of method proposed to insulate component.

340.040 SUPPORTS:

Arrange supports for control components to ensure no strain is imposed on components.

340.050 ACCESS:

Arrange control components to ensure adequate access for operation and maintenance.

340.080 POWER OPERATED CONTROLS:

Install power operated controls in accordance with manufacturer's instructions and relevant standards.

340.110 ANCILLARIES:

Install ancillaries in accordance with manufacturer's instructions.

340.120 ENCLOSURES:

Install enclosures where indicated, providing space for access and maintenance.

340.130 BUILDING MANAGEMENT SYSTEM INSTALLATION:

Install commission and set to work building management system in accordance with the manufacturer's recommendations.

340.140 BUILDING MANAGEMENT SYSTEM CABLE INSTALLATION:

Plan and install all building management monitoring systems cables in accordance with the cable manufacturer's recommendations.

Label and record all monitoring cables in accordance with,

340.150 BUILDING MANAGEMENT SYSTEM QUALITY CONTROL:

Handle, store and install equipment and components of the building management system in accordance with the manufacturer's recommendations.

Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.

Record all commissioning tests and site modifications to hardware or software, and revise operating and maintenance instructions accordingly.

340.160 CONTROL SYSTEM FUNCTION CHARTS:

Prepare function charts for the control system in accordance with BS EN 60848. Obtain approval of function chart before design of system hardware or writing control software.

- Function chart format.
- Combined function chart/circuit diagram.
- Function chart only.

350.000 COMMISSIONING

- Perform system commissioning in accordance with 251.040.

360.000 DEMONSTRATION AND HANDOVER

360.010 WITNESSING REQUIREMENTS:

- Ensure that the project supervisor's nominated representative implements the following witnessing requirements. Ensure that on-site commissioning staff facilitate the witnessing process.
- Ensure that the BMS hardware is installed in accordance with the specification.
- Verify any operator software and associated graphics.
- Witness completely the control of any main and/or critical items of plant along with a random sample of other points.
- If less than 300 points, witness all points. Between 300 and 1,00 points witness 50% (minimum of 300 to be witnessed). If more than 1,000 points witness 20% (with a minimum of 500 points witnessed).
- Reserve the right to witness 100% of the points if the failure rate is greater than 5%.
- Witness a sample of specific functions, eg 10% of alarms and 10% of data logging.
- Witness one of several identical items of plant in detail with the others witnessed on a random

basis.

- Verify the system security access.
- Verify that all safety-related functions perform to that specified, eg plant shutdown on fire condition.
- Verify all plant restarts according to that specified after building power failure and local power failure.
- Witness all power meter data-points to ensure that they match the meters.
- Ensure that trend logs are used when witnessing points in order to monitor the performance of control actions.
- Verify the handover of all operating manuals and system documentation.
- Verify the handover of backup copies of software.
- Verify the completion of any specified system operator training.

360.020 OPERATOR TRAINING:

360.030 OPERATION AND MAINTENANCE MANUALS:

- Ensure that an initial draft of the O&M manual is submitted for approval prior to commissioning.
- Ensure that the O&M documentation is produced as the work proceeds and is updated when necessary. Ensure that this work commences at the start of the contract and is added to/updated as the contract progresses.
- Ensure that approved final copies of the O&M manuals are provided at handover.
- Ensure that the O&M manual is properly indexed. Ensure that terminology and references are consistent with the physical identification of component parts.
- Ensure that the O&M manual includes the following and is included in the site health and safety file:
 - A written description of plant operation.
 - Control strategy/logic diagrams recording the final version of configuration software installed at handover.
 - Details of system application software configuration.
 - A points list including hard and soft-points (all points should have a unique mnemonic).
 - A description of user adjustable points.
 - Commissioning record details.
 - Detailed data sheets for all control components and equipment.
 - Wiring circuit details including origin, route and destination of each cable.
 - Basic security access to the system.
 - Comprehensive instructions for switching on, operation, switching off, isolation, fault finding and procedures for dealing with emergency conditions.
 - Instructions for any precautionary measures necessary.
 - Instructions for the routine operation of the control system including simple day-to-day guidance for those operating the control system with limited technical skill.
 - Instructions for servicing and system upkeep.
 - A provision for update and modification.
- Ensure that the O&M manual includes comprehensive system operating instructions.

360.050 POST-HANDOVER CHECKS:

- Ensure that the following post-handover checks are performed:
 - Global level checks
 - internal air temperature
 - relative humidity
 - ventilation
 - energy consumption (ensure that the pulse-input counters match the meters).
- Check that each of the above meets the specified requirements.
- System level checks
- Control strategies. Check that any suspect control strategies are appropriate for the intended

application. Check that the suspect control strategy has been implemented and commissioned correctly. Check that the control strategy is still appropriate for the intended use.

- Network communications. Check that all relevant field controllers communicate properly. Check for correct sharing between controllers of relevant data and correct inter-controller operation.
- Control set-points. Check that the set-points in question are correct and appropriate for the actual operating conditions.
- Control loop settings. Check that the control loop settings result in accurate and stable control. Check that all self-learned characteristics are valid.
- Control zones. Check that the control zones are appropriate.
- Occupant controls. Check that occupant controls work correctly.
- Sub-system/component level checks
- Sensors. Check the accuracy and location of any suspect sensors.
- Actuators. Check that any suspect actuators operate correctly.
- Dampers and valves. Check that any suspect dampers and valves are not jammed and that they operate as intended.

BS APPENDIX

BS 4678-1:1971

Cable trunking. Part 1 Steel surface trunking.
Current, but obsolescent

BS 4678-2:1973

Cable trunking. Part 2 Steel underfloor (duct) trunking.
Current, Proposed For Obsolescence

BS 4678-4:1982

Cable trunking. Part 4 Specification for cable trunking made of insulating material.
Current, Proposed For Obsolescence

BS 5499-5:2002

Graphical symbols and signs. Safety signs, including fire safety signs. Part 5 Signs with specific safety meanings

BS 5839-1:2002

Fire detection and alarm systems for buildings. Part 1 Code of practice for system design, installation, commissioning and maintenance

BS 6701:2004

Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance

BS 7649:1993

Guide to the design and preparation of documentation for users of application software

BS 7671:2001

Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition

BS 7807:1995

Code of practice for design, installation and servicing of integrated systems incorporating fire detection and alarm systems and/or other security systems for buildings other than dwellings

BS EN 12098-2:2001

Controls for heating systems. Part 2 Optimum start-stop control equipment for hot water heating systems

BS EN 14908-1:2005

Open data communication in building automation, controls and building management. Building network protocol. Part 1 Protocol stack

BS EN 14908-2:2005

Open data communication in building automation, controls and building management. Control network protocol. Part 2 Twisted pair communication

BS EN 50065-1:2001

Specification for signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Part 1 General requirements, frequency bands and electromagnetic disturbances

BS EN 50085-1:2005

Cable trunking systems and cable ducting systems for electrical installations. Part 1 General requirements

BS EN 50085-2-3:2001

Cable trunking and cable ducting systems for electrical installations. Part 2-3 Particular requirements for slotted cable trunking systems intended for installation in cabinets. Slotted in cabinets

BS EN 50160:2000

Voltage characteristics of electricity supplied by public distribution systems

BS EN 50174-1:2001

Information technology. Cabling installation. Part 1 Specification and quality assurance

BS EN 50174-2:2001

Information technology. Cabling installation. Part 2 Installation planning and practices inside buildings

BS EN 50174-3:2003

Information technology. Cabling installation. Part 3 Installation planning and practices outside buildings

BS EN 60439-1:1999

Specification for low-voltage switchgear and controlgear assemblies. Part 1 Type-tested and partially type-tested assemblies

BS EN 60529:1992

Specification for degrees of protection provided by enclosures (IP code)

BS EN 60848:2002

GRAFCET specification language for sequential function charts

BS EN 61508-1:2002

Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 1 General requirements

BS EN 61508-2:2002

Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 2 Requirements for electrical/electronic/programmable electronic safety-related systems

BS EN 61508-3:2002

Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 3 Software requirements

BS EN 61508-4:2002

Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 4 Definitions and abbreviations

BS EN 61508-5:2002

Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 5 Examples of methods for the determination of safety integrity levels

BS EN 61508-6:2002

Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 6 Guidelines on the application of IEC 61508-2 and IEC 61508-3

BS EN 61508-7:2002

Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 7 Overview of techniques and measures

BS EN 954-1:1997

Safety of machinery. Safety related parts of control systems. Part 1 General principles for design

BS EN ISO 16484-2:2004

Building automation and control systems. Part 2 Hardware

BS EN ISO 16484-3:2005

Building automation and control systems. Part 3 Functions

BS ISO/IEC 17799:2005

Information technology. Security techniques. Code of practice for information security management

BS ISO/IEC 27001:2005

Information technology. Security techniques. Information security management systems. Requirements

W70 STRUCTURED CABLING SYSTEM

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:

The contractor shall design, install, test, commission and demonstrate the structured cable installation in accordance with this specification and the employer's requirement documents. To this end the contractor shall:

- Engage a specialist to carry out all works described within this work section.
- Provide a structured cabling system (SCS) compliant with all clauses contained within this work section.
- Provide and incorporate all necessary equipment, accessories and ancillaries for a complete working structured cabling system. If there are any areas of doubt, or, if any other equipment or ancillary works are required to provide a complete working system it is the responsibility of the contractor to identify the works, equipment and components required and to provide the necessary items.
- The internal telecommunications cabling shall be fully designed, installed, tested, commissioned and demonstrated by the contractor in accordance with the CAT6 cabling design requirements. The contractor is responsible for providing all cabling, back boxes, data fascia plates/connectors/sockets and terminating the cable at both ends, fully labelled and tested, ready for the college to plug the cables into the college provided patch panels and server equipment.

100.030 SYSTEM DESCRIPTION:

- Supply, install and test a structured cabling system.
- Type
 - T1A/E1A
 - Category 6
 - BS EN 50173-1
- Provide the entire structured cabling system supplied from a single manufacturer.
- Refer to manufacturers schedule

Requirement Specification

Project objectives

The new building will provide the facilities for teaching staff and pupils to encourage the use of ICT to support teaching and learning.

The scope of this project is to:

- Provide for structured wiring system, containment, faceplates, back plates, RJ45 modules, patch cables, termination, labelling and testing. Minimum specified bandwidth of 1000Mbps (CAT-6).
- Full site wireless survey and implementation of wireless LAN (IEEE 802.11a/g compliant).
- To work collaboratively with the selected M & E contractor to ensure the effective delivery of the ICT solution to the new college
- To work collaboratively with other appointed contractors whom intent to use the common network infrastructure to support converged services (e.g. IP Security, IP Telephony and IP enabled PA system).
- To provide a new secondary IT cable link system to all of the existing on site buildings

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W70

300.005 STANDARDS:

- Provide structured cabling systems in compliance with the following standards:
 - European Committee for Electrotechnical Standardisation (CENELEC) - European
- Note, this specification is based on the European Standards.
- Identify any instances where the proposed solution is only compliant with the above.

300.010 AMENDMENTS AND REVISIONS:

Comply with any published amendments and revisions to standards, requirements and recommendations issued up to and including start on site (and subsequently where the contractor can reasonably be assumed to be able to comply).

300.020 STANDARDS CONTRADICTIONS:

Confirm that this document has been checked to identify any areas it appears to contradict any of the standards referenced in this document.

300.030 STANDARDS:

Carry out work in accordance with the following standards and all standards that are referenced within.

- BS EN 50173-1 - Information Technology - Generic Cabling Systems.
- BS EN 50174-1 - Information Technology - Cabling Installation. Specification and quality assurance.
- BS EN 50174-2 - Information Technology - Cabling Installation. Installation planning and practices inside buildings.
- BS EN 50174-3 - Information Technology - Cabling Installation. Installation planning and practices outside buildings.
- BS 6701 - Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance.
- BS 7671 - Requirements for Electrical Installations - IEE Wiring Regulations Sixteenth Edition.

300.050 INDUSTRY PRACTICE:

Carry out work in accordance with the following industry practices.

- Ensure that the structured cabling system is fully compliant with the fibre optic industry association (FIA) code of practice for the installation of fibre cables.

300.060 MANUFACTURER'S GUIDELINES:

Carry out work in accordance with the manufacturer's requirements, guidelines and recommendations.

300.070 CLIENT SPECIFIC STANDARDS:

Provide the structured cabling system in accordance with:

- Preferred system
"Flood wired system, emanating from the cabinet rack.
Each data and telephone point will be wired as individual radial circuits from the rack in Cat 6 cable, which is to be segregated from other LV services in line with Bs 7671 and protected throughout their length in the cable containment.
The cables shall terminate onto single/dual or multiple RJ45 outlet plates as applicable, fixed to either recessed/surface mounted boxes as detailed on the drawings.
Cables within/on walls shall be protected by galvanised conduit, which shall terminate onto the accessory box and onto the main cable containment systems.
At each telephone outlet point, the RJ45 socket outlet shall be complete with proprietary adaptor to convert the line from data to telephone signal.
- Preferred supplier Refer to manufacturers schedule.

310.020 TERMINOLOGY:

Note, the following terminology is used throughout this section

- User Outlet (UO), End point of horizontal cable located in the work area.
- Floor Distributor (FD). Horizontal cabling subsystem termination point.
- Building Distributor (BD). Building backbone subsystem termination point.
- Campus Distributor (CD). Campus backbone subsystem termination point.
- Main Distributor Frame (MDF). Consolidation point for FD/BD and/or CD.
- Test Jack Frame (TJF). Telephone system / PTO / copper backbone termination point.
- Data Patch Panel (DPP). Active data equipment termination point.
- Voice Patch Panel (VPP). Active voice equipment termination point.

320.000 HORIZONTAL CABLING SUB SYSTEM

Link by horizontal cabling all user outlets to the Floor Distributor in a star topology, with each cable terminated, presenting an RJ45 outlet at the UO end. Terminate at the FD, end the cable onto either an RJ45 patch panel, 110 or Krone type interface.

Note, User Outlets (RJ45 outlets) are universal outlets and serve both voice and data needs (i.e. telephones, fax, PCs, terminals, printers, etc.)

320.010 HORIZONTAL CABLE:

Provide horizontal cable of not more than 4 pairs and within its own sheath, and not sharing sheaths with any other cable. Provide cable to be of the same type and manufacturer throughout the entire system.

- Cable type
 - Shielded Twisted Pair (STP), 100ohm
- Sheath composition
 - LSFOH

Connect each cable into the back of an RJ45 outlet, plug or socket. Ensure connection does not form a mated RJ45 pair. Terminate cable onto the back of a user outlet at the work area end and interface at the Floor Distributor end.

Ensure each cable and each sheath is continuous throughout its route length with no cable splicing or other type of connection.

Ensure every cable is installed so that it can be cut and re-terminated. Allowed this singly or in cable groups depending on the terminations considered (typically in patch frames, groups would need to be re-terminated).

Notes, some RJ45s are only suitable for stranded cables and some are only suitable for solid cables. Ensure that the appropriate RJ45s are used in each situation.

Ensure cables are not bent to a radius less than that specified by the cable manufacturer, either during installation or as installed, and that any part of the overall installation provided is such as to mean that any cable would in the future need to contravene these bending principles.

Notify the relevant parties if works installed by others may mean that it would be difficult or impossible to meet the bending radii requirements.

- Install cables in the relevant containment as shown on the drawings and otherwise.

320.030 ACTIVE DATA HOST LOOMS:

Provide host looming patch panels to allow attachment of active network devices without requiring them to be directly patched to the system. Locate the active LAN equipment in equipment cabinets or open frames. Locate the host loom patch panels in the floor distributors.

Provide each host loom as multiple single-ended RJ45 fly leads. Form the plug end of the looms neatly to plug into the active equipment (or left spare for future connection). Terminate or present the other end of the fly leads on the active data RJ45 patch panel (DPP).

Type

- 24 way host loom.
- 48 way host loom.
- Contractor to advise

320.040 HORIZONTAL CABLE PRESENTATION:

Present the horizontal cable on patch panels within cabinets or frames as defined later in this work section.

- Patch panel type
 - 1U - 24 port patch panel
 - 2U - 48 port patch panel
 - Contractor to advise

Separate the patch panels by 1U cable tidies such that each cable tidy is followed by not more than 48 outlets, followed by a 1U cable tidy and so on, i.e. one cable tidy per 48 outlets plus one additional cable tidy.

330.050 TELECOMMUNICATIONS TIE CABLE:

- Provide telecommunications tie cables as follows
 - From the incoming Public Telephone Operator (PTO) frame to the Test Jack Frame.
- Cable size
 - 100 pair

330.055 TELECOMMUNICATIONS TIE CABLE PRESENTATION:

Terminate the tie cable on panels within cabinets or frames as defined later in this work section.

- Patch panel type
 - 1U - 24 port patch panel
 - 2U - 48 port patch panel
 - Contractor to advise

Separate the patch panels by 1U cable tidies such that each cable tidy is followed by not more than 48 outlets, followed by a 1U cable tidy and so on, i.e. one cable tidy per 48 outlets plus one additional cable tidy.

350.000 PATCH CORDS AND FLY LEADS

Utilise patch cords to patch the required services to the required outlets within both the Floor and Building Distributors.

Note, fly leads are utilised to provide the final connection from the user outlet to the end device.

- Type
 - Copper

350.010 COPPER PATCH CORDS AND FLY LEADS:

Provide copper patch cords and fly leads composed of stranded not solid conductors and be provided with factory fitted RJ45 plugs.

- Colours
 - LAN - grey
 - WLAN - green
 - Voice services - blue
 - Essential services - red
 - Servers - yellow

350.030 PATCH CORD INSTALLATION:

Install the following patch cord type to ensure the correct device is patched to the correct service.

- Copper

The responsibility for production of the patching schedule is

- SCS contractor

350.040 FLY LEAD INSTALLATION:

Install all fly leads to ensure the correct device is connected to the correct user outlet. The responsibility for production of the patching schedule is

- SCS contractor

360.000 CABINETS AND FRAMES

360.010 CABINETS:

Provide cabinets.

- Manufacturer and reference

To be a 19"/2M high rack free standing rack provided by the contractor.

Provide cabinets to house the Building and Floor Distributors and the following equipment provided by the contractor.

- Active data equipment
- CCTV equipment
- PA amplifier
- CD player
- DVD player
- Type
 - Free standing
- Size and quantity of the cabinets are detailed in schedule reference W70-Structured cabling cabinets.

370.000 INSTALLATION

Ensure all manufacturer guidelines, main contractor site rules and client requirements detailed within the complete tender documentation are followed.

Carry out all installation works in accordance with the site health and safety file, with the contractor ensuring their areas of responsibility operate in a clean and tidy environment. Ensure all outlets are protected from dust ingress.

370.010 BRING INTO SERVICE SUPPORT:

Make available engineers over at least the two days either side of each bring into service (BIS) date, as well as on the BIS date(s) itself, to provide whatever support is required.

370.020 PROJECT MANAGEMENT:

Appoint a qualified and experienced structured cabling system project manager to plan, direct and oversee their works and workers, and to liaise with and provide timely information to all relevant parties.

Meet the main contractor's programme.

370.030 TRAINING:

Train the users how to use the system, showing all elements of patching and user outlet relocation and addition.

Provide training for up to

- Four users.

with training being scheduled with reasonable notice at the request of client name or their agents.

Train the users together or separately, before or within one month after hand over, at the discretion of client name or their agents.

370.040 TESTING:

Describe how it is intended to prove the provenance of the components which will be installed. Note provenance means how the parts were provided by the manufacturer, how they were obtained by the contractor, how they were held by the contractor, etc, ensuring overall that they are what they purport to be.

Carry out full testing as specified in the standards for all elements of the structured cabling system, and obtain appropriate passes for each element such as to ensure total structured cabling system compliance with the standards.

- Tests to include but not be limited to:
 - Attenuation.
 - NEXT (near end cross talk).
 - DC resistance/unbalance.
 - Mutual capacitance and capacitance to ground.
 - Impedance.
 - Distance in metres from the relevant patch panel to each outlet.
 - Testing in accordance with the manufacturer and TIA/EIA, ISO and EN standards.
- Tests carried out on the cat3 or CW1308 cabling to include but not be limited to:
 - Full continuity tests on every conductor.
 - Polarity tests on every pair.
- Tests carried out on the fibre optic cabling to include but not be limited to optical time domain reflectometer (OTDR) tests.
- Where test results are produced by electronic means submit the electronic versions in
 - CD
 - DVD
 - Hard disk
- Provide if special software is required to view the results, the necessary disks containing the software, together with the required user licence(s)

370.050 TESTING EQUIPMENT:

List and describe the proposed testing equipment, which will be used on site and/or in their factory. Provide copies of valid calibration certificates for all equipment used for testing to the client or their agents at their premises with reasonable notice.

Provide sample test result sheets for each of the tests to be carried out.

370.060 INSPECTION CHECKS:

Note, during the installation period the client or their agents will make various physical inspections of the installation, including but not limited to: standard of workmanship, standards adherence, labelling. Also note, the client or their agents will carry out witness checks of about 10% of the structured cabling system and the testing. Ensure reasonable notice is given before commencement of any tests. Also note before hand over and after full testing by the contractor, the client or their agents will carry out random sample tests to confirm the quality of the installation. Tests will include electronic tests and inspection for such as labelling shortcomings.

Make available all personnel and equipment required to enable the client or their agents to carry out any of the above checks, both on site and in their factory.

370.070 AS INSTALLED INFORMATION:

Provide an operations manual that explains how to use the structured cabling system and describes what can and what cannot be connected to it.

Provide the as installed information as defined below and in accordance with the main contract requirements. Provide this information as part of the systems operations manual.

- Drawings
 - Equipment room plan
 - Equipment room elevation
 - Outlet positions
- Schedules
 - Cables and outlets
 - Test results
- Component descriptions
- Handover certificate
- Warranty certificate

370.080 LABELLING:

Provide appropriate labelling for all elements of the scheme, including

- Horizontal Cabling Subsystem
 - Horizontal cable
 - User outlet
 - Patch panel, both the panel and the outlet
- Fly leads
- Cabinets and frames
- Labels on patch cords are not required.

Label cables at all points where they enter or exit from concealment.

Prove labelling machine produced. Ensure that hand written labels are not used.

Label patch panel of two rows of characters top row to be common to the complete length of the patch panel and be descriptive of the outlet type, i.e. 1st Floor User Outlets, the bottom row to identify each individual outlet.

370.090 LABELLING SCHEME:

Adopt the proposed labelling scheme identified below.

370.092 HORIZONTAL CABLING SYSTEM:

Uniquely identify each user outlet using the following notation:

N - NN - A - A - NN

N 1 digit number indicating building, 1 for building one, 2 for building two, etc,

NN 2 digit number indicating floor level, 00 for ground, 01 for first, 02 for second, etc

A 1 letter indicating patch frame or cabinet

A 1 letter indicating patch panel

NN 2 digit number from 1 to 48

Uniquely identify each horizontal cable at both ends using consecutive numbers.

Uniquely identify each fly lead at both ends to match the user outlet.

380.000 WARRANTY

Provide a warranty for the complete structured cabling system.

Type

- Installer warranty.
- Main Contractor warranty.
- Major Structured Cabling Manufacturer warranty.
- Duration of the warranty from the handover date of the completed system for a minimum of:
 - 2 years

Cover appropriate extensions to the structured cabling system by the warranty. Note appropriate extensions to be those which meet the manufacturer's design guides, installed by the contractor (or by any other contractor registered with and authorised by the end manufacturer as a certified installer) using certified components and procedures as prescribed by the manufacturer.

Arrange for the structured cabling manufacturer to visit site during the installation and at practical completion and confirm to the client, or their agents, manufacturer compliance.

Ensure the warranty is voided by normal use of the system, including moves and changes carried out by the client or their agents.

Ensure the warranty provides for the client or their agents to contact the contractor in the first instance, who shall attend the site within one working day to carry out appropriate tests and who will then progress the claim through the manufacturer. Agree action on the claim and initiated within 10 working days of notification of the claim. Ensure the action shall be completed without unreasonable delay.

Arrange a contract between the client and the manufacturer such that if the contractor is no longer in existence (or in the event of non-performance by the contractor) then the manufacturer shall fulfil all the obligations of the contractor.

State the name, address and claim contact details (department name, persons name and phone no) of the manufacturer. Note this may be used to verify that the warranty is fully compliant with the above requirements.

Y SECTIONS

Y10 PIPELINES

Y10.1000 GENERAL

- Supply pipes and fittings as specified in work section
- Supply pipes and fittings as schedule reference Y10-Pipework
- Location

1010 PRE-FABRICATED PIPEWORK:

Supply pre-fabricated pipework in accordance with relevant materials and workmanship clauses.

1020 FITTINGS:

For changes in direction use centreline radius/nominal bore of not less than 1.5 unless otherwise directed. For reductions and enlargements use easy transition type with inclined angle not exceeding 30 degrees.

1030 FABRICATED FITTINGS:

Use only with approval, if manufacturer's standard fittings are not available.

1040 PIPE JOINTS:

Obtain approval from Local Water Authority or Water Research Centre for materials used in water supplies.

Y10.2010B MEDIUM BLACK STEEL PIPES TO BS EN 10255:

Material - Steel

Standard - BS EN 10255

Dimensions - Medium. Random single lengths, 4m to 7m.

Ends - Screwed to BS 21 and BS EN 10226-1, taper thread or Plain.

Finish - Varnished.

Y10.2020A STEEL FITTINGS - SCREWED BENDS AND SPRINGS TO BS EN 10255:

Material - Steel grade, seamless.

Standard - BS EN 10255.

Size range - 6mm to 150mm.

Dimensions - BS EN 10255, medium weight.

Ends - Screwed to BS 21 and BS EN 10226-1.

Finish - Galvanised.

Y10.2060B MEDIUM WEIGHT CARBON STEEL FITTINGS, BUTT WELDED TO BS 1965-1:

Material

Carbon steel, grade 430, electric resistance welded.

Standard - BS 1965-1.

Size range - 25mm to 400mm.

Dimensions - BS EN 10253-1 Medium.

Ends - Bevelled.

Finish - Varnished.

Y10.2070A MALLEABLE CAST IRON FITTINGS, SCREWED:

Material - Cast iron to BS EN 1562.
Standard - BS 143 & 1256 or BS EN 10242.
Size range - 10mm to 164mm.
Dimensions - BS 143 & 1256 or BS EN 10242.
Ends - screwed to BS 21 and BS EN 10226-1.
Finish - Black

Y10.2270A COPPER HALF HARD:

Kitemarked.
Material - Copper.
Standard - BS EN 1057, R250, (Class X).
Dimensions - BS EN 1057 table 3.
Ends - Plain
Finish - Uncoated.

Y10.2310A CAPILLARY FITTINGS FOR COPPER TUBING, GENERAL POTABLE RANGE:

Material - Copper or dezincifiable resistant copper alloy.
Standard - BS EN 1254-1.
Size range - 6mm to 67mm.
Dimensions - BS EN 1254-1 table 2.
Ends - Integral (lead-free) solder ring.
Finish - Natural.

Y10.2320A TYPE A COMPRESSION FITTINGS FOR COPPER TUBING:

Kitemarked.
Material - Dezincifiable resistant copper alloy
Standard - BS EN 1254-2, type A, non-manipulative.
Size range - 6mm to 54mm.
Dimensions - BS EN 1254-2, table 2 and 3.
Ends - Socket.
Finish - Natural.

Y10.2350A CAST IRON PIPES AND FITTINGS TO BS 416-1:

Material - Cast grey or ductile iron.
Standard - BS 416-1, spun.
Dimensions - BS 416-1.
Ends - Socket type A or B.
Finish - Hot dipped to BS 416-1.

Y10.2370A CAST IRON PIPES TO BS 437 FOR FLEXIBLE JOINTS:

Material - Cast iron.
Standard - BS 437.
Dimensions - BS 437.
Ends - For flexible joint to BS EN 877.
Finish - Hot dipped to BS 437.

Y10.2380A CAST IRON FITTINGS TO BS 437 FOR FLEXIBLE JOINTS:

Material - Cast iron.
Standard - BS 437, sand cast.
Size range - 50mm to 225mm.
Dimensions - BS 437, figures 1 to 66.

Ends - For flexible joints to BS EN 877.
Finish - Hot dipped to BS 437.

Y10.2390A RED CAST IRON PIPES AND FITTINGS TO BS EN 877:

Material - Cast iron.
Standard - BS EN 877.
Dimensions - BS EN 877, table 1.
Ends - Plain.
Finish - Red epoxy.

Y10.2390B GREY CAST IRON PIPES AND FITTINGS TO BS EN 877:

Material - Cast iron.
Standard - BS EN 877.
Dimensions - BS EN 877, table 1.
Ends - Plain.
Finish - Grey epoxy.

Y10.2410A FLANGED DUCTILE IRON PIPES AND FITTINGS TO BS EN 545:

Material - Ductile iron.
Standard - BS EN 545.
Dimensions - Flanged, class K9.
Ends - Flanged.
Finish - External, zinc rich, with polyethylene sleeving, extruded polyethylene, extruded polypropylene or polyurethane.
Internal, polyurethane to BS EN 15189.

Y10.2410B DUCTILE IRON PIPES AND FITTINGS TO BS EN 545:

Material - Ductile iron.
Standard - BS EN 545.
Dimensions - Spigot/socket, table 14.
Ends - Spigot and socket.
Finish - External, zinc rich, with polyethylene sleeving, extruded polyethylene, extruded polypropylene or polyurethane.
Internal, polyurethane to BS EN 15189.

Y10.2415A FLANGED DUCTILE IRON PIPES AND FITTINGS TO BS EN 969:

Material - Ductile iron.
Standard - BS EN 969.
Dimensions - Flanged, class K9 or K10.
Ends - Flanged.
Finish - External, zinc rich, with polyethylene sleeving, extruded polyethylene, extruded polypropylene or polyurethane.
Internal, polyurethane to BS EN 15189.

Y10.2415B DUCTILE IRON PIPES AND FITTINGS TO BS EN 969:

Material - Ductile iron.
Standard - BS EN 969.
Dimensions - Spigot, table 13, socket, table 12.
Ends - Spigot and socket.
Finish - External, zinc rich, with polyethylene sleeving, extruded polyethylene, extruded polypropylene or polyurethane.
Internal, polyurethane to BS EN 15189.

Y10.2420A FLANGED DUCTILE IRON PIPES AND FITTINGS TO BS EN 598:

Material - Ductile iron.
Standard - BS EN 598.
Dimensions - Flanged, Class K9.
Ends - Flanged.
Finish - External, zinc rich, with polyethylene sleeving, extruded polyethylene, extruded polypropylene or polyurethane to BS EN 15189.
Internal, high alumina cement mortar.

Y10.2420B DUCTILE IRON PIPE AND FITTINGS TO BS EN 598:

Material - Ductile iron.
Standard - BS EN 598.
Dimensions - Spigot/socket, table 11.
Ends - Spigot or socket.
Finish - External, zinc rich, with polyethylene sleeving, extruded polyethylene, extruded polypropylene or polyurethane to BS EN 15189.
Internal, high alumina cement mortar.

Y10.2455A PLASTICS PIPING SYSTEMS FOR WATER SUPPLY - PIPES TO BS EN 1452:

Material - Unplasticised polyvinyl chloride (PVC-U).
Standard - BS EN 1452-2.
Dimensions - Length - manufacturer's standard range. BS EN 1452-2 tables 1, 2, 3, 4 and 5.
Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.
Finish - Grey, blue or cream.

Y10.2475A PLASTICS PIPING SYSTEMS FOR WATER SUPPLY - FITTINGS TO BS EN 1452:

Material - Unplasticised polyvinyl chloride (PVC-U).
Standard - BS EN 1452-3.
Size range - 12mm to 315mm
Dimensions - Length - manufacturer's standard range. BS EN 1452-2 tables 1, 2, 3, 4 and 5.
Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.
Finish - Grey.

Y10.2490A UNPLASTICIZED PVC FITTINGS, SOLVENT WELDING TO BS 4514:

Material - Unplasticized PVC.
Standard - BS 4514, table 2.
Size range - 82mm, 110mm or 160mm.
Dimensions - BS 4514 tables 3 and 5.
Ends - Spigot/plain.
Finish - Black, grey or white.

Y10.2495A PLASTICS PIPING SYSTEMS TO BS EN 1453:

Plastics piping system with structured wall pipes for soil and waste discharge (low and high temperature) within the building structure.
Material - Unplasticised polyvinyl chloride (PVC-U).
Standard - BS EN 1453.
Dimensions - Length - manufacturer's standard range. BS EN 1453 tables 1, 2 and 3.
Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.
Finish - Grey, black, or white.

Y10.2500A POLYETHYLENE TO BS 6730:

Material - Polyethylene.

Standard - BS 6730.

Dimensions - BS 6730 table 1.

Lengths - straight pipe 6 and 12m; coils 50m, 100m and 150m.

Ends - Plain or Sockets.

Finish - Black pigment.

Y10.2510A COMPRESSION FITTINGS FOR POLYETHYLENE PIPES:

Material - Copper/copper alloy (dezincifiable resistant).

Standard - BS EN 1254-3 or BS 864-5.

Size range - 20mm to 63mm.

Dimensions - To suit pipes to BS EN 12201.

Ends - Socket.

Finish - Cast.

Y10.2520 POLYETHYLENE TO BGC/PS/PL2 AND BS 3412:

Material - Polyethylene.

Standard - To BGC/PS/PL2 Part 1, table 2.

Dimensions - To BGC/PS/PL2 Part 1, table 2.

Lengths - straight pipe 6m or 12m.

Lengths - coiled pipe multiples of 50m.

Ends - Plain.

Finish - Natural self colour.

Y10.2528 POLYETHYLENE PIPES TO BS EN 1555:

Material - Polyethylene.

Standard - BS EN 1555-1, BS EN 1555-2 and BS EN 1555-5.

Dimensions - BS EN 1555-2, table 1.

Lengths - straight pipe 6m or 12m.

Lengths - coiled pipe multiples of 50m.

Marking - BS EN 1555-2, table 7.

Ends - Plain.

Finish

- Black
- Yellow
- Black with yellow identification stripes.

Y10.2530 POLYETHYLENE FITTINGS, FUSION TO BGC/PS/PL2 PART 2:

Material - Polyethylene.

Standard - To BGC/PS/PL2 Part 2.

Size range - Socket type up to 125mm. Butt type up to 500mm. Saddle type up to 180mm.

Dimensions - To BGC/PS/PL2 Part 2.

Ends - Plain.

Finish - Natural self colour.

Y10.2538 POLYETHYLENE FUSION FITTINGS TO BS EN 1555:

Material - Polyethylene.

Standard - BS EN 1555-1, BS EN 1555-3 and BS EN 1555-5.

Dimensions - BS EN 1555-3, Section 6, to suit pipes to BS EN 1555-2.

Marking - BS EN 1555-3, table 7.

Ends - Sockets with heating elements for fusion jointing.

Finish

- Black
- Yellow.

Y10.2545A PLASTICS PIPING SYSTEMS TO BS EN 1451-1 - PIPES:

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure.

Material - Polypropylene (PP).

Standard - BS EN 1451-1.

Dimensions - Length - manufacturer's standard range. BS EN 1451-1 tables 1, 2, 3 and 4.

Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.

Finish - Grey, black, or white.

Y10.2552# POLYPROPYLENE PIPING SYSTEMS FOR UNDERGROUND DRAINAGE AND SEWERAGE TO BS EN 14758:

- Plastics piping system for underground drainage and sewerage both buried in the ground within the building structure, and buried in the ground outside the building structure.
- Material - Polypropylene with mineral modifiers (PP-MD).
- Standard - BS EN 14758-1.
- Nominal Ring Stiffness
- SN4
- SN8
- Dimensions
- Length - manufacturer's standard range.
- Ends
- Plain, with chamfer.
- Plain, without chamfer.
- Single socket with ring seal, with chamfer.
- Single socket with ring seal, without chamfer.
- Finish
- Black.
- Orange-brown (approximately RAL 8023).
- Dusty grey (approximately RAL 7037).
- Coloured

Y10.2552A POLYPROPYLENE PIPING SYSTEMS FOR UNDERGROUND DRAINAGE AND SEWERAGE TO BS EN 14758:

Plastics piping system for underground drainage and sewerage both buried in the ground within the building structure, and buried in the ground outside the building structure.

Material - Polypropylene with mineral modifiers (PP-MD).

Standard - BS EN 14758-1.

Dimensions - Length - manufacturer's standard range.

Ends - Plain (with or without chamfer); or single socket with ring seal (with or without chamfer).

Finish - Black, orange-brown (approximately RAL 8023) or dusty grey (approximately RAL 7037).

Other colours may be used.

Y10.2555A PLASTICS PIPING SYSTEMS TO BS EN 1451-1 - FITTINGS:

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure.

Material - Polypropylene (PP).

Standard - BS EN 1451-1.

Size range - 32mm to 315mm.

Dimensions - BS EN 1451-1 tables 5 - 8.

Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.
Finish - Grey, black, or white.

Y10.2580A PVC-U PIPING SYSTEMS - PIPES:

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure.

Material - Unplasticised polyvinyl chloride (PVC-U).

Standard - PVC-U to BS EN 1329-1.

Dimensions - Length - manufacturer's standard range. BS EN 1329-1 tables 1, 2, 3 and 4.

Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.

Finish - Grey, black, or white.

Y10.2585A PVC-U PIPING SYSTEMS TO BS EN 1329-1 - FITTINGS:

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure.

Material - Unplasticised polyvinyl chloride (PVC-U).

Standard - PVC-U to BS EN 1329-1.

Size range - 32mm to 315mm.

Dimensions - BS EN 1329-1 tables 5-14.

Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.

Finish - Grey, black, or white.

Y10.2772# GLASS REINFORCED PLASTICS (UNSATURATED POLYESTER RESIN) TO BS EN 1796 AND BS EN 14364:

- Material - Glass reinforced thermosetting plastic based on unsaturated polyester resin.
- Standard
- BS EN 1796 and BS EN 14364.
- Installation to DD CEN/TS 14578
- Dimensions
- Diameters as indicated.
- Ends
- Plain.
- Spigot.
- Flanged.
- Screwed.
- Finish
- Natural self colour.
- Jointing
- BS EN 1796.
- BS EN 14364.

Y10.3010A CIRCULAR FLANGES FOR PIPES, PN DESIGNATED - WELDED FLANGE:

Material - BS EN 1092-1.

Flange type - Weld neck flange or hubbed slip-on flange for welding.

Flange facings - Raised face - type B.

Bolting - In accordance with BS EN 1092-1.

Y10.3010B CIRCULAR FLANGES FOR PIPES, PN DESIGNATED - THREADED FLANGE:

Material to BS EN 1092-1.

Facings - Raised face type B.

Bolting - in accordance with BS EN 1092-1.

Threaded flanges - BS 21 and BS EN 10226-1 parallel thread.

Y10.3010C CIRCULAR FLANGES FOR PIPES, PN DESIGNATED - CAST IRON FLANGE:

Material - BS EN 1092-2 - Ductile cast iron.

Bolting - In accordance with BS EN 1092-2.

Y10.3020A JOINTING RINGS - NON-METALLIC FLAT GASKETS:

Non-metallic flat gaskets for flanges to BS EN 1092-1, BS EN 1092-2, BS EN 1092-3 or BS EN 1092-4.

Standard - BS EN 1514-1

Gasket type - Full face for type B.

Y10.3020B JOINTING RINGS - METALLIC GASKETS:

Corrugated, flat or grooved metallic and filled metallic gaskets for flanges to BS EN 1092-1, BS EN 1092-2, BS EN 1092-3 or BS EN 1092-4.

Standard - BS EN 1514-4

Gasket type - Corrugated metal.

Gasket design - Self centring for type B.

Y10.3020C JOINTING RINGS FOR CAST IRON:

Non-metallic flat gaskets for flanges to BS EN 1092-2

Standard - BS EN 1514-1.

Gasket type - Suitable for flanges to BS EN 545, BS EN 598 and BS EN 969.

Y10.3030A SCREWED JOINTS TO BS 21 AND BS EN 10226-1:

Use PTFE tape to BS 7786 or use hemp and jointing compound to BS 6956-5, or BS EN 751-2.

Y10.3030B SCREWED JOINTS TO BS 21 AND BS EN 10226-1 WITH PTFE TAPE:

Use PTFE tape to BS 7786.

Y10.3030C SCREWED JOINTS TO BS 21 AND BS EN 10226-1 WITH CHEMICAL CLEANING:

Use hemp and jointing compound to BS 6956-5 or BS EN 751-2, prior to chemical treatment and use PTFE tape to BS 7786 after chemical treatment.

Y10.3040A RAILROAD UNION CONNECTIONS:

Seating - Spherical seating bronze to iron, railroad pattern.

Y10.3040B NAVY UNION CONNECTIONS:

Seating - Spherical seating bronze to bronze, navy pattern.

Y10.3050A WELDED JOINTS, WELDING RODS FOR STEEL PIPES:

Gas welding, BS 1453 type A2 or A3; electric arc welding BS 2633; or electric arc welding BS 2971.

Y10.3105A STAINLESS STEEL COUPLINGS FOR CAST IRON PIPES TO BS EN 877:

Material - Stainless steel, with zinc coated bolts and bolt holder.
Gasket - EPDM.

Y10.3105B RED DUCTILE IRON COUPLINGS FOR CAST IRON PIPES TO BS EN 877:

Material - Ductile iron.
Finish - Red.
Gasket - EPDM.

Y10.3105C GREY DUCTILE IRON COUPLINGS FOR CAST IRON PIPES TO BS EN 877:

Material - Ductile iron.
Finish - Grey.
Gasket - EPDM.

Y10.3105D BLACK DUCTILE IRON COUPLINGS FOR CAST IRON PIPES TO BS EN 877:

Material - Ductile iron.
Finish - Black.
Gasket - EPDM.

Y10.3110A SPIGOT/SOCKET CAULKED JOINTS:

Use for spun cast iron pipe.
Yarn - Tarred hemp or spun yarn; or sterile inorganic yarn.
Lead - Virgin blue pig lead.

Y10.3170# FLEXIBLE COUPLINGS, SLEEVE TYPE:

- Joint
- Bolted, sleeve type, with wedge type elastomeric gaskets.
- Type
- End load capable, gripping elements embedded in gaskets (up to 250mm).
- Non-end load capable.
- Dimensions - Manufacturer's standard.
- Material
- Malleable cast iron to BS EN 1562.
- Ductile cast iron to BS EN 1564.
- Carbon steel to BS EN 10025-1, BS EN 10025-2.
- Finish
- Manufacturer's standard.
- Galvanized.
- Nylon coated.
- Gaskets
- BS EN 682
- GA - Gaseous fuel (-50C to 50oC)
- GAL - Gaseous fuel (-15oC to 50oC)
- GB - hydrocarbon fluids (-5oC to 50oC)
- GBL - hydrocarbon fluids (-15oC to 50oC)
- H - Aromatic hydrocarbon fluids and gaseous fuels containing condensates (-5oC to 50oC)
- BS EN 681-1
- WA - cold potable water.
- WB - hot potable water.
- WC - cold non-potable water supply, drainage, sewerage and rainwater pipes.
- WD - hot non-potable water.
- WE - hot potable water, seals manufactured from isoprene-isobutylene copolymer.
- WF - hot non-potable water, seals manufactured from isoprene-isobutylene copolymer.

- WG - cold non-potable water supply, drainage, sewerage and rainwater pipes with oil resistance.
- BS EN 681-2
- WT - above ground use.

Y10.3170A FLEXIBLE COUPLINGS, SLEEVE TYPE:

Joint - Bolted, sleeve type, with wedge type elastomeric gaskets.
Type - Non-end load capable.
Dimensions - Manufacturer's standard.
Material - Ductile cast iron to BS EN 1564, or to BS EN 1563.
Finish - Manufacturer's standard.
Gaskets - In accordance with BS EN 681-1, BS EN 681-2 or BS EN 682.

Y10.3180# FLEXIBLE FLANGE ADAPTERS, SLEEVE TYPE:

- Joint
- Bolted, sleeve type, with wedge type elastomeric gaskets, flanged on end.
- Type
- End load capable, gripping elements embedded in gaskets (up to 250mm).
- Non-end load capable.
- Dimensions - Manufacturer's standard.
- Material
- Ductile cast iron to BS EN 1564.
- Carbon steel to BS EN 10025.
- Flange
- To connect to BS EN 1092-1, BS EN 1092-2, BS EN 1092-3 or BS EN 1092-4, PN10 flange.
- To connect to BS EN 1092-1, BS EN 1092-2, BS EN 1092-3 or BS EN 1092-4, PN16 flange.
- Finish
- Manufacturer's standard.
- Galvanized.
- Nylon coated.
- Gaskets
- BS EN 682
- GA - Gaseous fuel (-50C to 50oC)
- GAL - Gaseous fuel (-150C to 50oC)
- GB - hydrocarbon fluids (-50C to 50oC)
- GBL - hydrocarbon fluids (-150C to 50oC)
- H - Aromatic hydrocarbon fluids and gaseous fuels containing condensates (-50C to 50oC)
- BS EN 681-1
- WA - cold potable water.
- WB - hot potable water.
- WC - cold non-potable water supply, drainage, sewerage and rainwater pipes.
- WD - hot non-potable water.
- WE - hot potable water, seals manufactured from isoprene-isobutylene copolymer.
- WF - hot non-potable water, seals manufactured from isoprene-isobutylene copolymer.
- WG - cold non-potable water supply, drainage, sewerage and rainwater pipes with oil resistance.
- BS EN 681-2
- WT - above ground use.

Y10.3180A FLEXIBLE FLANGE ADAPTERS, SLEEVE TYPE:

Joint - Bolted, sleeve type, with wedge type elastomeric gaskets, flanged on end.
Type - Non-end load capable.
Dimensions - Manufacturer's standard.
Material - Ductile cast iron to BS EN 1564.
Flange - To connect to BS EN 1092-2, PN10 flange.
Finish - Manufacturer's standard.

Gaskets - In accordance with BS EN 681-1, BS EN 681-2 or BS EN 682.

Y10.3190A WALL, FLOOR AND CEILING CHROMIUM PLATED MASKING PLATES:

Material - Copper alloy, chromium plated.

Type - Heavy, split on the diameter, close fitting to outside of pipe.

Fixing - Chrome raised head fixing screws.

Y10.3190B WALL, FLOOR AND CEILING PLASTIC MASKING PLATES:

Material - Plastic.

Fixing - Clipped with plastic lug.

Y10.4010 APPEARANCE:

Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure, subject to gradients for draining or venting.

Ensure all vertical pipes are plumb or follow building line.

Y10.4020 SPACING:

Space pipe runs in relation to one another, other services runs and building structure, allow for specified thickness of thermal insulation and ensure adequate space for access to pipe joints, etc.

The following are recommended as minimum clearances in spacing of pipe runs:-

Y10.4030 GRADIENTS:

Install pipework with gradients to allow drainage and/or air release, and to the slopes where indicated.

Y10.4040A AIR BOTTLES:

Provide a means of venting the pipe system at all high points.

Provide a vertical extension from the pipe approximately 100mm long, at the bore of the pipe, with a copper extension pipe with a manual vent cock located in an easily accessible position.

Y10.4040B AUTOMATIC AIR VENTS:

Provide a means of venting the pipe system at all high points.

Provide an automatic air vent valve with a copper outlet pipe from the valve to a tundish in an adjacent drain line or to another suitable location.

Y10.4050 DRAIN REQUIREMENTS:

Grade pipework to allow system to be drained. Provide a means of draining the system at all low points.

Y10.4060 EXPANSION AND CONTRACTION:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes, generally allow the flexure at changes in direction. Allow for movement at branch connections.

Y10.4070A PIPE FITTINGS, BENDS/SWEPT TEES:

Use eccentric type reductions and enlargements on horizontal pipe runs to allow draining and venting, concentric on vertical pipes, with easy transition and an included angle not exceeding 30 degree. Do not use bushes, except at radiators and at fittings where required size is not of standard manufacture. Where required, use eccentric bushes to allow draining or venting; maximum aspect ratio not to

exceed two pipe sizes; above this ratio use reducing fittings. Use square tees at venting and draining points. Square elbows are not acceptable. Use bends and swept tees where practical.

Y10.4070B PIPE FITTINGS, ELBOWS/SQUARE TEES:

Use eccentric type reductions and enlargements on horizontal pipe runs to allow draining and venting, concentric on vertical pipes, with easy transition and an included angle not exceeding 30 degree. Do not use bushes, except at radiators and at fittings where required size is not of standard manufacture. Where required, use eccentric bushes to allow draining or venting; maximum aspect ratio not to exceed two pipe sizes; above this ratio use reducing fittings. Use square tees at venting and draining points. Square elbows are not acceptable. Use elbows and square tees.

Y10.4110 PIPES THROUGH WALLS AND FLOORS:

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves. Fit masking plates where visible pipes pass through building elements, including false ceilings of occupied rooms.

Y10.4110# PIPES THROUGH WALLS AND FLOORS - FIRE STOPPING:

- Material
- Fire Stopping Compound
- Thickness
- 75mm
- 100mm
- 150mm
- Intumescent Pillows
- Dimensions
- 300x200x30mm
- 300x150x30mm
- 300x100x30mm
- 300x50x30mm
- Intumescent Coated Batt
- Dimensions
- Intumescent Pipe Wrap
- Dimensions
- 50mm
- 100mm
- Standard
- To manufacturer's standard
- To BS 476-20
- To BS 476-22
- Installation
- To manufacturer's standard

Y10.4120A PIPE SLEEVES:

Where pipe insulation is not carried through pipe sleeve, cut sleeves from material same as pipe one or two sizes larger than pipe to allow clearance. Do not use sleeves as pipe supports. Install sleeves flush with building finish. In areas where floors are washed down install with a 100mm protrusion above floor finish.

Y10.4120B PIPE SLEEVES WITH INSULATION CARRIED THROUGH:

Where pipe insulation is carried through pipe sleeve, cut sleeves from material same as pipe one or two sizes larger than pipe and insulation to allow clearance. Do not use sleeves as pipe supports. Install sleeves flush with building finish. In areas where floors are washed down install with a 100mm protrusion above floor finish.

Y10.4125 PIPE SLEEVES THROUGH FIRE BARRIERS:

Pack annular space between pipe and sleeve or insulation and sleeve with non-flammable and fire resistant material to form a fire/smoke stop of required rating. Apply 12mm deep cold mastic seal at both ends within sleeve.

Y10.4130 CONNECTIONS TO EQUIPMENT:

Make final connections to equipment in accordance with manufacturer's instructions and as indicated.

Y10.4140 DISTRIBUTION HEADERS:

Terminate ends with a cap, a blank flange, a grooved blank end or as indicated.

Y10.4150A TEMPORARY PLUGS, CAPS AND FLANGES:

Seal all open ends as installation proceeds by plugs, caps or blank flanges, to prevent ingress of foreign matter.

Use plugs of metal, plastic or wood to suit pipework material.

In the event of such precautions not being taken, strip out pipework adjacent to open ends to demonstrate that fouling of bores has not occurred.

Y10.4160 FLANGED JOINTS GENERAL:

Use number and diameters of bolts to standard. Fit bolts of length to give not less than one thread, or more than 3mm protrusion beyond nut when joint is pulled up.

Fit washers under each nut.

Y10.4170 DISSIMILAR METALS:

Take appropriate means to prevent galvanic action where dissimilar metals are connected together.

Y10.4180 PIPE RINGS AND CLIPS:

Select type according to the application and material compatibility, give particular attention where pipes are subject to axial movement due to expansion or contraction.

Y10.4190 ANCHORS:

Location

- As drawing numbers
- Construct to resist axial stress transmitted by flexure of horizontal and vertical pipe runs or loading on vertical pipes assuming that unbalanced forces exist at all anchor points, even when these are situated in intermediate positions between two expansion loops or bellows. Use similar or compatible materials to the attached pipe.
- Provide and fix all associated backing plates, nuts, washers and bolts for attachment to or building into building structure; ensure structure is suitable for transmitted stress. Set out and line up anchors accurately in position. Inspect final grouting into building structure.

Y10.4200 SLIDE GUIDES:

Location

- As drawing numbers
- Direct movement of expansion and contraction from pipe anchor points towards loops, bellows or flexible inserts. Ensure that thrust is linear relative to the axis of pipe.

- Apply a friction reducing material between metal faces subjected to movement.

Y10.4205 PIPE SUPPORTS:

Arrange supports and accessories for equipment, appliances or ancillary fittings in pipe runs, so that no undue strain is imposed upon pipes.

Ensure that materials used for supports are compatible with pipeline materials.

Y10.4210 SUPPORT SYSTEM - WIRE ROPE:

• 4215# WIRE ROPE SUSPENSION SYSTEM:

- Type
- Application
- Manufacturer and reference
- Or approved equivalent
- Standards
- BS EN 12385-1.
- BS EN 13411-3.
- BS EN 13411-4.
- DIN 3093.
- BSRIA COP 22/2002.
- Dimensions
- Safe working load (kg)
- Length
- Components
- Wire rope
- Safe working load (kg)
- Length (mm)
- Material
- Stainless steel grade 316
- Galvanised
- Fastener
- Components
- Springs - stainless steel grade 302
- Adjustment
- Tamperproof
- Fixing
- Loop
- Safe working load (kg)
- Length (mm)
- Stud (permanently fixed to wire rope length)
- Single toggle
- Double toggle
- Double karabiner
- Hook
- Accessories
- Setting keys
- Span/bearer supports
- Ceiling clip fixings
- Threaded adaptors
- Anchor bolts
- Anchor for stud fixings
- Ceiling fixing kit
- Corner saddle
- Fastener décor cover

Provide wire rope support system. Confirm wire rope is suitable for supporting pipelines.

Y10.4215# WIRE ROPE SUSPENSION SYSTEM:

- Type
- Application
- Manufacturer and reference
- Or approved equivalent
- Standards
- BS EN 12385-1.
- BS EN 13411-3.
- BS EN 13411-4.
- DIN 3093.
- BSRIA COP 22/2002.
- Dimensions
- Safe working load (kg)
- Length
- Components
- Wire rope
- Safe working load (kg)
- Length (mm)
- Material
- Stainless steel grade 316
- Galvanised
- Fastener
- Components
- Springs - stainless steel grade 302
- Adjustment
- Tamperproof
- Fixing
- Loop
- Safe working load (kg)
- Length (mm)
- Stud (permanently fixed to wire rope length)
- Single toggle
- Double toggle
- Double karabiner
- Hook
- Accessories
- Setting keys
- Span/bearer supports
- Ceiling clip fixings
- Threaded adaptors
- Anchor bolts
- Anchor for stud fixings
- Ceiling fixing kit
- Corner saddle
- Fastener décor cover

Y10.4220 SUPPORT SPACING:

Space supports as tables.

Maximum horizontal support spacing for grooved steel pipe 6 metres.
Vertical support spacing.

Check total self-weight and pressure loading against manufacturer's recommendations when using

mechanical joints or end load capable flexible couplings. Ensure adequate pipe support when using non-end load capable flexible couplings.

Space vertical support intervals for plastics pipe at not greater than twice horizontal intervals tabulated.

Where multiple pipe runs of differing bores are supported from a common point, use support spacing of pipe requiring closest spacing.

Spacings give for PVC-U pipe to BS 3505 are for 20°C. Support continuously for temperatures 60°C and above.

Y10.4230A ISOLATION AND REGULATION:

Provide valves, cocks and stop taps for isolation and/or regulation where indicated, and on:- mains to isolate major sections of distribution;

the base of all risers and drops except in cases where one item of apparatus only is served which has its own local valve or stop tap;

points of pipe connection of all items of apparatus and equipment except where the item could conveniently be isolated or regulated by valves provided for other adjacent items;

draw-off fittings except where ranges of fittings are served by a common float, the isolator then being fitted with the float.

Y10.4240 MAINTENANCE AND RENEWAL:

Arrange pipework, valves, drains, air vents, demountable joints, supports, etc., for convenient routine maintenance and renewals. Provide all runs with a regularly spaced pattern of demountable joints in the form of unions, flanges, etc., and also at items of equipment to facilitate disconnection. Locate valves, drains, flanges etc. in groups.

Y10.4250 CLEANING:

Remove cement and clean off all pipework and brackets.

Y10.4260 NON-FERROUS COMPONENTS:

Thoroughly clean and degrease.

Y10.5010A WELDING GENERAL, CLASS 1:

Use skilled craftsman in possession of a current Certificate of Competence appropriate to type and class of work, issued by an approved authority. Mark each weld to identify operative. Submit specimen welds, representative of joints and conditions of site welding, for each craftsman, test non-destructively, approximately 10% of butt weld joints and 5% of all other joints.

Weld pipeline joints to BS 1821 and BS 2633 as appropriate. Carry out non-destructive testing on 10% or as indicated.

Y10.5010B WELDING GENERAL, CLASS 2:

Use skilled craftsman in possession of a current Certificate of Competence appropriate to type and class of work, issued by an approved authority. Mark each weld to identify operative. Submit specimen welds, representative of joints and conditions of site welding, for each craftsman, test non-destructively, approximately 10% of butt weld joints and 5% of all other joints.

Weld pipeline joints to BS 2640 and BS 2971 and to HVCA Code of Practice TR/5, Welding of Carbon Steel Pipework, as appropriate.

Y10.5020 WELDED JOINTS, STEEL PIPES:

Preparation, Making and Sealing.

Oxy-acetylene welding, conforming to BS 1821 or BS 2640 appropriate to system temperature and pressure.

Arc welding, conforming to BS 2633 or BS 2971 appropriate to system temperature and pressure. Use arc welding process on piping greater than 100mm.

Y10.5030 PAINTING WELDED JOINTS, STEEL PIPES:

Unless pipework is being prepared for galvanizing after manufacture, wire brush and paint all welds with red oxide paint when welds are complete.

Y10.5040 FLANGED JOINTS, STEEL PIPES:

Welded Flanges

Weld neck and bore of 'slip on' flange.

Butt weld neck of welding neck flange.

Screwed Flanges

Apply jointing materials. Screw on flange and expand tube into flange with roller expander where necessary.

Preparation

Ensure that flange mating faces are parallel; flange peripheries are flush with each other; and bolt holes are correctly aligned.

Making and Sealing

Insert jointing between flange mating faces. Pull up joint equally all round.

Y10.5050 SCREWED JOINTS, STEEL PIPES:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends.

Screw plain ends, taper thread.

Making and Sealing

Coat male pipe threads with jointing compound and hemp, or PTFE tape on small sizes. Immediately after applying coating, connect with female end of socket or fitting, and tighten ensuring that coating does not intrude into pipe. Leave joint clean.

Y10.5060 MECHANICAL JOINTS, GROOVED STEEL AND STAINLESS STEEL PIPES:

Preparation

Ensure that cut ends are square, free of bumps, dents and score marks and are within manufacturer's tolerances. Form groove in accordance with manufacturer's recommendations. Assemble joint in accordance with manufacturer's instructions.

Making and Sealing

Ensure gasket is suitable for service. Thoroughly lubricate gasket, externally and internally, using manufacturer's recommended lubricant. Stretch gasket over pipe end and bring pipe ends together. Slide gasket into central position over both pipe ends. Position joint half housings over gasket and insert bolts and nuts and electrical continuity clip if required. Tighten bolts to manufacturer's instructions. Check alignment of joint and pipework.

Earth continuity

Use manufacturer's earth continuity clips to ensure compliance with IET regulations.

Y10.5070A ANCHORS, STEEL PIPES, U-BOLTS:

Provide anchors constructed using mild steel over-straps or heavy U-bolts. Secure to channel section, adequately attached to or grouted into building structure; weld longitudinal edges of strap to pipe.

Y10.5070B ANCHORS, STEEL PIPES, SLIP-ON FLANGES:

Provide anchors constructed by passing two slip-on flanges over pipe to anchor point. Bolt together through an interposed mild steel channel section attached to or grouted into building structure, and finally weld flanges to pipe.

Y10.5090 STEEL PIPEWORK PAINTING:

Remove scale, rust or temporary protective coating by chipping, wire brushing or use of approved solvents and paint with one coat of red oxide primer, as work proceeds.

Y10.5100 COMPRESSION JOINTS, STAINLESS STEEL PIPES:

Use BS EN 1254-2 Type 'A' fittings.

Preparation - Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool.

Making and Sealing - In accordance with fitting manufacturer's instructions.

Y10.6030 COMPRESSION JOINTS, COPPER PIPES, LIGHT GAUGE:

Preparation for fittings to BS EN 1254-2.

Type 'A' fitting

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool or fine sandpaper.

Type 'B' fitting

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool or fine sandpaper. Then comply with manufacturer's instructions.

Making and Sealing - As manufacturer's instructions.

Y10.6040 CAPILLARY JOINTS, COPPER PIPES, LIGHT GAUGE:

Preparation - Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool.

Making and sealing - Use specified flux ensuring no excess material used. Make joint in accordance with manufacturer's instructions. Clean off traces of flux when joint is completed.

Y10.6060A ANCHORS, COPPER PIPES, SADDLE CLAMPS:

Provide anchors constructed by fitting two flanges to copper female adapters in pipe run at anchor point. Bolt together through an interposed mild steel channel section attached to or grouted into building structure.

Y10.6060B ANCHORS, COPPER PIPES, SADDLE CLAMPS:

Anchor pipework using saddle clamps to mild steel channel section attached to or built into building structure.

Y10.8010 SOLVENT WELDED JOINTS, PVC PIPES:

Use solvent welded joints generally, ring seal joints at expansion joints and elsewhere as necessary.

Preparation - Ensure that plain ends are cut square. Reamer out bore at plain ends. Clean plain ends with solvent cleaner.

Making and Sealing - In accordance with fitting manufacturer's instructions.

Y10.8020 FUSION JOINTS, POLYETHYLENE PIPES:

Preparation - Square cut plain ends. Form pipe ends for socket type joints.
Making and Sealing - In accordance with fitting manufacturer's instructions.

Y10.8030 MECHANICAL FITTINGS FOR POLYETHYLENE PIPE:

Preparation - Ensure that cut ends are square. Check wall thickness/pressure rating of fitting.
Making and sealing - Ensure correct gasket type is used for service (e.g. water or gas). Assemble fitting in accordance with manufacturer's instructions.

Y10.8040 ANCHORS - PVC PIPES:

Clamp pipework to mild steel channel section attached to or grouted into building structure, using PVC coated over-straps, or clamps and with a polypropylene strip between pipe and mild steel section.

Y10.8050 JOINTING POLYBUTYLENE PIPES AND FITTINGS:

Carry out installation of polybutylene pipes and fittings in accordance with manufacturer's instructions.

Y10.9020A STEAM AND CONDENSE MAINS:

Install steam and condense mains to a minimum fall of 1 in 250. Take steam connections to plant and equipment from the top of the steam main. Connect condense discharge from trap sets, into the top of the condense main.

Do not use trap sets to lift condense on equipment with automatic control valves.

On steam mains, provide drain trap sets discharging into the condense mains, at all low points in steam mains. Connect drain traps to a large bore pocket below the steam mains.

Y10.9020B STEAM AND CONDENSE MAINS:

Install steam and condense mains to a minimum fall of 1 in 250. Take steam connections to plant and equipment from the top of the steam main. Connect condense discharge from trap sets, into the top of the condense main. Do not use trap sets to lift condense on equipment with automatic control valves. On steam mains, provide drain trap sets discharging into the condense mains, at all low points in steam mains and immediately before all automatic control valves in the steam mains. Connect drain traps to a large bore pocket below the steam mains.

Y10.9030 PROTECTION OF UNDERGROUND PIPEWORK:

Location

- As shown on drawing
- Protect where indicated against corrosion by the application of a compatible anti-corrosive, non-cracking, non-hardening waterproof sealing tape.

Apply, after cleaning pipework, by wrapping contrawise with two layers spirally around the pipe, ensuring a 50% minimum overlap.

Y10.9040A PROTECTION OF BURIED PIPES, UNMARKED:

Provide earth cover as follows

Water pipework

900 mm minimum; 1200 mm maximum where practicable.

Fuel oil and gas - 500 mm minimum.

Under roadways provide minimum cover of 900 mm.

Y10.9040B PROTECTION OF BURIED PIPES, MARKED:

Location

Provide earth cover as follows

Water pipework

900 mm minimum; 1200 mm maximum where practicable.

Fuel oil and gas - 500 mm minimum.

Under roadways provide minimum cover of 900 mm.

Provide a marker tape to identify buried pipe services as indicated.

Y10.9120A STEELWORK GALVANIZED AFTER MANUFACTURE:

Prepare supports, bearers and other uncovered steelwork as steel pipework.

Where not exposed, paint with one coat zinc chromate or red oxide primer.

Y11 PIPELINE ANCILLARIES

Y11.1000 GENERAL

1010 SAFETY AND RELIEF VALVES, SELF OPERATED, APPLICATION:

Safety - To discharge with rapid opening action to prevent pre-determined safe pressure being exceeded.

Relief - To discharge with opening action proportional to increase in pressure above set pressure.

1020 EXPOSED VALVES:

Fit easy-clean covers over glands and bonnets to small copper alloy valves exposed in areas other than plant rooms. Fit thermoplastic valve wheels. Fit dust caps to lockshield valves.

1030 TESTING:

Ensure that valves and cocks are pressure tested at manufacturer's works, in accordance with appropriate British Standards specification. Test valves in accordance with BS EN 12266-1 and BS EN 12266-2.

Y11.2010A THREADED ENDS STOP TAPS TO BS 1010-2:

Material - Bronze or DZR copper alloy body. Washer material suitable for service fluid and operating temperature.

Ends - Threaded to BS 21 and BS EN 10226-1.

Pattern - Straight pattern.

Y11.2010B CAPILLARY FITTING STOP TAPS TO BS 1010-2:

Material - Bronze or DZR copper alloy body. Washer material suitable for service fluid and operating temperature.

Ends - Capillary fitting to BS EN 1254-1.

Pattern - Straight pattern.

Y11.2015A STOP VALVES TO BS EN 1213 FOR POTABLE WATER SUPPLIES - COMPRESSION ENDS FOR COPPER:

Pattern - Straight.

Material - copper alloy.

Flow rate class - VA (straight and angle pattern stopvalves).

End connections - Compression to BS EN 1254-2.

Y11.2015B STOP VALVES TO BS EN 1213 FOR POTABLE WATER SUPPLIES - COMPRESSION ENDS FOR PLASTICS:

Pattern - Straight.
Material - copper alloy.
Flow rate class - VA (straight and angle pattern stopvalves).
End connections - Compression to BS EN 1254-3.

Y11.2015C STOP VALVES TO BS EN 1213 FOR POTABLE WATER SUPPLIES - CAPILLARY:

Pattern - Straight.
Material - copper alloy.
Flow rate class VA (straight and angle pattern stopvalves).
End connections - Capillary to BS EN 1254-1.

Y11.2015D STOP VALVES TO BS EN 1213 FOR POTABLE WATER SUPPLIES - THREADED:

Pattern - Straight.
Material - copper alloy.
Flow rate class - VA (straight and angle pattern stopvalves).
End connections - Threaded to BS 21 and BS EN 10226-1.

Y11.2020A THREADED ENDS GATE VALVES TO BS EN 12288:

Series - B.
Gate valve type - Solid or split wedge.
Ends - Threaded to BS EN ISO 228-1 or ISO 7-1.
Stem - Inside screw non-rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.

Y11.2020B COMPRESSION ENDS GATE VALVES TO BS EN 12288:

Series - B.
Gate valve type - Solid or split wedge.
Ends - Compression to BS EN 1254-2.
Stem - Inside screw non-rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.

Y11.2020C FLANGED ENDS GATE VALVES TO BS EN 12288:

Series - B.
Gate valve type - Solid or split wedge.
Ends - Flanged to BS EN 1092-3.
Stem - Inside screw non-rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.

Y11.2020D LOOSE NUT/UNION ENDS GATE VALVES TO BS EN 12288:

Series B.
Gate valve type - Solid or split wedge.
Ends - Loose nut/union end.
Stem - Inside screw non-rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.

Y11.2030A FLANGED GATE VALVES TO BS EN 1171:

Valve type - Solid or split wedge.
Seat - Metal.
Ends - Flanged to BS EN 1092-2.
Body and bonnet material - Grey cast iron.
Trim category - Copper alloy faced.
Operation - Handwheel.

Y11.2040A THREADED END GLOBE VALVES TO BS 5154:

Series - B.
Pattern - Straight.
Ends - Threaded to BS 21 and BS EN 10226-1.
Stem - Inside screw rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.
Options - Non-metallic renewable seat/disk rings.

Y11.2040B FLANGED GLOBE VALVES TO BS 5154:

Series - B.
Pattern - Straight.
Ends - Flanged to BS EN 1092-3.
Stem - Inside screw rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.
Options - Non-metallic renewable seat/disk rings.

Y11.2040C COMPRESSION GLOBE VALVES TO BS 5154:

Series - B.
Pattern - Straight.
Ends - Compression fitting to BS EN 1254-2.
Stem - Inside screw rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.
Options - Non-metallic renewable seat/disk rings.

Y11.2040D COMPRESSION GLOBE VALVES TO BS 5154 FOR PLASTIC PIPE:

Series - B.
Pattern - Straight.
Ends - Compression fitting to BS EN 1254-3 or BS 864-5.
Stem - Inside screw rising stem.
Trim material - Manufacturer's standard.
Operation - Handwheel.
Options - Non-metallic renewable seat/disk rings.

Y11.2050A FLANGED GLOBE VALVES TO BS EN 13789:

Pattern - Straight.
Stem - Rising stem outside screw.
Ends - Flanged to BS EN 1092-2.
Material - Manufacturer's standard.

Y11.2070A FLANGED STOP VALVES - GATE TYPE TO BS EN 1984:

Pattern - Full bore or reduced bore.

Materials - Cast steel body and materials to suit fluid and operating conditions.

Ends - Flanged.

Operation - Handwheel.

Y11.2070D THREADED STOP VALVES - GATE TYPE TO BS EN 1984:

Pattern - Full bore or reduced bore.

Materials - Cast steel body and materials to suit fluid and operating conditions.

Ends - Threaded to BS 21 and BS EN 10226-1.

Operation - Handwheel.

Y11.2080A THREADED END BALL TYPE VALVES - SCREW DRIVER/KEY OPERATED:

Materials - Bronze or DZR copper alloy body.

Ends - Threaded to BS 21 and BS EN 10226-1.

Chrome or nickel plated DZR sphere with full bore flow aperture. PTFE seats and stem seals. Anti-blowout stem.

Operation - Screw driver operated or key operated.

Y11.2080B COMPRESSION END BALL TYPE VALVES - SCREW DRIVER/KEY OPERATED:

Materials - Bronze or DZR copper alloy body.

Ends - Compression fittings to BS EN 1254-2.

Chrome or nickel plated DZR sphere with full bore flow aperture. PTFE seats and stem seals. Anti-blowout stem.

Operation - Screw driver operated or key operated.

Y11.2080C THREADED END BALL TYPE VALVES - LEVER OPERATED:

Materials - Bronze or DZR copper alloy body.

Ends - Threaded to BS 21 and BS EN 10226-1.

Chrome or nickel plated DZR sphere with full bore flow aperture. PTFE seats and stem seals. Anti-blowout stem.

Operation - lever operated.

Y11.2080D COMPRESSION END BALL TYPE VALVES - LEVER OPERATED:

Materials - Bronze or DZR copper alloy body.

Ends - Compression fittings to BS EN 1254-2.

Chrome or nickel plated DZR sphere with full bore flow aperture. PTFE seats and stem seals. Anti-blowout stem.

Operation - lever operated.

Y11.2080E THREADED END BALL TYPE VALVES - LOCKSHIELD:

Materials - Bronze or DZR copper alloy body.

Ends - Threaded to BS 21 and BS EN 10226-1.

Chrome or nickel plated DZR sphere with full bore flow aperture. PTFE seats and stem seals. Anti-blowout stem.

Operation - lockshield.

Y11.2080F COMPRESSION BALL TYPE VALVES - LOCKSHIELD:

Materials - Bronze or DZR copper alloy body.

Ends - Compression fittings to BS EN 1254-2.

Chrome or nickel plated DZR sphere with full bore flow aperture. PTFE seats and stem seals. Anti-blowout stem.

Operation - lockshield.

Y11.2090A LEVER OPERATED BUTTERFLY VALVES TO BS EN 593 BETWEEN FLANGES:

Construction - Provide controlled elastomer compression on flange faces; semi-lugged wafer type design, for installation between flanged pipework connections, body to suit BS EN 1092-2.

Provide lever and gear operated valves with long body neck for lagging clearance.

Seat - Bonded.

Materials - Cast iron body; stainless steel shaft; aluminium bronze disc; EPDM seat.

Operation - Lever and graduated notch plate.

Y11.2090B GEAR OPERATED BUTTERFLY VALVES TO BS EN 593 BETWEEN FLANGES:

Construction - Provide controlled elastomer compression on flange faces; semi-lugged wafer type design, for installation between flanged pipework connections, body to suit BS EN 1092-2.

Provide lever and gear operated valves with long body neck for lagging clearance.

Seat - Bonded.

Materials - Cast iron body; stainless steel shaft; aluminium bronze disc; EPDM seat.

Operation - gear operated.

Y11.2090C LEVER OPERATED BUTTERFLY VALVES TO BS EN 593 BETWEEN MECHANICAL JOINTS:

Construction - Semi-lugged wafer type design, for installation between mechanical joints, body with grooved ends.

Provide lever and gear operated valves with long body neck for lagging clearance.

Seat - Bonded.

Materials - Ductile iron body; stainless steel shaft; rubber coated ductile iron disc; EPDM seat.

Operation - Lever and graduated notch plate.

Y11.2090D GEAR OPERATED BUTTERFLY VALVES TO BS EN 593 BETWEEN MECHANICAL JOINTS:

Construction - Semi-lugged wafer type design, for installation between mechanical joints, body with grooved ends.

Provide lever and gear operated valves with long body neck for lagging clearance.

Seat - Bonded.

Materials - Ductile iron body; stainless steel shaft; rubber coated ductile iron disc; EPDM seat.

Operation - gear operated.

Y11.2210A LEVER OPERATED REGULATING BUTTERFLY VALVES TO BS EN 593 BETWEEN FLANGES:

Construction - Provide controlled elastomer compression on flange faces; semi-lugged wafer type design, for installation between flanged pipework connections, body to suit BS EN 1092-2.

Provide lever and gear operated valves with long body neck for lagging clearance.

Seat - Bonded seat.

Materials - Cast iron body; stainless steel shaft; aluminium bronze disc; EPDM seat.

Operation - Infinitely variable setting with travel stops and indicator, lever operation.

Y11.2210B GEAR OPERATED REGULATING BUTTERFLY VALVES TO BS EN 593 BETWEEN

FLANGES:

Construction - Provide controlled elastomer compression on flange faces; semi-lugged wafer type design, for installation between flanged pipework connections, body to suit BS EN 1092-2.

Provide lever and gear operated valves with long body neck for lagging clearance.

Seat - Bonded seat.

Materials - Cast iron body; stainless steel shaft; aluminium bronze disc; EPDM seat.

Operation - Infinitely variable setting with travel stops and indicator, gear operation.

Y11.2210C LEVER OPERATED REGULATING BUTTERFLY VALVES TO BS EN 593 BETWEEN MECHANICAL JOINTS:

Construction - Semi-lugged wafer type design, for installation between mechanical joints with grooved ends.

Provide lever and gear operated valves with long body neck for lagging clearance.

Seat - Bonded seat.

Materials - Ductile iron body; stainless steel shaft; rubber coated ductile iron disc; EPDM seat.

Operation - Infinitely variable setting with travel stops and indicator, lever operation.

Y11.2210D GEAR OPERATED REGULATING BUTTERFLY VALVES TO BS EN 593 BETWEEN MECHANICAL JOINTS:

Construction - Semi-lugged wafer type design, for installation between mechanical joints with grooved ends.

Provide lever operated valves with long body neck for lagging clearance.

Seat - Bonded seat.

Materials - Ductile iron body; stainless steel shaft; rubber coated ductile iron disc; EPDM seat.

Operation - Infinitely variable setting with travel stops and indicator, gear operation.

Y11.2220A THREADED END DOUBLE REGULATING VALVES TO BS 7350, COPPER ALLOY:

BS 7350, section 3.1.

Ends - Threaded to BS 21 and BS EN 10226-1.

Material - Bronze or DZR copper alloy to BS 5154.

Series B; oblique or Y pattern; inside screw non-rising stem; manufacturer's standard trim material.

Options - Provide drain plug facility; independent means for positive isolation on pressure tapping or adapter; and test and manufacturer's certificates as indicated.

Y11.2220B FLANGED DOUBLE REGULATING VALVES TO BS 7350, COPPER ALLOY:

BS 7350, section 3.1.

Ends - Flanged to BS EN 1092-2.

Material - Bronze or DZR copper alloy to BS 5154.

Series B; oblique or Y pattern; inside screw non-rising stem; manufacturer's standard trim material.

Options - Provide drain plug facility; independent means for positive isolation on pressure tapping or adapter; and test and manufacturer's certificates as indicated.

Y11.2220C FLANGED DOUBLE REGULATING VALVES TO BS 7350, CAST IRON:

BS 7350, section 3.1.

Ends - Flanged to BS EN 1092-2.

Material - Cast iron to BS EN 13789.

Oblique or Y pattern; copper alloy, nickel alloy or resilient valve face; rising stem outside screw or non-rising stem inside screw; manufacturer's standard materials.

Options - Provide drain plug facility; independent means for positive isolation on pressure tapping or adapter; and test and manufacturer's certificates as indicated.

Y11.2220D GROOVED ENDS DOUBLE REGULATING VALVES TO BS 7350, CAST IRON:

BS 7350, section 3.1.

Ends - Grooved.

Material - Ductile iron to BS EN 13789.

Oblique or Y pattern; copper alloy, nickel alloy or resilient valve face; rising stem outside screw or non-rising stem inside screw; manufacturer's standard materials.

Options - Provide drain plug facility; independent means for positive isolation on pressure tapping or adapter; and test and manufacturer's certificates as indicated.

Y11.2230A THREADED ENDS FLOW MEASUREMENT DEVICES TO BS 7350, COPPER ALLOY:

BS 7350, section 3.2 - type 3

A fixed orifice either integral with or as a fixed orifice fitting close coupled to a double regulating globe valve.

Ends - Threaded to BS 21 and BS EN 10226-1.

Material - Double regulating globe valve, bronze or DZR copper alloy to BS 5154 series B and close coupled fixed orifice fitting to BS 7350 table 6.

Options - Independent means for positive isolation on pressure tapping or adapter.

Y11.2230B FLANGED ENDS FLOW MEASUREMENT DEVICES TO BS 7350 TYPE 3, COPPER ALLOY:

BS 7350, section 3.2 - type 3

A fixed orifice either integral with or as a fixed orifice fitting close coupled to a double regulating globe valve.

Ends - Flanged to BS EN 1092-3.

Material - Double regulating globe valve, bronze or DZR copper alloy to BS 5154 series B and close coupled fixed orifice fitting to BS 7350 table 6.

Options - Independent means for positive isolation on pressure tapping or adapter.

Y11.2230C FLANGED FLOW MEASUREMENT DEVICE TO BS 7350 CAST IRON, TYPE 3:

BS 7350, section 3.2 - type 3

A fixed orifice either integral with or as a fixed orifice fitting close coupled to a double regulating globe valve.

Ends - Flanged to BS EN 1092-2.

Material - Double regulating globe valve to BS EN 13789 and close coupled fixed orifice fitting to BS 7350, table 6.

Options - Independent means for positive isolation on pressure tapping or adapter.

Y11.2230E THREADED ENDS FLOW MEASUREMENT DEVICES TO BS 7350 TYPE 4, COPPER ALLOY:

BS 7350, section 3.2 - type 4, variable orifice valve.

Ends - Threaded to BS 21 and BS EN 10226-1.

Material - Variable orifice, double regulating globe valve, bronze or DZR copper alloy to BS 5154 series B.

Options - Independent means for positive isolation on pressure tapping or adapter.

Y11.2230F FLANGED FLOW MEASUREMENT DEVICES TO BS 7350 TYPE 4, COPPER ALLOY:
BS 7350, section 3.2 - type 4, variable orifice valve.

Ends - Flanged to BS EN 1092-3.

Material - Variable orifice, double regulating globe valve, bronze or DZR copper alloy to BS 5154 series B.

Options - Independent means for positive isolation on pressure tapping or adapter.

Y11.2230G FLOW MEASUREMENT DEVICES TO BS 7350 TYPE 4, CAST IRON:
BS 7350, section 3.2 - type 4, variable orifice valve.

Ends - Flanged to BS EN 1092-2.

Material - Variable orifice, double regulating globe valve, cast iron to BS EN 13789.

Options - Independent means for positive isolation on pressure tapping or adapter.

Y11.2260A RADIATOR VALVES TO BS 2767 (TYPE 4):

- Finish
- Natural.
- Chromium plated.

Material - Bronze or brass copper alloy body. Pattern - Angle or straight to suit application.

Straight - Threaded to BS 21 and BS EN 10226-1 or compression to BS EN 1254-2 to suit pipework as indicated.

Angle - Threaded to BS 21 and BS EN 10226-1 with one end internal and other end external with union nut and tail pipe; or compression joint to BS EN 1254-2 one end and other end externally threaded to BS 21 and BS EN 10226-1 with union nut and tail pipe to suit pipework as indicated.

Options - Fit wheel valves on flow connections to radiators, and other heat emitters, without thermostatic radiator valves. Fit lockshield valves on return connections.

Y11.2315A OPEN/CLOSE CONTROL BALL VALVES:

Valve - Open/Close valve.

Rotary Actuator - Open/close.

Material - Nickel-plated brass; stainless steel ball; PTFE seal; stainless steel spindle; EPDM spindle seal. Connections - Threaded to BS 21 and BS EN 10226-1. Ancillaries - Lever for manual operation.

Y11.2315B TWO WAY CONTROL BALL VALVES:

Valve - Two way control valve.

Rotary Actuator - Modulating.

Material - Nickel-plated brass; stainless steel ball; PTFE seal; stainless steel spindle; EPDM spindle seal.

Connections - Threaded to BS 21 and BS EN 10226-1.

Ancillaries - Lever for manual operation.

Y11.2315C THREE WAY CONTROL BALL VALVES:

Valve - Three way control valve.

Rotary Actuator - Modulating.

Material - Nickel-plated brass; stainless steel ball; PTFE seal; stainless steel spindle; EPDM spindle seal.

Connections - Threaded to BS 21 and BS EN 10226-1.

Ancillaries - Lever for manual operation.

Y11.2320A THREADED ENDS SWING CHECK VALVES TO BS 5154:

Series B; horizontal pattern.

Ends - Threaded to BS 21 and BS EN 10226-1.

Trim material - Manufacturer's standard.

Y11.2320B FLANGED SWING CHECK VALVES TO BS 5154:

Series B; horizontal pattern.

Ends - Flanged to BS EN 1092-3.

Trim material - Manufacturer's standard.

Y11.2330A FLANGED SWING CHECK VALVES TO BS EN 12334

Check valve type to BS EN 736-1 - Swing.

Body type - Flanged.

Ends - Flanged to BS EN 1092-2.

Body and cover materials - Grey cast iron or SG cast iron.

Orientation of pipework - Horizontal or vertical.

Y11.2330B WAFER BODY SWING CHECK VALVES TO BS EN 12334:

Check valve type to BS EN 736-1 - Swing.

Body type - Wafer.

Body and cover materials - Grey cast iron or SG cast iron.

Orientation of pipework - Horizontal or vertical.

Y11.2330C FLANGED LIFT CHECK VALVES TO BS EN 12334:

Check valve type to BS EN 736-1 - Lift.

Body type - Flanged.

Ends - Flanged to BS EN 1092-2.

Body and cover materials - Grey cast iron or SG cast iron.

Orientation of pipework - Horizontal or vertical.

Y11.2330D WAFER BODY LIFT CHECK VALVES TO BS EN 12334:

Check valve type to BS EN 736-1 - Lift.

Body type - Wafer.

Body and cover materials - Grey cast iron or SG cast iron.

Orientation of pipework - Horizontal or vertical.

Y11.2340A FLANGED SWING CHECK VALVES TO BS EN 12334:

Wafer pattern design suitable for installation between flanged pipework, body to suit BS EN 1092-2.

Disc - Double disc.

Type - Light spring type.

Seat - Bonded.

Materials - Cast iron body; bronze disc; EPDM seat.

Y11.2385A COMBINED CHECK AND ANTI-VACUUM DEVICE TO PREVENT CONTAMINATION OF WATER BY BACKFLOW TO BS 6282:

Standard - BS 6282-4 combined check and anti-vacuum valves.

WRAS approval.

Ends - Compression connections to BS EN 1254-2.

Y11.2390A COMBINED CHECK AND ANTI-VACUUM TYPE ANTI BACK SYPHONAGE VALVES:

Bronze or DZR copper alloy body assembly with compression connections to BS EN 1254-2.

Pattern - In-line pattern.

Components - Stainless steel domed air inlet. Non-return valve with plastic body, rubber actuator and stainless steel to plastic seal. WRAS approval.

Y11.2430A SAFETY VALVES TO BS EN ISO 4126-1, COPPER ALLOY, SINGLE SPRING:

Material - Bronze or DZR copper alloy body.
Ends - Threaded to BS 21 and BS EN 10226-1.
Spring type - Single spring loaded, high lift type.

Y11.2430B SAFETY VALVES TO BS EN ISO 4126-1, COPPER ALLOY, DOUBLE SPRING:

Material - Bronze or DZR copper alloy body.
Ends - Threaded to BS 21 and BS EN 10226-1.
Spring type - Double spring loaded, high lift type.

Y11.2440A DRAIN COCKS, THROUGHWAY GLAND COCK:

Bronze body threaded male to BS 21 and BS EN 10226-1.
Tapered plug with square shank for loose lever; bolted gland; strap and blank cap screwed on hand tight. Outlet to accept hose union.

Y11.2450 DRAIN COCKS - SCREWDOWN TO BS 2879, TYPE 1:

Bronze body threaded male to BS 21 and BS EN 10226-1.
Screw down plug with square shank for loose lever.
Serrated outlet to accept hosepipe, fixed or union pattern. Lockshield to accept key.

Y11.2460 DRAIN COCKS - BALL TYPE:

Bronze or DZR copper alloy body; chrome-plated DZR ball; PTFE seats and stem seals; blow-out proof stem; strap and blank cap screwed on hand tight; serrated outlet to accept hose pipe. Lockshield key operated.

Y11.2470 VENT COCKS - TWO WAY GLAND COCK TYPE:

Bronze body threaded to BS 21 and BS EN 10226-1; tapered plug with square shank for loose lever; plug position indicator; bolted gland.

Y11.2480 VENT COCKS - BALL TYPE:

Bronze or DZR copper alloy body; chrome-plated DZR ball; PTFE seats and stem seals; blow-out proof stem.
Permanently identified ports in T-configuration.
Lever operated.

Y11.2490 VENT COCKS - THREE WAY GLAND COCK TYPE:

Bronze body threaded to BS 21 and BS EN 10226-1; tapered plug with square shank for loose lever; plug position indicator; port markings to indicate inlet, vent, waste; bolted gland.
Port configuration, T port.

Y11.2500A THREE WAY PLUG VALVE VENT COCKS - WRENCH OPERATED:

Cast iron body, plug and bottom cover. PTFE thrust washer.
Ends - Flanged to BS EN 1092-2.
T port configuration. Wrench operation.

Y11.2500B THREE WAY PLUG VALVE VENT COCKS - GEAR OPERATED:

Cast iron body, plug and bottom cover. PTFE thrust washer.
Ends - Flanged to BS EN 1092-2.
T port configuration. Gear operation.

Y11.2510A AUTOMATIC AIR VENTS, FLOAT TYPE:

Construction - Bronze or DZR copper alloy body with threaded inlet to BS 21 and BS EN 10226-1.
Solid polypropylene float and air release valve. Ensure valve is self closing.
Operating Conditions - Maximum temperature 130°C. Maximum pressure 10 bar.
Options - Provide connection for piping away released air and integral non-return valve where indicated.

Y11.2610A STEEL EXPANSION LOOPS:

- Galvanized after manufacture.
- Provide expansion loop in material and finish of associated pipeline. Size to limit stress set up in material of pipe wall to 69 MPa.
- Forge bend from a single length of pipe or join by welding fittings if expansion loops are too large to manufacture in one piece.
- Where indicated, galvanize after manufacture.

Y11.2620 EXPANSION LOOPS - COPPER:

Provide expansion loop in material and finish of associated pipeline. Size to limit total stress set up in material of pipe wall to less than 51.5 MPa.
Forge bend from a single length of pipe.

Y11.2630A THREADED END EXPANSION COMPENSATORS, AXIAL BELLOWS:

Ends - Threaded to BS 21 and BS EN 10226-1.
Bellows - Stainless steel, multi ply or single-ply construction fitted with stainless steel inner sleeves.
Operation - Supply expansion joints capable of not less than 2000 complete reversals of movement at the given working conditions; and of withstanding a pressure test of 1.5 times the design pressure without deformation.

Y11.2630B FLANGED EXPANSION COMPENSATORS, AXIAL BELLOWS:

Ends - Flanged to BS EN 1092-1.
Bellows - Stainless steel, multi-ply or single-ply construction fitted with stainless steel inner sleeves.
Operation - Supply expansion joints capable of not less than 2000 complete reversals of movement at the given working conditions; and of withstanding a pressure test of 1.5 times the design pressure without deformation.

Y11.2630D THREADED ENDS EXPANSION COMPENSATORS, ARTICULATED BELLOWS:

Ends - Threaded to BS 21 and BS EN 10226-1.
Bellows - Stainless steel, multi-ply or single-ply construction fitted with stainless steel inner sleeves.
Operation - Supply expansion joints capable of not less than 2000 complete reversals of movement at the given working conditions; and of withstanding a pressure test of 1.5 times the design pressure without deformation.

Y11.2630E FLANGED EXPANSION COMPENSATORS, ARTICULATED BELLOWS:

Ends - Flanged to BS EN 1092-1.
Bellows - Stainless steel, multi-ply or single-ply construction fitted with stainless steel inner sleeves.

Operation - Supply expansion joints capable of not less than 2000 complete reversals of movement at the given working conditions; and of withstanding a pressure test of 1.5 times the design pressure without deformation.

Y11.2650B THREADED END EPDM RUBBER FLEXIBLE CONNECTIONS UP TO 10 BAR AND 100 DEGREE C:

Material - EPDM rubber with wire reinforced cuffs.

Steel reinforcement within the body.

Marking - Mould date of manufacture on bellows.

Show manufacturer and type.

Ends - Threaded to BS 21 and BS EN 10226-1 with one union end.

Operation - Ensure flexible connections have a design life of 120 months at 100°C. Provide tie bars with rubber top hat washers where working pressure exceeds 4 bar. Supply threaded tie bars with adjustable length. Ensure flexible connections are tied when the plant is on vibration isolation mountings.

Y11.2650H FLANGED CHLOROBUTYL RUBBER FLEXIBLE CONNECTIONS UP TO 10 BAR AND 60 DEGREE C:

Material - Multi-ply reinforced chlorobutyl rubber with wire reinforced cuffs. Synthetic fibre reinforcement within the body.

Marking - Mould date of manufacture on bellows.

Show manufacturer and type.

Ends - Flanges to BS EN 1092-1 that can swivel and are removable.

Operation - Ensure flexible connections have a design life of 120 months at given conditions. Provide tie bars with rubber top hat washers where working pressure exceeds 4 bar. Supply threaded tie bars with adjustable length. Ensure flexible connections are tied when the plant is on vibration isolation mountings.

Y11.2670A TEST PLUGS, SELF SEALING:

Provide DZR copper alloy self sealing test plugs for measurement of temperature and pressure, complete with captive cap for sealing when not in use. Ensure test plugs are suitable for system operating temperature and pressure.

Provide one thermometer and pressure gauge for each range of conditions, for use with test plugs.

Y11.2670B TEST PLUGS, VALVE CONTROLLED:

Provide DZR copper alloy self valve controlled test plugs for measurement of temperature and pressure, complete with captive cap for sealing when not in use. Ensure test plugs are suitable for system operating temperature and pressure.

Provide one thermometer and pressure gauge for each range of conditions, for use with test plugs.

Y11.2680A THREADED PIPELINE STRAINERS, BRONZE:

Material - Bronze to BS EN 1982.

Ends - Threaded to BS 21 and BS EN 10226-1.

Pattern - Y pattern body.

Screen free area - Not less than 250% of pipe bore.

Screen perforations

15 to 50mm nominal size, within range 0.7 - 0.9 mm diameter.

65mm and over nominal size, within range 1.5 - 1.8mm diameter.

Internal to external flow through screen. Provide plugged connections for drain, air vent and differential pressure monitoring, threaded to BS 21 and BS EN 10226-1.

Y11.2680B FLANGED PIPELINE STRAINERS, BRONZE:

Material - Bronze to BS EN 1982.
Ends - Flanged to BS EN 1092-3.
Pattern - Y pattern body.
Screen free area - Not less than 250% of pipe bore.
Screen perforations
15 to 50mm nominal size, within range 0.7 - 0.9 mm diameter.
65mm and over nominal size, within range 1.5 - 1.8mm diameter.
Internal to external flow through screen. Provide plugged connections for drain, air vent and differential pressure monitoring, threaded to BS 21 and BS EN 10226-1.

Y11.2680C COMPRESSION PIPELINE STRAINERS, BRONZE:

Material - Bronze to BS EN 1982.
Ends - Compression fittings to BS EN 1254-2.
Pattern - Y pattern body.
Screen free area - Not less than 250% of pipe bore.
Screen perforations
15 to 50mm nominal size, within range 0.7 - 0.9 mm diameter.
65mm and over nominal size, within range 1.5 - 1.8mm diameter.
Internal to external flow through screen. Provide plugged connections for drain, air vent and differential pressure monitoring, threaded to BS 21 and BS EN 10226-1.

Y11.2680D PIPELINE STRAINERS, CAST IRON:

Material - Cast iron.
Ends - Flanged to BS EN 1092-2.
Pattern - Y pattern body.
Screen free area - Not less than 250% of pipe bore.
Screen perforations
15 to 50mm nominal size, within range 0.7 - 0.9 mm diameter.
65mm and over nominal size, within range 1.5 - 1.8mm diameter.
Internal to external flow through screen. Provide plugged connections for drain, air vent and differential pressure monitoring, threaded to BS 21 and BS EN 10226-1.

Y11.2690A TUNDISHES, COPPER:

Provide tundishes located adjacent to equipment, as indicated.
Use 3mm minimum thickness copper sheet. Form sheet into a tapered reducing cone with a minor diameter to suit drain line.
Major diameter nominally 50 mm larger than minor diameter, tapering at approximately 30 degrees.

Y11.2690B TUNDISHES, MILD STEEL, GALVANIZED:

Provide tundishes located adjacent to equipment, as indicated.
Use mild steel sheet; galvanize after manufacture.
Form sheet into a tapered reducing cone with a minor diameter to suit drain line.
Major diameter nominally 50 mm larger than minor diameter, tapering at approximately 30 degrees.

Y11.2700A GAUGES, GENERAL:

- 150mm black stove enamel finish
- 2700B GAUGES, 150MM DIAMETER, FLUSH PANEL:
- Dial case - 150mm diameter, heavy pattern, finished in black stove enamel for flush mounting.

- Mount gauges with dial face in vertical plane flush to panel and conceal casing within a steel metal cubicle.
- 2700C GAUGES, 150MM DIAMETER, DIRECT MOUNTING:
- Dial case - 150mm diameter, heavy pattern finished in black stove enamel, for direct connection to instrument.
- Mount gauges with dial face in vertical plane and support casing by connection to instrument.
- 2700D GAUGES, 150MM DIAMETER, FLANGED:
- Dial case - 150mm diameter, heavy pattern finished in black stove enamel, with annular mounting flange.
- Mount gauges with dial face in vertical plane and surface mount casing to equipment or building element, as required.
- 100mm - finish
- 2700E GAUGES, 100MM DIAMETER, FLUSH MOUNTING:
- Dial case - 100mm diameter for flush mounting to steel panel.
- Mount gauges with dial face in vertical plane flush to panel and conceal casing within a steel metal cubicle.
- 2700F GAUGES, 100MM DIAMETER, DIRECT MOUNTING:
- Dial case - 100mm diameter for direct connection to instrument.
- Mount gauges with dial face in vertical plane and support casing by connection to instrument.
- 2700G GAUGES, 100MM DIAMETER, FLANGE MOUNTING:
- Dial case - 100mm diameter with annular mounting flange.
- Mount gauges with dial face in vertical plane and surface mount casing to equipment or building element, as required.

Use dial type gauges of robust construction, enclosed in dust tight metal cases. Retain dial glass with bezels screwed to case. Finish with chromium plating.

Use white dial scales indelibly and clearly marked with black lettering to indicate measured values. Select scale ranges which indicate 'Normal' when pointer is vertical or central on scale.

Y11.2700B GAUGES, 150MM DIAMETER, FLUSH PANEL:

Dial case - 150mm diameter, heavy pattern, finished in black stove enamel for flush mounting.
Mount gauges with dial face in vertical plane flush to panel and conceal casing within a steel metal cubicle.

Y11.2700C GAUGES, 150MM DIAMETER, DIRECT MOUNTING:

Dial case - 150mm diameter, heavy pattern finished in black stove enamel, for direct connection to instrument.

Mount gauges with dial face in vertical plane and support casing by connection to instrument.

Y11.2710A TEMPERATURE GAUGES, GENERAL:

- 2710B TEMPERATURE GAUGES, MERCURY IN STEEL:
- Provide mercury in steel temperature gauge, mounted direct in pocket.
- Vapour pressure to BS EN 13190
- 2710C TEMPERATURE GAUGES, VAPOUR PRESSURE TO BS 5235 FOR DIRECT MOUNTING:
- Vapour pressure type to BS EN 13190, mounted direct in pocket, with horizontal or vertical stem as appropriate.
- 2710D TEMPERATURE GAUGES, VAPOUR PRESSURE TO BS 5235 FOR REMOTE MOUNTING:
- Vapour pressure type to BS EN 13190, for remote mounting with capillary tube of sufficient length

to allow slack run to immersion bulb. Protect capillary along full length by a flexible sheath jointed to dial case and bulb.

- 2710# TEMPERATURE GAUGES:
- Use temperature gauges with pocket and provided with gland attachment on thermometer stem.
- Type
- Mercury in steel, mounted direct in pocket.
- Vapour pressure to BS EN 13190, mounted direct in pocket with horizontal or vertical stem as appropriate.
- Vapour pressure to BS EN 13190, for remote mounting with capillary tube of sufficient length to allow slack run to immersion bulb. Protect capillary along full length by a flexible sheath jointed to dial case and bulb.
- Use separable type pockets, threaded 15/19mm BSP and manufactured from
- Stainless steel.
- Screw pockets into tapped bosses or stools set in pipelines or vessels. Fill pockets with oil to BS 7207 to ensure contact with thermometer bulb.
- Provide gauges with dial graduation in degrees Celsius marked on a logarithmic scale. Ensure pointer movement is clockwise for increase in temperature.
- Provide sensing elements for air and gas systems, where indicated, and fix to provide airtight joints. Provide with metal shielding around sensing element to prevent effects of local radiation from equipment.

Mercury in steel type, mounted direct in pocket.

Use temperature gauges with pocket and provided with gland attachment on thermometer stem.

Use separable type pockets, threaded 15/19mm BSP and manufactured from stainless steel.

Screw pockets into tapped bosses or stools set in pipelines or vessels. Fill pockets with oil to BS 7207 to ensure contact with thermometer bulb.

Provide gauges with dial graduation in degrees Celsius marked on a logarithmic scale. Ensure pointer movement is clockwise for increase in temperature.

Provide sensing elements for air and gas systems, where indicated, and fix to provide airtight joints. Provide with metal shielding around sensing element to prevent effects of local radiation from equipment.

Y11.2710B TEMPERATURE GAUGES, MERCURY IN STEEL:

Provide mercury in steel temperature gauge, mounted direct in pocket.

Y11.2710C TEMPERATURE GAUGES, VAPOUR PRESSURE TO BS 5235 FOR DIRECT MOUNTING:

Vapour pressure type to BS EN 13190, mounted direct in pocket, with horizontal or vertical stem as appropriate.

Y11.2720 PRESSURE AND ALTITUDE GAUGES:

Use vapour pressure type gauges to BS EN 837-1. Connect to pipeline systems via matched gauge cocks and cock connectors.

Ensure dial graduation is from zero to between 1.5 and 3.0 times normal working pressure. Graduate in bar (gauge) on gauges reading head or working pressure, or in Pascals where pressure differences across plant items are to be established. Where fitted on boilers and pressure vessels, clearly mark with operating and maximum permissible working heads in accordance BS 759. Elsewhere provide gauges with normal working pressure. Ensure dial movement is clockwise for an increasing in head. Fit syphons on steam systems.

Provide flexible piping where gauge is subject to noticeable vibration.

Fit gauge cocks preceding all connections to altitude and pressure gauges. Copper alloy, tapered ground plug, with ebonite lever. Unless flanged joints are required, screw inlet ends female and fit outlet ends with union connections allowing removal of gauges.

Y11.2730 VACUUM GAUGES:

Use vacuum gauges complying with BS EN 837-1. Calibrate in mm of mercury.

Y11.2750A GAUGE MOUNTING BOARDS, HARDWOOD:

Manufacture from 12mm thick, polished hardwood.
Mount on walls or purpose made steel frames at a height approximately 1.3m above floor level.

Y11.3010A LOOSE ITEMS, KEYS FOR SPINDLE SHANK VALVES:

- Number
- Provide tee handled short shank keys suitable for each size of valve spindle shank.

Y11.3010B LOOSE ITEMS, FOR DRAIN COCKS:

- Number
- Provide lever pattern keys suitable for each drain cock and loose hose unions for drain cocks.

Y11.4010 INSTALLATION:

Install pipeline ancillaries in accordance with manufacturer's recommendations and BS 6683.

Y11.4020 LOCATION:

- Positions
- Install valves, cocks, traps, strainers, test plugs, tundishes and other ancillary equipment in positions indicated.

Y11.4025 LOCATION OF THERMOSTATIC RADIATOR VALVES:

Install thermostatic radiator valves in an area which reflects the space temperature. Ensure that they are not behind curtains or enclosed in heating or radiator panels.

Y11.4030 POSITIONING OF COMPONENTS:

Locate flow and pressure measurement valves to ensure manufacturer's recommended straight length of pipe upstream and downstream of valve is provided.

Y11.4040 POSITIONING OF DOUBLE REGULATING VARIABLE ORIFICE VALVE:

Install double regulating variable orifice valve to ensure equivalent of 10 diameters of straight pipe upstream and 5 diameters downstream of double regulating valve.

Y11.4045 INSTALLATION OF CONTROL BALL VALVES:

Install control ball valves in accordance with manufacturer's recommendations.

Y11.4050# POSITIONING OF CONTROL COMPONENTS:

- Install pipeline control components in accordance with manufacturer's instructions and in positions indicated.
- Insulation - Where control components are incorporated in insulated pipelines provide details of

insulation method proposed for approval.

- Supports - Arrange supports for control components to ensure no strain is imposed on components.
- Access - Arrange control components to ensure adequate access for operation and maintenance.

Y11.4060 VENT COCKS:

Provide outlets of vent cocks with discharge pipes.

Y11.4070 VALVE STUFFING BOXES:

Adjust glands of all stuffing boxes at normal plant operating temperature and pressure in accordance with manufacturer's instructions. Ensure that valve action is not impaired by over tightening.

Y11.4080A DISCHARGE CONNECTIONS, SAFETY VALVES:

Fit pipework connections, where indicated, to provide discharge connection to Safety and Relief valves terminating at a safe discharge point.

Y11.4080B DISCHARGE CONNECTIONS, VENT COCKS:

Fit pipework connections, where indicated, to provide discharge connection to vent cocks terminating 150mm above floor level.

Y11.4080C DISCHARGE CONNECTIONS, AIR BOTTLES:

Fit pipework connections, where indicated, to provide bleed connection from air bottles terminating with air cock or needle valve in a convenient position.

Y11.4080D DISCHARGE CONNECTIONS, AUTOMATIC AIR VENTS:

Fit pipework connections, where indicated, to provide discharge pipe to automatic air vents terminating over a suitable gully or drain line in a visible location.

Y11.4090 EXPANSION DEVICES:

Where expansion and contraction cannot be accommodated by selected route, provide pipework loops, as indicated. Limit total stress set up in material of pipe wall, taking into account components due to internal pressure, tension and bending to less than 69 MPa for steel pipelines and less than 51.5 MPa for copper pipe lines.

Where location does not permit sufficient flexibility, provide proprietary devices, as indicated.

Y11.4100 EXPANSION COMPENSATORS INSTALLATION:

Provide anchors and guides to contain all movement and resist maximum loads imposed. Install expansion compensators strictly in accordance with manufacturer's instructions.

Y11.4110 FLEXIBLE CONNECTIONS INSTALLATION:

Fit rubber bellows as close to source of vibration as practicable. Ensure the pipe at other end of bellows is a fixed point. Install flexible connections strictly in accordance with manufacturer's instructions.

Ensure flexible connections are tied when the plant is on vibration isolation mountings.

Y11.4120 TERMINAL UNIT CONNECTIONS INSTALLATION:

Install hose connections strictly in accordance with manufacturer's instructions.

Y20 PUMPS

Y20.1000 GENERAL

1010 PUMPS:

Provide pumps manufactured and tested in accordance with appropriate British Standard, in particular BS EN 809, BS EN 60335-2-41 and BS EN 60335-2-51 where applicable.

1020 PUMP SELECTION

Select pump at or near most efficient part of performance curve for duty required.

1030 SAFETY GUARDS:

Fit safety guards around revolving parts on close coupled and belt drive pumps.

1040 PUMP TESTING:

Ensure pumps comply with BS EN ISO 5198 and BS EN ISO 9906 as appropriate.

Y20.4010 GENERAL:

Comply with manufacturer's recommendations for installation of pumps. For in-line pumps ensure that motor is positioned in accordance with manufacturer's requirements.

Y20.4020 PIPELINE CONNECTIONS:

Support pumps independently from connecting pipework to ensure no load is transmitted from pipework to pump casing on pump suction and discharge.

Y20.4030 MOUNTINGS:

Mount motors and pumps for belt drive pumps resiliently.

Y20.4040 ALIGNMENT:

Align pump to prevent undue restraint and thrust on interconnecting pipework. Align drives to prevent undue wear and restraint on pump shaft. For belt drives, align pulleys and tension belts to prevent undue wear and out of balance forces.

Y20.4050 ACCESS:

Locate pump within the system with adequate space around it for service and maintenance.

Y20.4060 MAINTENANCE REQUIREMENTS FOR SEWAGE PUMPS:

For ease of service and maintenance, install submersible sewage pumps on guide rails or with lifting cables. Fit pumps with automatic discharge connections, which locate on to permanent pipework at low level in chamber.

Y24 TRACE HEATING

Y24.1000 GENERAL

1010 STANDARDS:

Comply with BS 7671 (IEE Wiring Regulations), BS 6351-1 and BS 6351-2, for the design and

specification of electric trace heating.

Y24.2010C ELECTRIC TRACE HEATING, SELF REGULATING TAPE, RCD PROTECTION:

Supply electric trace heating complete with fixing tape, shrink sleeves, crimps, junction boxes and controls.

Tape - Self regulating heating tape.

Insulation

Thermoplastic elastomer or modified polyolefin.

Jacket - Tinned copper braid.

Electrical protection - Provide MCB and RCD protection.

Y24.3010 INSTALLATION OF ELECTRIC TRACE HEATING:

Install electric surface heating in accordance with BS 6351-3 and manufacturer's instructions. Ensure pipe is cleaned of all abrasive material prior to application.

Y24.3040 THERMAL INSULATION:

Enclose pipework to be heated and trace heating elements in common thermal insulation. Use oversized insulation.

Y25 CLEANING AND CHEMICAL TREATMENT

Y25.1000 GENERAL

1010 CONDITIONS FOR CLEANING AND CHEMICAL TREATMENT:

Ensure treatment complies with statutory authority and health and safety regulations. Notify manufacturers and suppliers of equipment of proposed system cleaning and chemical treatment processes. Establish if any manufacturer or supplier of equipment requires any particular cleaning and chemical treatment process due to size of waterways or materials used.

All chemicals used are to be compatible with the metallurgy of the systems.

1015 METHOD STATEMENT:

Provide a method statement covering the sequence of events, chemicals to be used etc. Statement to be provided at least two months prior to the start of any flushing and/or chemical cleaning works.

Y25.2010 CLEANING AND CHEMICAL TREATMENT SPECIALIST:

Use a specialist for analysis and for design, supply, installation and operation of any system cleaning and chemical treatment process.

Y25.2030A PRELIMINARY CHECKS:

- Prior to carrying out cleaning or chemical treatment process, ensure that
- All foreign matter is removed.
- Certified pressure tests have been carried out in the parts of the system to be cleaned. Carry out further pressure tests on the isolated sections of the system independently.
- All water used for pressure testing is inhibited. Leave remaining pipework sections full after testing.
- Where there is a risk of freezing inhibited mono-ethyleneglycol is used.

- Circulation has been demonstrated and approval obtained on all parts of the system. Manipulate and leave fully open all valves other than those used to isolate sections. Carry out balancing and certification after the flushing, cleaning and passivation operations.
- No damage can occur to any item of plant or equipment due to cleaning and chemical processes.
- Chemicals used are compatible with system materials.
- All items of plant and equipment subject to damage or blockage due to cleaning and chemical treatment processes are isolated or removed.
- Permanent or temporary by-passes are provided as indicated on drawings.
- Dirt pockets are installed at low points to facilitate solids removal. Supply dirt pockets with drain valves sized to pipework size.
- All drains provided have been tested and approved and that any pumping equipment associated with the drainage system is fully commissioned.
- Dead legs that are more than 3 pipe diameters in length are looped to allow effective cleaning.
- Strainer baskets and filter media, incorporated within systems, are removed; and where necessary spool or stool pieces are installed.
- Temporary strainers and filters are installed as required for removal of solids during cleaning and chemical treatment processes.
- Strainers are clean prior to the start of the cleaning process, throughout the cleaning and on completion.
- Suitable supply and drainage points are provided with 50mm minimum connections, properly sited and installed, either valved or plugged.
- All automatic/manual air vents are fully commissioned.
- All requirements of COSHH regulations are complied with during the chemical cleaning and chemical treatment of the system.
- Where required by local water authority, provide effluent tanks for storage of all waste products of cleaning and chemical treatment processes.
- Following local water authority approval, either neutralize or dispose to drain of all waste products; or ensure authorised disposal at registered sites.
- Comply with Waste Management Duty of Care: A Code of Practice and The Hazardous Waste (England & Wales) Regulations 2005 where appropriate.

Y25.2040A PROCEDURAL PRECAUTIONS FOR CLEANING AND CHEMICAL TREATMENT:

- Carry out tests to ensure that cleaning and chemical treatment processes are operating as required.
- Carry out tests to ensure that cleaning and chemical treatment processes are operating as required. and detailed in the Method Statement.
- Submit all test and sample results for certification and approval.

Y25.2040B PROCEDURAL PRECAUTIONS FOR CLEANING AND CHEMICAL TREATMENT INCLUDING TAKING SAMPLES:

- Take samples during and following chemical treatment and/or cleaning.
- Submit samples to an independent analyst.
- Use sterile containers to take samples.
- Carry out tests to ensure that cleaning and chemical treatment processes are operating as required.
- Submit all test and sample results for certification and approval.
- Ensure all samples are witnessed.

Y25.2060A CHEMICAL INJECTION AND DOSING METHODS FOR CLOSED SYSTEMS:

Method of introducing chemicals

Dosing pots; manually initiated timer controlled dosing; or proportional dosing as appropriate.

Y25.2060B CHEMICAL CLEANING AND DOSING METHODS FOR OPEN RECIRCULATING SYSTEMS:

Method of introducing chemicals
Chemical dosing for scale and corrosion inhibitors
Continuous; timer controller; or proportional dosing as appropriate.
Bleed-off control.
Biocide dosing - automatic dosing control.

Y25.2060C PACKAGED CHEMICAL INJECTION AND DOSING PLANT:

Provide packaged monitoring and treatment plants.

Y25.2060D DOSING - CLOSED SYSTEMS:

Chemical feed
Provide feeder (dosing pots) with a tundish for filling; separate air vent with discharge tube; drain and isolating valves.
Install in each water system a means of taking a sample as follows:-
Chilled water systems - provide a gate valve and discharge.
Heating systems - provide a sample cooler with a copper coil and cooling jacket with cooling water valve and drained to waste.

Y25.2060E DOSING - OPEN SYSTEMS:

Chemical dosing
Provide an interface between water treatment plant and system pumps to allow the initiation of water circulation in addition to the requirements of the building services.
Where control by-passes are used, set valves to allow reduced circulation but not complete isolation of the equipment.
Provide control of chemical inhibitors by linking the dosing pump control unit to operate on a signal from a water meter.
Provide skid mounted packaged equipment to feed chemical inhibitors including pre-wired controls and dosing pump, high density polyethylene tank, chemical diaphragm pump complete with all necessary valves and tubing.
Provide control of total dissolved solids by linking a solenoid purge valve to operate by a signal automatically received from a conductivity sensor.
Biocide dosing
Provide skid mounted packaged equipment to feed two types of biocides on an automatically alternating basis including pre-wired timer controls and twin biocide diaphragm pumps complete with all necessary valves and tubing. Draw biocide chemical direct from the chemical supply drums located on the skid.
Control
Provide low level alarms for all dosing units.
Provide BMS connections to monitor dosing and show run and alarm conditions.
Injection manifold
Provide an injection manifold for use with the above water treatment equipment.
Connect the manifold across flow and return pipework and mount above the dosing plant modules, unless otherwise indicated.

Y25.2065 CHEMICALS - DOSING:

Provide biocides effective against Legionella Pneumophila, algae, fungi, moulds and slime forming bacteria including pseudomonas and sulphate reducing bacteria.
Supply biocides as recommended by water treatment specialist.
Incorporate a bio dispersant in the programme to break up and disperse any slime masses, where required.

The water treatment specialist shall select the appropriate corrosion inhibitors, to minimise corrosion, and biocides to prevent any proliferation to mild steel, copper and copper alloys.

Provide a specific inhibitor to protect aluminium when it is present in the system.
The cleaning agent is to be specified by the water treatment specialist.

Y25.2070A MONITORING:

- Remote location
- Provide monitoring system to enable on-line analyses, system alarms and chemical stock levels to be monitored by water treatment specialist.
- Where indicated, provide facility for system to be monitored by water treatment specialist at remote location.

Y25.2070B SAMPLING:

Provide testing equipment to carry out tests for all inhibitors used in treatment programme indicated.

Y25.2070C SAMPLING KITS:

Provide the following test kits as appropriate.

Boiler water test kit for steam boilers; conductivity test kit; pH test kit; inhibitor test kit; hardness test kit where a softener is installed; chloride level test kit. Install a corrosion test rig to enable corrosion rates to be monitored using corrosion coupons.

Bacteriological monitoring with use of dipslides.

Log sheets for recording of test results, bacteriological analysis and any actions required or taken.

Y25.2080A CHEMICAL PROVISION, STANDARD ARRANGEMENT:

Provide consumables for a period of 12 months.

Where indicated, provide for supply of chemicals from containers refilled by drumless delivery system.

Include for supply of chemicals for all systems using the basis of:

Open circuit systems operating at 100 % load for 2080 hours per annum.

Closed circuit systems make-up 1% system volume/month.

Y25.2090 AVOIDANCE OF STAGNANT WATER IN PRESSURISATION UNIT EXPANSION VESSELS:

Install pressurisation units with re-circulating circuits, to avoid stationary pockets of water and minimise bacterial growth.

Y25.3010A FLUSHING:

- System filling
- Temporary connection from mains in compliance with the Water Supply (Water Fittings) Regulations 1999, and the Water Supply (Water Fittings) (Amendment) Regulations 1999.
- Temporary connection from fire hydrant pipework.
- By installation of temporary tank and pump arrangement.

Carry out flushing of water systems in accordance with BSRIA Application Guide 1/01 Pre-commission cleaning of pipework systems.

Section 2 Installation considerations

2.1 Management

2.2 Pipework installation

2.3 Preparation for flushing and cleaning

2.4 Procedure for filling, pressure testing and static flushing.

Section 3 System dynamic flushing.

C1 Flushing objectives

C2 Dynamic flushing procedure.

Inspection and witnessing, as section 1.4.

Y25.3010B FLUSHING:

All water used for pressure testing, flushing and system filling is of good quality. Leave remaining pipework sections full and treated after pressure testing.

Install all necessary pipework ancillaries to enable a specialist to carry out flushing, inspection and witnessing of water systems in accordance with BSRIA Application Guide AG 1/01. Pre-commission cleaning of pipework systems.

Temporary connection from the mains must be in compliance with the Water Supply (Water Fittings) Regulations 1999 and amendment, or by installation of a temporary tank and pump arrangement. Domestic water systems are to be flushed and disinfected in accordance with the requirements of BS 6700, and to the satisfaction of the local water supply authority. Flush systems using mains water until the water is clear.

Y25.3020A TESTING AND PURGING GAS PIPEWORK - INDUSTRIAL AND COMMERCIAL INSTALLATIONS:

Comply with IGE/UP/1 Strength and tightness testing and direct purging of industrial and commercial gas installations.

Y25.3020B TESTING AND PURGING GAS PIPEWORK - SMALL LOW PRESSURE INDUSTRIAL AND COMMERCIAL INSTALLATIONS:

Comply with IGE/UP/1A Strength and tightness testing and direct purging of small low pressure industrial and commercial natural gas installations.

Y25.3020C TESTING GAS PIPEWORK TO BS EN 12327:

- Purge each system using either Nitrogen or CO₂.
- This operation is to prove the continuity of the pipework, remove any cutting fluid and ensure that the nozzles are clear.
- Flimsy paper bags are to be attached to all nozzles during the purge and removed upon completion of the purge.
- Carry out pressure testing in accordance with BS EN 12327.

Y25.3030A CHEMICAL CLEANING AND SOLIDS REMOVAL - INHIBITED ACID:

Carry out chemical cleaning procedure in accordance with BSRIA Application Guide 1/01 Pre-commission cleaning of pipework systems.

- 4.1 Introduction.
- 4.2 Cleaning options.
 - 4.2.1 Degreasing.
 - 4.2.2 Biocide wash.
 - 4.2.3 Removal of surface oxides - Inhibited acid cleaning.
 - 4.2.4 Effluent disposal/final flushing.
 - 4.2.5 Neutralisation.
 - 4.2.6 Passivation
 - 4.2.7 Corrosion inhibitor/biocide dosing.
 - 4.2.8 Treatment up to system handover.
- 4.3 On-going water treatment.

Inspection and witnessing, as section 1.4.

Y25.3030B CHEMICAL CLEANING AND SOLIDS REMOVAL - FORMULATED PRODUCTS:

Carry out chemical cleaning procedure in accordance with BSRIA Application Guide 1/01 Pre-

commission cleaning of pipework systems.

- 4.1 Introduction.
- 4.2 Cleaning options.
 - 4.2.1 Degreasing.
 - 4.2.2 Biocide wash.
 - 4.2.3 Removal of surface oxides - Inhibited acid cleaning.
 - 4.2.4 Effluent disposal/final flushing.
 - 4.2.5 Neutralisation.
 - 4.2.6 Passivation
 - 4.2.7 Corrosion inhibitor/biocide dosing.
 - 4.2.8 Treatment up to system handover.
- 4.3 On-going water treatment.

Inspection and witnessing, as section 1.4.

Y25.3040 STERILIZATION - GENERAL:

After flushing process, carry out sterilization in accordance with BS 6700.
Prior to sterilization ensure each system is flushed, cleaned and drained.

Provide temporary connections to system terminal points suitable for introduction of sterilization chemicals and fluids and 22mm minimum valved drain connection on incoming main immediately downstream of mains isolating valve.

Fill system with clean, fresh water.

Y25.3050 STERILIZATION - MAINS WATER SYSTEM:

- System standing time
- Carry out the following operations in accordance with BS 6700.
- Flush system and introduce sterilisation chemical.
- Take samples from all sentinel points to ensure correct chlorine concentration.
- Leave system to stand for period of time indicated.
- Repeatedly flush system with clean water until all traces of chlorine have been removed - leave system filled.
- Submit samples to registered laboratory for microbiological analysis and report.
- Certificate of conformity
- Immediately prior to handover, retake samples and submit for analysis and report.
- Where necessary repeat sterilisation of potable water system immediately prior to handover.

Y25.3060 STERILIZATION - WATER STORAGE SYSTEMS:

Carry out the following operations in accordance with BS 6700 and HSE L8 Legionnaires' disease - control of legionella bacteria in water systems ACOP and guidance.
Carry out operations on all water storage tanks and cisterns, cold and hot.
Carry out procedures as for mains water systems.

Y25.3080 SERVICE VISITS:

Provide monthly service visits for one full year by a fully qualified chemist, to carry out the following:-
Review water analysis records, correspondence and reports since previous visit.
Test water samples on site for hardness; all inhibitors; dissolved solids; pH; total alkalinity.
Check performance of feeding equipment, softeners, and testing equipment on site.
Submit a written report.
Carry out micro-biological analysis using dipslides.
Special requirements as indicated.

Y25.3090 DOCUMENTATION:

Provide number of copies as indicated of hard cover binders containing details of Programme outlines.
Purpose of chemical treatment.
Chemicals used and quantity.
On site testing procedures.
Control limits of tests.
Equipment data and drawings.
Product notes and material safety data sheets for all chemicals used.
Provide a complete training programme for site operatives covering Methods of basic water testing.
Explanation of results obtained.
Actions to be taken on test results.

30 AIR DUCTLINES AND ANCILLARIES

Y30.1000 GENERAL

1010 DUCTWORK INSTALLATION STANDARDS:

Carry out construction and installation of ductwork in accordance with DW 144, DW 154, DW 171, DW 191 and BS 5588 as appropriate.

1020 DUCTWORK DIMENSIONS:

Sizes of ductwork are internal dimensions. Where applicable make allowance for any internal lining.

Y30.2010A DESIGN INFORMATION - CLASS A POSITIVE:

Supply ductwork in accordance with classification in DW 144 Table 1 and DW 154 Table 1.
Ductwork Classification and Air Leakage limits
Low pressure - Class A - Positive.

Y30.2010B DESIGN INFORMATION - CLASS A NEGATIVE:

Supply ductwork in accordance with classification in DW 144 Table 1 and DW 154 Table 1.
Ductwork Classification and Air Leakage limits
Low pressure - Class A - Negative.

Y30.2025 SPARK TESTING ON PLASTICS DUCTWORK:

Carry out spark testing in accordance with DW 154 at land marks identified in the contract programme.

Y30.2035 STRENGTH AND LEAKAGE TESTING OF CIRCULAR SHEET METAL DUCTWORK:

Carry out ductwork strength and air leakage testing on circular sheet metal ductwork in accordance with BS EN 12237.
Test procedure shall be as detailed in BS EN 12237, Section 7.
Produce a test report as detailed in BS EN 12237, Section 8.

Y30.2036 STRENGTH AND LEAKAGE TESTING OF RECTANGULAR SHEET METAL DUCTWORK:

Carry out ductwork strength and air leakage testing on circular sheet metal ductwork in accordance with BS EN 1507.
Test procedure shall be detailed in BS EN 1507, Section 5.
Produce a test report as detailed in BS EN 1507, Section 6.

Y30.2040A ZINC-COATED DUCTWORK MATERIAL:

DW 144 Part 2 - Standards, paragraph 7, zinc-coated steel.

Y30.2060A RECTANGULAR CONSTRUCTION:

Rectangular ductwork - DW 144 Part 3.

Y30.2060B CIRCULAR CONSTRUCTION:

Circular ductwork - DW 144 Part 4, spirally wound or straight seamed.

Y30.2060C FLAT OVAL CONSTRUCTION:

Flat oval ductwork - DW 144 Part 5, spirally wound or straight seamed.

Y30.2110A FIRE PROTECTION WITH FIRE DAMPERS:

Ensure complete ductwork system complies with the requirements of BS 476-24.
Supply and install fire rated ductwork. Method of protection DW 144 Appendix D using fire dampers.

Y30.2110B FIRE PROTECTION WITH FIRE RESISTING ENCLOSURES:

Ensure complete ductwork system complies with the requirements of BS 476-24.
Supply and install fire rated ductwork. Method of Protection DW 144 Appendix D using fire resisting enclosures.

Y30.2110C FIRE RATED AND SMOKE EXTRACT DUCTWORK:

Ensure complete ductwork system complies with the requirements of BS 476-24 and BS 5588.
Supply and install fire rated ductwork. Method of Protection DW 144 Appendix D using fire resisting ductwork.

Ductwork to be in accordance with HVCA Specification DW 144. Ducts to be fire protected with the correct thickness of high density single layer mineral wool fire rated ductwork slab in accordance with manufacturers recommendations and instructions. Insulation system to be independently tested and carry current valid certification to provide fire protection fully in accordance with the requirements of duct 'Type A' and duct 'Type B' of BS 476-24 and BS 5588.

Drop rods and exposed bearers to be insulated in accordance with manufacturers recommendations and instructions.

Where a vapour barrier is required, all exposed edges and penetrations through the foil should be sealed using soft self-adhesive aluminium foil tape.

Y30.2110D FIRE RATED DUCTWORK:

Ensure complete ductwork system complies with the requirements of BS 476-24 and BS 5588.
Supply and install fire rated ductwork. Method of Protection DW144 Appendix D using fire resisting ductwork. Ductwork to be in accordance with HVCA Specification DW 144. Ducts to be fire protected with the correct thickness of high density single layer mineral wool fire rated ductwork slab in accordance with manufacturers recommendations and instructions. Insulation system to be independently tested and carry current valid certification to provide fire protection fully in accordance with the requirements of duct 'Type A' and duct 'Type B' of BS 476-24 and BS 5588.

Fire classification of fire resisting ductwork to be accordance with BS EN 13501-3.

Drop rods and exposed bearers to be insulated in accordance with manufacturers recommendations and instructions.

Where a vapour barrier is required, all exposed edges and penetrations through the foil should be sealed using soft self-adhesive aluminium foil tape.

Y30.2130A PREINSULATED EXTERNAL THERMAL/ACOUSTIC DUCTWORK:

Supply preinsulated ductwork where indicated.

Y30.2140A HANGERS AND SUPPORTS:

Provide hangers and supports throughout in accordance with DW 144 Part Six Section 19; DW 154 Part 5; or DW 191 Section 7 as appropriate.
Comply with BS EN 12236.

Y30.2150A SUPPORT OF AIR TERMINAL UNITS:

Support air terminal units and their plenums by the ceiling grids, as DW 144 Part One, paragraph 4.8.

Y30.3010 CONSTRUCTION AND FINISHES:

Ensure that materials of accessories are compatible with ductwork and that finishes of accessories comply with any special requirements for ductwork.
Ensure casing losses of components are compatible with ductwork in which they are incorporated.

Y30.3020A METAL DUCTWORK INSPECTION/SERVICING ACCESS OPENINGS:

Provide access/inspection openings in accordance with DW 144 Part Seven Section 20 and Appendix M Table 25 Level 1.

Y30.3020D DUCTWORK INSPECTION/SERVICING ACCESS OPENINGS:

Provide access/inspection openings in accordance with HVCA TR/17 Section 2.

Y30.3030A METAL DUCTWORK TEST HOLES:

Provide test holes in ductwork system, as shown on drawings, to allow complete testing and balancing of system in accordance with CIBSE Commissioning Code A.
Site drill test holes in accordance with DW 144 paragraph 20.6.

Y30.3040 HOLES FOR CONTROLS/INSTRUMENTS - METAL DUCTWORK:

Provide holes in ductwork, in accordance with DW 144 Part Seven, paragraph 20.7, to accommodate thermostats, humidistats and other control sensors in positions and sizes indicated on drawings.

Y30.3042 INSTALLATION OF INSTRUMENTS AND CONTROLS:

Instruments and controls should be installed to manufacturers or specialist supplier's requirements. The installation must be checked by the manufacturer or specialist supplier, and rectified as necessary.

Y30.3050A CLEANING ACCESS - LEVEL 2:

Provide access for cleaning in accordance with DW 144 Part Seven, paragraph 20.8 and Appendix M Table 25 Level 2.

Y30.3050C CLEANING ACCESS - HVCA TR/17:

Provide access/inspection openings in accordance with HVCA TR/17 Section 2.

Y30.3060B STEEL MULTI-BLADE BALANCING DAMPERS - METAL DUCTS:

Provide single or double skin steel multi-blade balancing dampers in accordance with DW 144 Part Seven Section 21. Parallel or opposed blade, manual operation. Locations and size as shown on drawings.

Y30.3060D STEEL MULTI-BLADE CONTROL DAMPERS - METAL DUCTS:

Provide single or double skin steel multi-blade control dampers in accordance with DW 144 Part Seven Section 21. Parallel or opposed blade, automatic operation. Locations and size as shown on drawings.

Y30.3070C STEEL CURTAIN FIRE DAMPERS - BLADES OUT OF AIR STREAM:

Supply and install steel folding curtain fire dampers, with blades out of the air stream in accordance with DW 144 Part Seven Section 22, size and location as shown on the drawings.

Y30.3070I INTUMESCENT FIRE DAMPERS:

Supply and install intumescent fire dampers in accordance with DW 144 Part Seven Section 22, size and location as shown on the drawings.

Y30.3070J FIRE DAMPERS ACCESSORIES:

- No. of spare fusible links

Provide accessories compatible with fire dampers. Electrical cut-out switches and external visual indication of fire damper blade position.

Supply spare fusible links for fire dampers to fuse at 72°C as specified in DW 144.

Y30.3075 FIRE DAMPERS - GENERAL:

Provide fire dampers in accordance with DW 144 Section 22 and DW 154 Part 6 paragraph 17. Types to be as identified elsewhere in the specification, in schedules or on drawings.

Fire dampers shall be supplied and fixed in accordance with the manufacturer's recommendations with installation mounting frames which conform to the prevailing Building Regulations and are acceptable to the District Surveyor/Building Control Officer and Fire Officer in accordance with DW 144 Fig. Nos. 78 and 79. Fire dampers shall be installed in accordance with the manufacturer's recommendations regarding minimum distances from bends and branches. The proposed "standard installation solution" must be supported by a valid test report or assessment provided by an approved 3rd party body.

The construction shall allow for all additional framing supports, bracing and fire stopping as may be necessary to adequately attach the fire dampers to the structure. The assembly is to be approved by the Building Control Officer/District Surveyor and Fire Officer.

Each fire damper and installation mounting frame shall have at least the same standard of fire resistance as the wall or floor through which the duct passes. Unless otherwise indicated it shall have a minimum fire resistance rate of 2 hours to the dynamic heated gas flow tests of BS EN 1366-2 Classification ES and to BS 476-20, BS 476-22 and BS 476-24. When a fire resistance rating of 4 hours is required either two dampers factory assembled in series or a single damper having a fire resistance rating of 4 hours certified by an approved Testing Authority shall be provided.

Fire classification of fire dampers to be in accordance with BS EN 13501-3.

Shutter dampers shall be provided with the shutter blades located outside the air stream (unless otherwise indicated). Each damper shall have a stainless steel curtain in all-welded galvanized steel casing

with stainless steel side seal gaskets. The damper blade curtain shall be held in the folded position by a dual safe thermal actuator and fusible link.

All damper blades shall be tensioned to ensure instantaneous closure on thermal activation at 72°C (unless specified elsewhere). A self-latching reset mechanism shall be provided for easy re-setting of the damper curtain.

On completion of the installation, the contractor shall be responsible for ensuring the inspection and testing of all fire dampers installed are carried out. Upon completion of the tests, the certificates must be issued for confirming that the dampers have been inspected and that they function correctly in accordance with the manufacturer's data sheets.

Access panels with chains shall be provided adjacent to the access side of all fire dampers. In no instances shall flexible duct connections be allowed onto fire dampers, or through floors or walls. Provide installation frames, and local external visual indication of fire damper blade position, unless indicated otherwise.

Y30.3080B STEEL MULTI-BLADE SMOKE DAMPERS:

Supply and install steel multi-blade smoke dampers in accordance with DW 144 Part Seven Section 23, size and location as shown on the drawings.

Y30.3090B STEEL MULTI-BLADE COMBINATION SMOKE AND FIRE DAMPERS:

Supply and install multi-blade combination smoke and fire dampers in accordance with DW 144 Part Seven Section 24, size and location as shown on the drawings.

Y30.3100A COATED STEEL FLEXIBLE DUCTS:

Supply and fasten coated steel flexible duct connections as DW 144 Part Seven Section 25. Use flexible duct connections in applications listed in DW 144 paragraph 25.1.

Comply with BS EN 13180.

Maximum length 600mm.

Y30.3110A FLEXIBLE JOINT CONNECTIONS:

Supply and install flexible joint connections as detailed in DW 144 Section 26 or DW 154 Section 18, as appropriate.

Use flexible joints, as shown on drawings; on fan inlet/outlets; and on building expansion joints.

Comply with BS 476-6, BS 476-7, BS 476-20, BS 476-21, BS 476-22, BS 476-23 and BS 476-24.

Y30.3120A BIRD WIRE GUARDS:

Fit bird screens of 13mm square mesh wire on all intake and extract louvres to atmosphere. Wire gauge to be not less than 1mm.

Finish - Plastic coated wire.

Y30.4010 GENERAL WORKMANSHIP:

Install ductwork in accordance with DW 144, DW 154 and DW 191 as appropriate.

Ensure that there are no sharp edges or corners on cut edges on ductwork, flanges and supports.

Install pre-insulated ductwork in accordance with manufacturer's instructions.

Y30.4020 DUCTWORK SUPPORTS:

Support ductwork in accordance with DW 144 Part Six Section 19; DW 154 Part 5; or DW 191 Section

7 as appropriate. Install supports to ensure insulation can be applied unless otherwise indicated.

Y30.4025 COMPONENT SUPPORT ON PRE-INSULATED ALUMINIUM DUCTWORK:

Support ducts with dimensions less than 1m at intervals of no more than 4m. Support ducts with dimensions over 1m at intervals of no more than 2m.
Provide independent support for all accessories.

Y30.4030A DUCT SUPPORT FOR VAPOUR SEAL CONTINUITY:

Where a vapour seal is required, use method of support detailed on drawing as indicated.

Y30.4040 EXTERNAL DUCTWORK SUPPORT:

- As shown on drawings nos.
- Support ductwork external to building as indicated.

Y30.4050 DUCTWORK FLOOR SUPPORT:

- As shown on drawings nos.
- Support ductwork from floor as indicated.

Y30.4060 DRAINAGE OF DUCTWORK:

Arrange ductwork to drain any entrained moisture and ensure the lapping of joints minimises moisture leakage.

Y30.4070A CONNECTIONS TO BUILDERS WORK - METAL DUCTWORK:

Comply with DW 144 Part Seven Section 28.

Y30.4090A INTERNAL CLEANLINESS - BASIC:

Provide the basic level of cleanliness and protection as defined in HVCA TM2.

Y30.4100A WEATHERPROOFING:

Fit ductwork with trimming angle and weather cravat, skirt, flashing plate and cowl where ductwork passes through or terminates in roof, to ensure a weatherproof seal to building structure, as indicated.

Y30.4110B DUCTWORK SLEEVES WITH FLANGES:

Where indicated, enclose ducts passing through building elements, (walls, floors, partitions, etc.) within purpose made sleeves. Cut sleeves of the same material as the duct and pack with mineral fibre or similar non-flammable and fire resistant material to form a fire/smoke stop of adequate rating and to prevent air movement and noise transmission between duct and sleeve.

Provide flanges on either side of wall where ductwork is exposed in rooms.

Where finished insulation is carried through duct sleeves. Pack space between insulation finish and sleeve with non-flammable and fire resistant material to form fire stop.

Y30.4120 FIRE RATED DUCTWORK SLEEVES:

Provide fire rated ductwork sleeves as indicated.

Y30.4130 INSTALLATION OF CONTROL EQUIPMENT:

Fit sensors, damper motors and other control equipment as indicated.

- All control equipment should be installed to manufacturers or specialist supplier's requirements.

The installation must be checked by the manufacturer or specialist supplier, and rectified as necessary.

Y30.4140 INSTRUMENT CONNECTIONS:

- Positions
- Provide instrument connections where indicated.
- All instrument connections should be installed to manufacturers or specialist supplier's requirements. The installation must be checked by the manufacturer or specialist supplier, and rectified as necessary.

Y30.4150 FIRE PRECAUTIONS:

- As shown on drawing nos.
- Install fire dampers as indicated.

Y30.4160 DAMPER ACCESS:

Ensure access is provided to damper mechanisms on fire dampers; smoke dampers; combined smoke and fire dampers; and volume control dampers through access doors, false ceilings etc..

Demonstrate that damper blades close completely.

Demonstrate that fire links can be replaced. Where more than one fire damper is installed in a frame ensure access is provided to all fire dampers.

Y30.4170 POSITIONING:

Position components as indicated and in accordance with manufacturer's instructions as shown on the following drawings.

- Contract drawings
- Manufacturer's drawings
- Specialist supplier's drawings
- Specialist contractor's drawings

Y40 AIR HANDLING UNITS

Y40.1000 GENERAL

Y40.1010B AIR LEAKAGE:

Ensure air handling unit is sealed to prevent air leakage at design pressure. Determine air leakage in accordance with BS EN 1886, Table 2 at 400 Pa negative pressure and table 3 at 700 Pa positive pressure.

Y40.1010C AIR LEAKAGE - FILTER BYPASS:

Determine air bypass around filter cells in accordance with BS EN 1886.

Ensure air leakage rates do not exceed the values given in table 4 of BS EN 1886 at a test pressure of 400Pa.

Y40.2020B MANUFACTURER'S STANDARD DOUBLE SKIN CASING AIR HANDLING UNITS:

Outer skin material - Manufacturer's standard.
Inner skin material - Manufacturer's standard.
External casing finish - Manufacturer's standard.
Internal casing finish - Manufacturer's standard.

Y40.2030A AIR HANDLING UNIT CONSTRUCTION:

- Insulation to provide
- thermal treatment.
- structural treatment.
- acoustic treatment.

General construction

Construct unit to withstand maximum fan static pressure without plastic deformation.
Ensure panels do not deflect by more than 1/120 of maximum panel dimension when unit is in operation.

Use corrosion resistant fastenings throughout.

Do not use self tapping screws.

Provide panel gaskets to give a durable seal between panels and frames to prevent excessive air leakage.

Provide stacking units where indicated.

Casing Insulation

Ensure insulation complies with BS 476-6 and BS 476-7. Ensure insulation is fixed securely to panel, and protected to prevent migration of fibre into air flow.

Insulation to provide thermal, structural or acoustic treatment as indicated.

Ensure insulation is vapour sealed throughout and incorporate thermal breaks.

Insulation material

Provide insulation that is inorganic, vermin proof and non-hygroscopic.

Use mineral fibre, minimum of 50mm thick or rigid polyurethane foam, minimum of 25 mm thick.

Framework

Ensure framework is rigid enough to prevent distortion during transportation and after final assembly on site.

Seat panels into folded, rolled or extruded frame with purpose made corner joints; or pentapost type frame with purpose made corner joints.

Ensure framework is self supporting.

For vertical units strengthen framework to support additional weight.

Base

Provide feet under each section; formed base; or RSC base.

Y40.2040A AIR HANDLING UNIT ACCESS:

Provide access openings and covers complete with opening devices, and sealed to prevent air leakage.

Ensure seals are designed for normal maintenance operations for a minimum of 10 years.

Provide hinged access doors, 400mm minimum width.

Operating device - key operated door locks.

Provide access to fans, dampers, filters, spray coils, humidifiers and within air handling unit for inspection of nozzles and tanks.

Y40.2060A EXTERNAL AIR HANDLING UNITS:

Construct air handling units for external use. Provide weatherproof isolators.

Roof construction as indicated on drawings.

Options

Where indicated provide connection for Lightning protection.

Y40.4010A COMPONENT ASSEMBLY:

Assemble air handling units using gaskets to prevent air leakage from casing.

Y40.4020 ACCESS:

Ensure air handling units are positioned to allow adequate space for maintenance and access.

Y40.4030 HUMIDIFIER INSTALLATION:

Comply with manufacturer's installation instructions for steam electrode type of humidifier.

Y40.4040 DUCT CONNECTIONS:

Ensure air is straightened as it leaves unit discharge. Ensure ductwork connection is long enough to ensure the aerodynamic performance of the fan is not affected.

Y40.4050 SERVICES CONNECTIONS:

Ensure panels are sealed around electrical cable and pipework service entry points to prevent air leakage.

Provide flexible cables between fan motor and local isolator.

Y40.4060 ISOLATION OF UNITS:

Provide means of isolating air handling units electrically to allow maintenance and repairs to be carried out.

Provide means of isolating pipework to air handling units to allow maintenance and repairs to be carried out.

Provide means of isolating steam to humidifier when access door is opened.

Y40.4070 DRAINAGE OF FREE WATER:

Make provision for free water to be caught, collected and drained away. Provide U-traps on all drains suitable for the negative/positive pressure created by the fan.

Y40.4080A SUPPORT AIR HANDLING UNIT:

On builders work base.

Y40.4090# FACTORY TESTS:

- Carry out tests at the factory to measure the following.
- Panel deflection.
- Air leakage test in accordance with HEVAC Guide to Air Handling Unit Leakage Testing.
- Fan running to check rotation and vibration.
- Fan and motor speeds.
- Ratings and Performance to BS EN 13053
- Whole unit.
- Fan section.
- Coils.
- Heat recovery sections.
- Damper sections.
- Mixing sections.
- Humidifiers.
- Filter sections.
- Sound attenuation sections.
- Mechanical performance to BS EN 1886.
- Air leakage test.
- Filter bypass leakage test.
- Mechanical strength test.
- Thermal performance test.
- Acoustic insulation test.
- Air flow performance test in accordance with BS 6583.
- Motor starting and running currents.
- Fan flow rate and developed pressure, using simulated system resistance.
- Component air pressure drops.
- Component water pressure drops.
- Sound power level.
- Vibration measurements.
- Functional test on electrical equipment.
- Power consumption.

Y41 FANS

Y41.1000 GENERAL

Y41.2020A CONSTRUCTION AND HANDLING:

Casings

Construct rigid casing free from drumming under operating conditions. Supply in sections as required for access or handling. Flange dimensions in accordance with BS 848-4.

Safety standards - to BS EN 60335-2-80.

Rotating assemblies

Balance in accordance with BS ISO 1940-1; BS ISO 11342; or BS 7854-1; as appropriate.

Shafts and hubs

Machine impeller bosses and shafts to BS 4500 and key in accordance with BS 4235-1. Hold impeller to shaft with set screw or taper lock fitting.

Shaft bearings - Sealed for life.

Drives and guards

Provide guards over shaft, couplings and rope in accordance with BS EN ISO 12100 and Factory Inspectorate requirements.

Material - galvanized or sheet steel.

Lifting

Provide lifting eyebolts or similar facilities on fans or sections heavier than 20kg.

Y41.2030 TESTING:

Provide results of aerodynamic performance tests in accordance with BS 848-1; noise tests in accordance with BS EN ISO 5136, BS ISO 13347-1, BS ISO 13347-2, BS ISO 13347-3, BS ISO 13347-4; and fan vibration measurements in accordance with BS ISO 14695 and balancing and vibration measurements in accordance with BS 848-7 and BS ISO 14695.

Y41.2050A MATERIALS, GALVANIZED SHEET STEEL:

Construct casing from galvanized sheet steel in accordance with BS EN ISO 1461, BS EN 10326, BS EN 10327 or BS EN 10143.

Y41.2110A ROOF MOUNTED SINGLE FANS:

Operation - single.

Vertical or horizontal discharge as shown on drawings.

Y41.2110B ROOF MOUNTED TWIN FANS:

Operation - twin with automatic changeover.

Vertical or horizontal discharge as shown on drawings.

Y41.2120A IN LINE SINGLE FANS:

Operation - single centrifugal fans.

Y41.3050A GUARDS:

Provide guards in accordance with BS EN ISO 12100.

Fit safety guards on air inlet and air outlet connections where these are freely accessible to personnel in accordance with BS 848-5.

Provide bird guards where indicated.

Y41.3060A CONNECTIONS TO DUCT:

Provide matching flanges and flexible connections where indicated.

Y41.3100A SHUTTERS:

Fit shutters to prevent reverse flow through fan where indicated.

Y41.3110 AIR FLOW SENSORS:

Fit air flow sensors or pressure switches on twin fan units to sense fan failure and provide automatic changeover to standby fan.

Y41.3120A ACCESS:

Provide access via hinged casing or removable panel as indicated.

Y41.3130 MOUNTING:

Provide base frames when this is integral part of fan set.

Y41.3140 SPEED CONTROLLER:

Provide speed controller to match fans.

Y41.4010 LOCATION:

Install fans in positions indicated, in accordance with manufacturer's instructions and recommendations in the HEVAC Fan Application Guide.

Y41.4030 ALIGNMENT:

Ensure fan is installed aligned to allow optimum air flow path.

Y41.4040 TESTING:

Ensure fan is isolated from installation during air leakage testing of ductwork.

Y45 SILENCERS/ACOUSTIC TREATMENT

Y45.1000 GENERAL

1010 PERFORMANCE:

Ensure that specified performance is met where protection is applied to infill to protect from moisture and grease.

1020 TESTING:

Provide certified insertion loss data in accordance with BS EN ISO 7235. Provide generated sound power levels with insertion loss data.

Where equipment is manufactured in modules ensure performance ratings apply to complete unit

1030 PROTECTION:

Protect silencers where they are installed in positions exposed to external weather conditions.

Block ends of silencers prior to delivery to site to prevent damage.

1040 DIRECTION OF FLOW:

Clearly mark direction of air flow on silencers.

Y45.2010A FIRE PROPERTIES, BS 476-7, CLASS 1:

Use non-flammable adhesives. Ensure that all insulating materials and coverings are non-combustible material covered with a material that complies with flame spread requirements of BS 476-7, Class 1.

Y45.2010B FIRE PROPERTIES, BUILDING REGULATIONS, CLASS O:

Use non-flammable adhesives. Ensure that all insulating materials and coverings are to Class O surface rating of Building Regulations.

Y45.2040A RECTANGULAR SILENCERS - CASING TO DW144 WITH CONNECTIONS TO MATCH AHU:

Provide rectangular silencers compatible with ductwork installation. Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.

Construct splitters with manufacturer's standard ends.

Construct casing to DW 144 with duct connections to match the air handling unit and specified method of assembly.

Y45.2040B RECTANGULAR SILENCERS - CASING TO DW144 WITH EXTERNAL FLANGES:

Provide rectangular silencers compatible with ductwork installation. Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.

Construct splitters with manufacturer's standard ends.

Construct casing to DW 144 with external flanges drilled for bolting to counterflanges on adjacent plant or ductwork.

Y45.2040C RECTANGULAR SILENCERS - CASING TO DW144 WITH INTERNAL FLANGES:

Provide rectangular silencers compatible with ductwork installation.

Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.

Construct splitters with manufacturer's standard ends.

Construct casing to DW 144 with internal flanges drilled and threaded for bolting to counterflanges on adjacent plant or ductwork.

Y45.2060A ACOUSTIC SPLITTERS TO MANUFACTURER'S STANDARD:

Mount splitters vertically or horizontally and fix splitters as shown on drawings.

Construct splitters to ensure that infill is retained and individual acoustic integrity is maintained.

Construct splitters with manufacturer's standard ends.

Provide additional stiffening on horizontally mounted splitters.

Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.

Material

Non-combustible mineral wool or glass fibre with minimum density 48 kg/m³.

Retain infill by perforated galvanized mild steel sheet.

Y45.2060B ACOUSTIC SPLITTERS WITH LOW LOSS FAIRINGS:

Mount splitters vertically or horizontally and fix splitters as shown on drawings.

Construct splitters to ensure that infill is retained and individual acoustic integrity is maintained.

Construct splitters with low loss fairings.

Provide additional stiffening on horizontally mounted splitters.

Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.

Material

Non-combustible mineral wool or glass fibre with minimum density 48 kg/m³.
Retain infill by perforated galvanized mild steel sheet.

Y45.2070A AIR TRANSFER/CROSS TALK ATTENUATORS - EXTERNAL FLANGES:

- Fixing - Interface with building components
- Provide attenuators for air transfer and cross talk applications. Provide lining that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.
- Construct casing with lock-formed longitudinal joints, mastic sealed.
- Provide external flanges drilled for bolting to counterflanges on adjacent ductwork.
- Fixing
- Interface with building components as indicated.

Y45.2070B AIR TRANSFER/CROSS TALK ATTENUATORS - INTERNAL FLANGES:

- Fixing - Interface with building components
- Provide attenuators for air transfer and cross talk applications. Provide lining that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.
- Construct casing with lock-formed longitudinal joints, mastic sealed.
- Provide internal flanges drilled and threaded for bolting to counterflanges on adjacent ductwork.
- Fixing
- Interface with building components as indicated.

Y45.2070C AIR TRANSFER/CROSS TALK ATTENUATORS - SPIGOT ENDS:

- Fixing - Interface with building components
- Provide attenuators for air transfer and cross talk applications. Provide lining that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.
- Construct casing with lock-formed longitudinal joints, mastic sealed.
- Provide plain spigot ends for connection to adjacent ductwork.
- Fixing
- Interface with building components as indicated.

Y45.2110 ACOUSTIC FLEXIBLE DUCT CONNECTORS:

Provide acoustic flexible duct connectors in accordance with DW 144, Part 7, Section 25.

Y45.3010 GENERAL:

Install acoustic treatment equipment in positions indicated, in accordance with manufacturer's instructions.

Y45.3040 SUPPORTS:

Supply steel section supporting frames or brackets where silencers are fixed to the walls of air chambers.

Y45.3060 SOUND PRESSURE LEVEL READINGS:

Measure sound pressure levels at the positions indicated using equipment in accordance with BS EN 61672-1 and BS EN 61672-2.

Y45.3070 MEASURE SOUND INSULATION OF BUILDING ELEMENTS IN ACCORDANCE

Measure sound insulation of building elements in accordance with BS EN ISO 140-4, BS EN ISO 140-7 and BS EN ISO 140-14 as appropriate.

Y46 GRILLES/DIFFUSERS/LOUVRES

Y46.1000 GENERAL

1010 PERFORMANCE:

Air Supply - Ensure air velocity at occupancy level is not greater than 0.45 m/s.

Blades - Supply grilles and diffusers with blade profile to ensure correct aerodynamic performance and minimal noise generation.

Louvres - Ensure air velocities through face area of louvres minimises "carry-over" of rain, snow or other precipitation into ducts, shafts or plant rooms.

1020 SIZE:

Sizes indicated are "Nominal".

Provide site dimensions of linear diffusers and grilles before manufacture.

1030 NOISE LEVELS:

Ensure sound power levels indicated are not exceeded. Ensure accessories for grilles and diffusers have low noise generation characteristics, and cause minimum disturbance to airflow.

1033 PROTECTIVE WRAPPING:

Apply protective wrapping to exposed architectural finishes prior to despatch to site.

1035 TESTING:

Provide air terminal devices tested in accordance with BS EN ISO 5135, and BS EN 13030.

Y46.1040 ELECTRICAL BONDING TERMINAL

Ensure an electrical bonding terminal suitable for connection of 6mm² maximum conductor is provided on metal grilles, diffusers and louvres where indicated.

Y46.2010A GRILLES - FIXED BLADE TYPE:

Secure blades within flanged mounting frame or core collar. Provide support mullions to ensure blade stability.

Style, blade rows and air pattern control as indicated on schedule.

Y46.2020A GRILLES - ADJUSTABLE BLADE TYPE:

Pivot blades within flanged mounting frame and retain blades in set position by tensioners external to the airstream.

Provide blade rows and blade angle adjustment as indicated on schedule.

Y46.2040A GRILLES - EGG-CRATE TYPE:

Core material - Aluminium or plastic as indicated.
Style - Flanged or channel frame; or core only as indicated.

Y46.2050A GRILLES - LINEAR TYPE:

Supply linear type grilles with one row of parallel blades. Secure blades within mounting frame or opening. Permanently set at angle indicated.

Y46.2060A GRILLES - LINEAR FLOOR TYPE:

Supply linear type floor grilles with one row of parallel blades. Permanently set at angle indicated. Incorporate bar reinforcement.

Loading - Pedestrian or computer room to special requirements as indicated.

Y46.2070A GRILLES - SIGHTPROOF NON-VISION TYPE:

Supply sightproof non-vision grilles with one set of blades at centres indicated.
Fix within a flanged mounting frame or a core box as indicated.

Y46.2190A LOUVRES - EXTERNAL AIR SUPPLY/EXTRACT TYPE:

Performance - Ensure louvre withstands specified wind loads and prevent ingress of rain.

Construction - Construct louvre frame and aerodynamically profiled louvre blades from galvanized mild steel or aluminium as indicated.

Provide integral drainage channels.

Retain infill on louvre blades by perforated sheet of galvanized mild steel or aluminium as indicated.
Screen - Fit a bird-screen using mesh no coarser than 12mm, across inside face of louvres.

Fit an insect-screen using mesh no coarser than 3mm, across inside face of louvres.

Quality assurance - Ensure manufacturers are a firm of Assessed Capability to BS EN ISO 9001 and produce louvre to relevant Quality Assessment schedule.

Y46.2210A GALVANISED STEEL:

•Finish

- Primed to prevent rust.
- Stove enamelled to colour
- With epoxy resin powder/hardener coating colour

Galvanised steel in accordance with BS EN 10326, BS EN 10327 or BS EN 10143.

Y46.2210B ALUMINIUM:

- Finish
- Etched or buffed to give self colour satin finish.
- With clear lacquer finish.
- Primed to prevent oxidization.
- Stove enamelled to colour
- With epoxy resin powder/hardener coating colour
- Anodized after manufacture colour

Use aluminium sheet/extruded aluminium produced to BS EN 485, BS EN 515 and BS EN 573, or BS EN 755.

Y46.2220A GRILLE AND DIFFUSER CONSTRUCTION:

Ensure grilles and diffusers are robust and mounting frame flanges on square and rectangular terminals have mitred corners. Fit a rubber or plastic foam sealing strip or gasket to rear face of flange. Diffusers - Ensure face of diffuser outer cone or frame is completely smooth.

Y46.2230A LOUVRE CONSTRUCTION:

Ensure louvres are robust. Incorporate in purpose made sub-frame. Provide drip cills as indicated.

Y46.2240# MOUNTING:

- Grilles
- Flanged screw fixings.
- Quick release fasteners.
- Concealed fixings.
- Spring clips.
- Diffusers
- Flanged screw fixings.
- Hidden screw fixing.
- Rear suspension brackets.
- Internal concealed fixings.
- Spring edge clips.
- Louvres
- Flanged screw fixings.
- Side screw fixings.
- Rear angles or cleats.

Y46.3010A OPPOSED BLADE VOLUME CONTROL DAMPERS - LOCAL CONTROL:

Balance and tension operating mechanisms to give positive setting for blade positions from fully open to fully closed.

Local blade operation

Supply device for operating damper blades through face or side of grille/diffuser as indicated.

Y46.3070 BLANKING PLATES:

Supply blanking plates to restrict projection of air flow from a particular section of grille or diffuser. Ensure that indicated dimensions or angles in degrees are maintained.

Y46.3090 PERFORATED SCREENS:

Fit perforated screens behind grille volume control devices to equalize air flow and pressure. Contain perforated sheet within rigid surrounding frame, incorporating fixing brackets or lugs.

Y46.3120B LIFT OUT LOUVRE ACCESS PANELS AND DOORS:

Incorporate purpose made access panels or doors within body of louvres, manufactured from compatible materials.

Use permanent housed or lockable lift out access panels.

Y46.4010 GRILLE/DIFFUSER LOCATION:

Fit at terminal air supply, extract and transfer points indicated, in accordance with the HEVAC Air

Diffusion Guide.

Y46.4020 LOUVRE LOCATION:

Fit at system main air intake and discharge points, as indicated.

Y46.4030 ACCESSORIES:

Fit accessories to each grille and diffuser in accordance with manufacturer's instructions and as indicated.

Y46.4040 CONNECTION TO DUCTWORK:

When connecting directly to duct spigot, secure grille mounting frame or flange with screws, or bolts and nuts, to returned flange, with filled in corners, at end of duct spigot.

Y46.4050A INSTALLATION IN BUILDERS WORK:

Ensure outer edge of grille mounting frame or flange extends on all sides beyond the joint between any builders work frame and surrounding building construction.

Ensure grilles are sealed to building fabric - including ceilings, to prevent air leakage from pressurised rooms to voids above.

Fix louvres to building fabric using method indicated on drawings.

Y46.4060A TRANSFER GRILLES:

Where transfer points are located in partitions or walls, prevent through vision by fitting a fixed blade grille on both faces of partition or wall. Connect cavity wall or partition transfer grille assemblies with ducting sleeve or collar extending between grilles.

Y46.4060B TRANSFER GRILLES WITH FIRE DAMPER:

- Location
- Where transfer points are located in partitions or walls, prevent through vision by fitting a fixed blade grille on both faces of partition or wall. Connect cavity wall or partition transfer grille assemblies with ducting sleeve or collar extending between grilles.
- Incorporate fire damper in fire compartment wall transfer grille assembly.

Y50 THERMAL INSULATION

Y50.1000 GENERAL

1010 TEMPERATURE RANGE:

Surface temperature within range -40°C to 230°C.

1020 STANDARDS:

Comply in general with BS 5422, BS 5970 and BS EN ISO 12241. Use the description of terms as BS 3533.

1030 MATERIALS:

Employ materials that comply with BS 476-4, non-combustibility test, or obtain a Class 'O' fire rating to Building Regulations when tested to BS 476-6 and BS 476-7.

Ensure metals and materials that cause galvanic corrosion are not installed in contact.

Do not use galvanized or zinc coated steel jacketing and accessories on austenitic stainless steel and austenitic nickel steel/alloy equipment and piping.

1032 PRE-INSULATED EQUIPMENT:

Where fire and surface spread of flame certificates relate to factory made products, ensure that certificates are still valid where products are incorporated in pre-insulated equipment.

1034 PROTECTION APPLIED IN SITU:

Where fire and surface spread of flame certificates relate to factory made products, ensure that the certificate remains valid when the finish is site applied.

Y50.1035A CLASS A1 EUROPEAN CLASSIFICATION FOR REACTION TO FIRE PERFORMANCE:

Supply insulating materials that comply with Euroclass A1.

Y50.1035B CLASS A2 EUROPEAN CLASSIFICATION FOR REACTION TO FIRE PERFORMANCE:

Supply insulating materials that comply with Euroclass A2.

Y50.1035C CLASS B EUROPEAN CLASSIFICATION FOR REACTION TO FIRE PERFORMANCE:

Supply insulating materials that comply with Euroclass B.

Y50.1035D CLASS C EUROPEAN CLASSIFICATION FOR REACTION TO FIRE PERFORMANCE:

Supply insulating materials that comply with Euroclass C.

Y50.1040# CFC'S AND HCFC'S:

- Ensure all thermal insulants for use in the building services are made using materials with zero ozone depletion potential (CFC and HCFC free).
- The following materials must not be used.
- Polyurethane.
- Urethane foams.
- Extruded polystyrene.
- Phenolic foam.

- Polyisocyanurate foam.
- Polyethylene foam.

Y50.1050A SPREAD OF FLAME:

When completed, ensure surface-finish complies with BS 476-7 Class 1 spread of flame.

Y50.1055A SMOKE EMISSION CHARACTERISTICS:

Supply materials classified as less than 5% smoke obscuration rating when tested in accordance with BS EN ISO 5659-2.

Y50.1080 ELECTRICAL BONDING TERMINAL:

Ensure an electrical bonding terminal suitable for connection of 6mm² maximum conductor is provided where indicated.

Y50.1090 INSPECTION AND TESTING:

Arrange performance test of thermal conductivity on materials selected, carried out at manufacturer's works or at an approved laboratory and in accordance with appropriate British Standard.

Y50.2010 THERMAL CONDUCTIVITY:

Ensure values are in accordance with BS 874 and BS 2972.

Y50.2015A THERMAL PERFORMANCE LIFE EXPECTANCY FOR PLANT DESIGN LIFE:

Ensure the insulation will maintain its thermal performance for a minimum of the plant design life.

Y50.2015B THERMAL PERFORMANCE LIFE EXPECTANCY DETAILS:

Provide manufacturer's details which define the life expectancy of the insulation material.

Y50.2020 RESTRICTIONS ON USE OF MATERIALS:

Protect insulated stainless steel surfaces from the risk of stress corrosion in accordance with the recommendations in BS 5970.

Y50.2030A FOIL FACED MINERAL FIBRE PIPE INSULATION:

Standard - BS 3958-4.

Nominal density - 80 kg/m³ to 120 kg/m³.

Thickness - 20mm to 100mm.

Thermal conductivity

Not exceeding 0.038 W/mK at a mean temperature of 50°C.

Finish - Reinforced aluminium foil with at least 25mm overlap.

Y50.2040A FOIL FACED MINERAL FIBRE RIGID DUCT INSULATION:

Standard - BS 3958-5.

Nominal density - 45 - 48 kg/m³.

Thickness - 25mm to 100mm.

Thermal conductivity - Not exceeding 0.04 W/mK at a mean temperature of 50°C.

Finish - Reinforced aluminium foil.

Y50.2050A FOIL FACED MINERAL FIBRE FLEXIBLE DUCT INSULATION:

Nominal density - 28 kg/m³ to 45 kg/m³.
Thickness - 25mm to 60mm.
Thermal conductivity - Not exceeding 0.04 W/mK at a mean temperature of 50°C.
Finish - Reinforced aluminium foil.

Y50.2080A FLAT DUCTWORK FIRE PROTECTION INSULATION - MITRED JOINTS:

Material - Mineral fibre, slab for flat ducts, with 45° mitred joints.
Nominal density - 165 kg/m³.
Thermal conductivity - Not exceeding 0.035 W/mK at a mean temperature of 10°C.
Facing - Reinforced aluminium foil.

Y50.2080B FLAT DUCTWORK FIRE PROTECTION INSULATION - BUTTED JOINTS:

Material - Mineral fibre, slab for flat ducts, with 90° butted joints.
Nominal density - 165 kg/m³.
Thermal conductivity - Not exceeding 0.035 W/mK at a mean temperature of 10°C.
Facing - Reinforced aluminium foil.

Y50.2080C CIRCULAR DUCTWORK FIRE PROTECTION INSULATION - SECTION:

Material - Mineral fibre
Section for circular duct, 17 to 610 mm diameter.
Nominal density - 165 kg/m³.
Thermal conductivity - Not exceeding 0.035 W/mK at a mean temperature of 10°C.
Facing - Reinforced aluminium foil.

Y50.2080D CIRCULAR DUCTWORK FIRE PROTECTION INSULATION - PSM:

Material - Mineral fibre
PSM for circular duct greater than 406mm diameter.
Nominal density - 165 kg/m³.
Thermal conductivity - Not exceeding 0.035 W/mK at a mean temperature of 10°C.
Facing - Reinforced aluminium foil.

Y50.2170A VAPOUR BARRIER PERMEANCE:

Do not exceed the following permeance values for vapour barriers.
Permeance values
Cold water pipework - 0.05g/sMN.
Chilled water pipework - 0.015g/sMN.
Refrigeration pipework - 0.010g/sMN.

Y50.2190 ADHESIVES:

Comply with the recommendations of clause 8.2 of BS 5970, section 2 for insulation bonding adhesives, lagging adhesives; and facing and film attachment adhesives.

Y50.2200A POLYISOBUTYLENE PROTECTION:

Minimum thickness 0.8mm.

Y50.2200C FLAT ALUMINIUM-ZINC COATED STEEL PROTECTION:

Mild steel sheet continuously hot dipped with 185gm aluminium-zinc coating to BS EN 10326 and BS EN 10327, applied directly to insulating material.
0.4mm thick flat sheet.

Y50.2200E ALUMINIUM SHEETING PROTECTION:

Apply flat (embossed) or profiled aluminium cladding directly to insulating material. 0.56mm thick on pipework; 0.71mm thick on ductwork.

Y50.2200F GALVANIZED SHEET STEEL PROTECTION:

Enclose insulation with 1.6mm thick sheeting around insulation and finish.

Y50.2200J LAMINATED FOIL/FILM PROTECTION:

Enclose insulation with laminated foil/film around insulation and finish.

Y50.2210A ALUMINIUM BANDS REINFORCEMENT:

Aluminium bands at 300mm centres.

Y50.2285 CALCULATION OF INSULATION THICKNESS:

Provide insulation of thickness conforming with the values given in the tables below. These figures are derived from the tables given in BS 5422 and the calculation methods given in BS EN ISO 12241.

Y50.2290 NON-DOMESTIC HOT WATER SERVICE AREAS - MINERAL WOOL:

Environmental insulation thickness for non-domestic hot water service areas to control heat loss.

- Use this table for insulation thickness of copper pipework of the nearest equivalent outside diameter.
- Use this table for insulation thickness of plastic pipework of the nearest equivalent outside diameter.

Y50.2310 NON-DOMESTIC HEATING INSTALLATIONS - MINERAL WOOL:

Environmental insulation thickness for non-domestic heating installations to control heat loss.

- Use this table for insulation thickness of copper pipework of the nearest equivalent outside diameter.

Y50.2330 DOMESTIC CENTRAL HEATING AND HOT WATER SYSTEMS - MINERAL WOOL:

Environmental insulation thickness for domestic central heating installations and hot water systems in potentially unheated areas to control heat loss.

Y50.2350 CHILLED AND COLD WATER SUPPLIES TO PREVENT CONDENSATION - MINERAL WOOL, HIGH EMISSIVITY:

Minimum insulation thickness for chilled and cold water supplies to prevent condensation on a high emissivity outer surface (0,9) with an ambient temperature of 25°C and a relative humidity of 80%.

- Use this table for insulation thickness of copper pipework of the nearest equivalent outside

diameter.

- Use this table for insulation thickness of plastic pipework of the nearest equivalent outside diameter.

Y50.2370 CHILLED AND COLD WATER SUPPLIES TO PREVENT CONDENSATION - MINERAL WOOL, LOW EMISSIVITY:

Minimum insulation thickness for chilled and cold water supplies to prevent condensation on a low emissivity outer surface (0.05) with an ambient temperature of 25°C and a relative humidity of 80%.

- Use this table for insulation thickness of copper pipework of the nearest equivalent outside diameter.
- Use this table for insulation thickness of plastic pipework of the nearest equivalent outside diameter.

Y50.2390 CHILLED WATER SERVICES - MINERAL WOOL:

Environmental insulation thickness for chilled water supplies to control heat gain.

- Use this table for insulation thickness of copper pipework of the nearest equivalent outside diameter.
- Use this table for insulation thickness of plastic pipework of the nearest equivalent outside diameter.

Y50.2420 PROTECTION AGAINST FREEZING - MINERAL WOOL:

- Indoor condition is for ambient air temperature of -6°C, permitted ice formation of 50%.
- Outdoor condition is for ambient air temperature of -10°C, permitted ice formation of 50%.

Y50.2450 ENVIRONMENTAL THICKNESS ON WARM AIR DUCTWORK:

Y50.2460 CONDENSATION CONTROL ON CHILLED AIR DUCTWORK - MINERAL WOOL:

Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature 25°C, relative humidity 80%, dew point temperature 21.3°C.

Y50.3010 GENERAL:

Carry out thermal insulation work using one of the scheduled firms employing skilled craftsmen conversant with class of work.

Do not apply thermal insulation until installation has been fully tested and all joints proved sound.

Ensure all materials are kept dry.

Ensure all pipework surfaces are dry before the installation of thermal insulation.

Insulate each unit separately. Do not enclose adjacent units together.

Ensure there is clearance between insulated pipes.

Application

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.

Finish

Neatly finish joints, corners, edges and overlaps and, where possible, arrange overlaps to fall on blind side. Ensure overlaps are neat and even and parallel to circumferential and longitudinal joints.

Y50.3020 INSTALLATION OF FOIL FACED MINERAL WOOL INSULATION ON PIPEWORK:

Ensure joints are close butted together. Secure overlaps with adhesive or matching class 'O' tape, a minimum of 50mm wide, on both longitudinal and circumferential butt joints. Insulate fittings to same standard as adjacent pipework and use mitred segments where necessary, taped as above.

Where a vapour seal or fibre containment is required tape exposed insulation membrane and return to pipe surface.

Where insulation abuts pipe support inserts that have integral vapour barriers seal using class 'O' foil tape to continue vapour barrier or containment.

Y50.3060 INSTALLATION OF FOIL FACED SEMI-RIGID SLAB INSULATION ON DUCTWORK:

Secure the insulation with adhesive in accordance with manufacturer's recommendations. Use insulation hangers spaced at maximum 300mm centres on the underside of ducts.

Cut slabs so that the top and bottom pieces overlap the sides. Seal joints and pin penetrations using 100mm wide class 'O' aluminium foil tape.

Where cut outs for test holes, etc occur tape over insulation membrane and return to the duct surface. Where insulation abuts duct support inserts that have integral vapour barriers seal using class 'O' foil tape to continue vapour barrier.

Y50.3070 INSTALLATION OF FOIL FACED FLEXIBLE DUCTWORK INSULATION:

Secure the insulation with adhesive in accordance with manufacturer's recommendations. Use insulation hangers spaced at maximum 300mm centres on the underside of rectangular and flat oval ducts.

Seal joints and pin penetrations using 100mm wide class 'O' aluminium foil tape. Where cut outs for test holes, etc occur tape over insulation membrane and return to the duct surface.

Where insulation abuts duct support inserts that have integral vapour barriers seal using class 'O' foil tape to continue vapour barrier.

Y50.3080 INSTALLATION OF FOIL FACED LAMELLA ON DUCTWORK:

Secure the insulation with adhesive in accordance with manufacturer's recommendations. Use insulation hangers spaced at maximum 300mm centres on the underside of rectangular and flat oval ducts.

Seal joints and pin penetrations using 100mm wide class 'O' aluminium foil tape. Where cut outs for test holes, etc occur tape over insulation membrane and return to the duct surface.

Where insulation abuts duct support inserts that have integral vapour barriers seal using class 'O' foil tape to continue vapour barrier.

Y50.3090 INSTALLATION OF INSULATION ON TANKS:

Fit insulation so that two opposite pieces overlap the sides. Bond insulation to the tank with adhesive, applied in accordance with the manufacturer's recommendations. Closely butt together all slabs and seal joints with a matching self-adhesive tape 100mm wide.

Y50.3100 INSTALLATION OF MINERAL WOOL INSULATION ON VESSELS:

Cut Lamella to length to wrap around duct with an additional 75mm to form an overlap. Remove insulation from facing of overlap together with dust, and seal overlap with adhesive in accordance with manufacturer's instructions. Butt joints closely together and seal with matching self-adhesive tape at least 100mm wide.

Y50.3110 INSTALLATION OF PHENOLIC FOAM INSULATION ON VESSELS:

Use pre-formed segments or pre-slotted foil faced insulation to fit the diameter of the vessel, laid with staggered joints. Vapour seal the joint faces. Use jointing compound to fill and seal joints around protrusions.

Do not use wire to secure insulation.

Secure insulation segments up to 3500mm outside insulation diameter with filament tape 38mm wide at 300mm centres.

Secure insulation segments over 3500mm outside insulation diameter with aluminium banding.

Y50.3120 INSTALLATION OF POLYISOBUTYLENE (PIB) PROTECTION:

Wrap pipework and fittings, ductwork or tanks and vessels with PIB sheeting lapped at every joint by at least 50mm. Solvent weld joints and support with banding in accordance with manufacturer's. Arrange joints to shed water and prevent the ingress of water.

Y50.3130A INSTALLATION OF SHEET METAL FINISH ON PIPEWORK:

Secure insulation with metal bands at each end of section and at maximum centres of 450mm. Form sheet metal to fit tightly over the outer circumference of insulation with a longitudinal overlap of at least 40mm. Secure the outer part of overlap with self tapping screws or rivets at centres of not more than 150mm. Not on pipes with vapour barrier; or metal bands of same material.

Ensure circumferential overlaps are at least 50mm, secured with self tapping screws or rivets. Make provision to accommodate expansion and contraction at intervals. Ensure all joints are lapped to shed liquids and seal all joints exposed to weather or spillage. Cover all bends and fittings with matching sheet metal, tailored to fit and sealed as appropriate. Fit pre-insulated, purpose-designed boxes to valves, flanges, etc.

Y50.3140A INSTALLATION OF SHEET METAL FINISH ON DUCTWORK, TANKS AND VESSELS:

Form sheet metal to fit tightly over the insulation with a longitudinal overlap of at least 40mm. Secure the outer part of overlap with self tapping screws or rivets at centres of not more than 150mm. Not on vapour sealed ducts; or metal bands of same material.

Ensure circumferential overlaps are at least 50mm, secured with self tapping screws or rivets. Make provision to accommodate expansion and contraction at intervals. Ensure all joints are lapped to shed liquids and seal all joints exposed to weather or spillage. Cover all bends and fittings with matching sheet metal, tailored to fit and sealed as appropriate.

Y50.3160 INSTALLATION OF ROOFING FELT PROTECTION:

Apply directly to insulating material with an overlap of at least 50mm on all joints, made to shed water. Secure in position with galvanized wire netting, of 1mm x 25mm mesh. Finish with two coats of black bituminous paint.

Y50.3170 INSTALLATION OF ALUMINIUM SHEETING PROTECTION:

Secure lapped joints (at least 40mm) by means of pop rivets at a maximum spacing of 150mm. For cold piping use matching aluminium straps at maximum spacing of 225mm. On piping operating below ambient temperature seal all joints against moisture. For external use make joints shed water

and use sheets with treated surface.

Where 'lockform' seams are used submit proposals for dealing with surfaces curved in three dimensions.

Y50.3180 INSTALLATION OF ALUMINIUM-ZINC COATED STEEL PROTECTION:

Install aluminium-zinc coated steel protection, in accordance with manufacturer's instructions.

Y50.3195 INSTALLATION OF LAMINATED FOIL/FILM PROTECTION:

Install laminated foil/film protection, in accordance with manufacturer's instructions

Ensure all surfaces are dry and clean, free from dust, oil and grease/silicone.

Arrange joints to give a water shed with the lap facing down.

Y50.3200 INSTALLATION OF DUCTWORK FIRE PROTECTION INSULATION:

Install fire protection insulation on ductwork, in accordance with manufacturer's instructions.

Y50.3210 FLANGES AND VALVES:

Cut back to allow removal of bolts and nuts, finish with neat bevel or use end caps.

Where boxes are used fit over insulation on adjacent piping. Ensure operation of valve remains unimpaired with box in place.

Y50.3220 LINERS:

Where load bearing insulation is required use segmental liners suitable for temperature. Fit insulant up to liner and carry facing across the pipe ring.

Y50.3230A INSTALLATION WHERE INSULATION IS CARRIED THROUGH PIPELINE SUPPORT:

For load bearing insulation, carry through insulation and finish.

For non-load bearing insulation on hot pipework close butt to a section of load bearing finished material 100mm long.

For non-load bearing insulation on cold pipework, close butt to high density phenolic foam pipe supports. Ensure the vapour barrier is maintained.

Y50.3240 INSTALLATION WHERE INSULATION IS NOT CARRIED THROUGH PIPELINE OR DUCTLINE SUPPORT:

Provide end caps to match applied finish.

Y50.3250 INSTALLATION WHERE INSULATION IS CARRIED THROUGH DUCTWORK SUPPORT:

Provide insulation between duct and support using high density phenolic foam strips. Butt insulation to spacer and carry over finish by 40mm and tape joint. Provide a sheet metal protecting sleeve.

Y50.3260 LIQUID VAPOUR BARRIERS:

Apply vapour seal solution evenly by brush in accordance with manufacturer's instructions; use solution which dries to a colour distinctive from insulating material.

Y50.3270 INTEGRITY OF VAPOUR BARRIERS:

Where a vapour barrier is indicated ensure its integrity throughout. Repair immediately any damage to vapour barriers and where such barriers have been applied off site, repair to manufacturer's instructions. Where aluminium sheeting is used for protection, submit proposals for securing sheeting without impairing the integrity of the vapour seal for approval.

Y51 TESTING AND COMMISSIONING OF MECHANICAL SERVICES

Y51.1000 GENERAL

Y51.2010 PRESSURE TESTING - GENERAL:

Comply with procedures given in HVCA TR/6 Guide to Good Practice for Site Pressure Testing of Pipework. Ensure safety precautions detailed in HSE Guidance Note GS4 Safety in Pressure Testing are adopted.

Provide a blanked connection to accommodate a check gauge in addition to the accurate gauge fitted to section under test.

Test concealed or buried pipework before any permanent covering is applied.
Advise appropriate personnel, in advance, of the time pressure tests may be witnessed.

Y51.2020 PRESSURE TESTING - WATER CIRCULATING AND SUPPLY SYSTEMS AND STEAM AND CONDENSE LINES:

Carry out Hydraulic Pressure Testing as described in HVCA TR/6 Guide to good Practice for Site Pressure Testing of Pipework. Test section by section for one hour, as the work proceeds and prior to application of thermal insulation as follows

Operating gauge pressure less than 3.5 bar, test gauge one and a half times operating pressure.

Operating gauge pressure 3.5 - 7.0 bar, test gauge pressure twice operating pressure.

Operating gauge pressure greater than 7.0 bar, test gauge pressure 14.0 bar or one and a half times operating pressure, whichever is the greater.

Y51.2030B PRESSURE TESTING - UNDERGROUND PIPEWORK, 4 HOURS:

Test to a gauge pressure twice the operating pressure or 7 bar, whichever the greater, for 4 hours.

Y51.2040 PRESSURE TESTING - WATER MAINS:

Test to Local Authority requirements. Ensure the provisions laid down in HVCA TR/6 Guide to Good Practice for Site Pressure Testing of Pipework for testing underground CWS mains are carried out.

Y51.2060A PRESSURE TESTING - GAS PIPEWORK - HVCA GUIDE:

Carry out a pneumatic leak test followed by a pneumatic pressure test as described in HVCA Guide to Good Practice for Site Pressure Testing of Pipework TR6.

Y51.2060B PRESSURE TESTING - GAS PIPEWORK TO BS EN 12327:

Pressure test gas supply pipework in accordance with BS EN 12327.

Y51.2060C PRESSURE TESTING - GAS PIPEWORK TO IGE/UP/1:

Comply with IGE/UP/1 Strength and tightness testing and direct purging of industrial and commercial gas installations.

Y51.2060D PRESSURE TESTING - GAS PIPEWORK TO IGE/UP/1A:

Comply with IGE/UP/1A Strength and tightness testing and direct purging of small low pressure industrial and commercial Natural Gas installations.

Y51.2080 PRESSURE TESTING - SOIL, WASTE, VENTILATION, ANTI-SYPHON AND RAINWATER PIPEWORK:

Test section by section as the work proceeds and subsequently on completion with all sanitary fittings fixed and working. Submit systems to two separate tests, Air test and Hydraulic Performance test in accordance with BS EN 12056-2.

Y51.2090 PRESSURE TESTING - UNDERSLAB DRAINAGE:

Test section by section as the work proceeds and subsequently after completion of backfilling and compaction to the satisfaction of the Engineers and the local Authority.
Individually test sections which will be permanently embedded in the structure or concealed in ducts or voids.

Submit sections to two separate tests Water test and Test for Straightness and Obstruction in accordance with BS EN 752.

Y51.2100 VACUUM TESTING:

Test vacuum mains in accordance with HVCA TR/6 Guide to Good Practice for Site Pressure Testing of Pipework, Table 1.

Y51.2110 TESTING RECORDS:

- Distribution
- Keep a systematic record of tests. Distribute records as indicated.

Y51.3010 CLEANING DUCTWORK SYSTEMS:

Clean ductwork before plant is first run, using access openings in ductwork.

Y51.3020 COMMISSIONING CODES:

Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the BSRIA Application Guides for water systems and air systems to achieve the standards set in the CIBSE Commissioning Codes.

Y51.3030A COMMISSIONING WATER DISTRIBUTION SYSTEMS INCLUDING BSRIA PRE-COMMISSIONING CHECKLIST:

Preliminary checks

Carry out checks and procedures as detailed in CIBSE Commissioning Code W, Section W1. Ensure system is statically complete as defined in section B4 of BSRIA Application Guide 2/89 Commissioning of water systems in buildings.

Use pre-commissioning checklist from BSRIA Application guide 2/89.

Setting to work and regulation

Set to work and regulate water distribution systems in accordance with CIBSE Commissioning Code W, Sections W2 and W3, and sections C3 and C4 in BSRIA Application Guide 2/89.

Measurement

Use instruments for measurement detailed in BSRIA Application Guide 2/89.

Y51.3040A COMMISSIONING AIR DISTRIBUTION SYSTEMS INCLUDING BSRIA PRE-COMMISSIONING CHECKLIST:

Preliminary checks

Carry out checks and procedures as detailed in CIBSE Commissioning Code A, Section A1. Ensure system is statically complete as defined in section B4 of BSRIA Application Guide 3/89 Commissioning of air systems in buildings.

Use pre-commissioning checklist in BSRIA Application guide 3/89.

Setting to work and regulation

Set to work and regulate air distribution systems in accordance with CIBSE Commissioning Code A, Section A2, and sections C3, C4 and C5 in BSRIA Application Guide 3/89.

Measurement of air flow

Use instruments for measurement and methods of measurement detailed in BSRIA Application Guide 3/89 and CIBSE commissioning guide, section A3.

Y51.3050 COMMISSIONING BOILER PLANT:

Follow the procedures laid down for carrying out Preliminary Checks and Start Operation in accordance with CIBSE Commissioning Code B and manufacturers instructions.

Apparatus and Instruments

Use Apparatus and Instruments detailed in CIBSE Commissioning Code B, Appendix B3.1. Apply tolerances defined in Appendix B3.2.

Y51.3055 COMMISSIONING OF GAS PLANT AND SYSTEMS:

Commission gas fired plant on industrial and commercial premises in accordance with IGE/UP/4. Commission gas supply systems in accordance with BS EN 12327.

Y51.3070 COMMISSIONING AUTOMATIC CONTROL SYSTEMS:

Carry out commissioning of Automatic Control Systems in accordance with Manual prepared by the controls equipment manufacturer. Carry out the Checking and Setting-Up procedure detailed in the CIBSE Commissioning Code C, Section C1.

Measurement

Carry out measurements in accordance with CIBSE Commissioning Code C, Appendix C2.1.

Y51.3080 COMMISSIONING PLANT ITEMS:

Comply with the manufacturer's recommendations for setting to work.

Y51.3090A INSTRUMENTS AND GAUGES:

Ensure instruments are correctly calibrated. Record details of instruments on record sheets.
Submit evidence of correct calibration of instruments to be used in connection with commissioning and testing.

Y51.3100A AIR SYSTEMS COMMISSIONING RECORDS TO BSRIA AG 3/89.3:

Keep a systematic record of commissioning results and distribute as indicated.

For air systems

Use record sheets as described in BSRIA Application Guide 3/89.3 Commissioning air systems in buildings.

Y51.3100B WATER SYSTEMS COMMISSIONING RECORDS TO BSRIA AG 2/89.3:

Keep a systematic record of commissioning results and distribute as indicated.

For water systems

Use record sheets as detailed in BSRIA Application Guide 2/89.3 Commissioning water systems in buildings.

Y51.3110 BMS COMMISSIONING - CONTROL SYSTEM SPECIFICATION DETAILS REQUIRED FOR COMMISSIONING:

Ensure that the following information is supplied to the commissioning engineer:

A network schematic providing a record of the overall control system architecture.

Schematics of the systems to be controlled indicating the location of sensors and actuators.
A written description of the configured control strategies.

Control strategy logic diagrams in the form of logic flow charts.

Set-points and other control settings such as initial default parameters for control loops relating to the control strategies.

Criteria relating to control accuracy and stability.

A points list including digital inputs/outputs and analogue inputs/outputs.

Control panel drawings.

BMS operator workstation graphics and associated point data displaying monitored conditions.

Trend logging archiving requirements and alarm routing.

The scope of operational and specified functionality of management software, e.g. utility monitoring and targeting software.
Functional requirements of any occupant interfaces.

Details of any hard-wired interfaces from, or to, other control devices.

Functionality and scope of data to be transferred over any gateway for use as part of an integrated system.

Functional profiles for any direct interoperability integration.

Ensure that the following is included in the BMS commissioning specification:-

A clear description of the division of responsibility between the various parties.

Off-site and on-site pre-commissioning procedures.

On-site commissioning procedures.

Requirements for assistance to air and water balancing testing (eg opening and closing control valves) and other plant tests where the controls need to be overridden.

A requirement for any point-by-point verification of correct operation.

Requirements for evaluation of control loop performance/loop tuning.

Requirements for the BMS operator workstation for assistance in the commissioning of plant.

Arrangement for the management of delays.

Phased completion requirements.

Requirements for demonstration/witness testing on the basis of a percentage of points or on a point-by-point basis. Ensure that the witnessing requirement includes the identification of those responsible.

Requirement for software/configuration data back-up.

Requirement for, and involvement in, any complete system and sub-system performance testing.

Requirement for system documentation.

Requirement for operator training requirements.

Requirement for post occupancy checks.

Y51.3120 BMS COMMISSIONING - PRE-COMMISSIONING:

Ensure that as much pre-commissioning work as possible is performed off-site:

Ensure that the following is followed:

Table 15 Pre-commissioning requirements

Ensure that a record of all settings, set-points and offsets are maintained throughout the pre-commissioning period.

Ensure that all final physical adjustments to the field devices are indelibly marked.

Ensure that all packaged plant interfaced with the BMS is fully tested and commissioned by the manufacturer or installer.

Ensure that the BMS is pre-commissioned in accordance with the following requirements of CIBSE Code C (Commissioning of automatic control systems).

Table 16 CIBSE Code C automatic control systems pre-commissioning requirements

Y51.3130A BMS COMMISSIONING - PLANT READY FOR CONTROL SYSTEM COMMISSIONING:

Confirm that the following plant commissioning has been performed before commencing the final BMS commissioning:

Water systems

The system is cleaned and flushed to remove any debris.

All regulating, isolating and control valves in place and operating correctly.

That all flow measuring devices are in place and in the correct location for accurate measurement (including pressure tapings).

The system is vented.

That the proportional balancing is completed to obtain the branch flow rates in the correct ratio to each other (or through the use of and setting of self-balancing valves).

That the pump flow rate has been adjusted to provide the specified flow rate.

Air systems

Debris has been removed from the air distribution system.

That dampers are in the correct location and fully functional.

That fire/smoke dampers open.

Test holes have been drilled and sealed with removable plugs.

That in-situ flow measuring devices have been installed.

Ductwork air leakage testing has been performed (if specified).

Completion of proportional balancing of regulating dampers so that terminals share the air flow in the correct proportions.

Regulation of the fan(s) to provide the specified flow rate.

Packaged equipment

Ensure that plant and controls have been fully commissioned and are functional, ready for integration with other plant/systems.

That control equipment inputs/outputs are in the specified format for connection to the main control system.

Confirm that the plant is commissioned in accordance with:

Air distribution systems, CIBSE Code A

Boiler plant, CIBSE Code B

Refrigeration systems, CIBSE Code R

Water distribution systems, CIBSE Code W

Commissioning water systems. Application principles, AG 89.3/2, BSRIA

Commissioning air systems. Application systems for buildings, AG 89.3/3, BSRIA.

Y51.3140 BMS COMMISSIONING - CONTROL SYSTEM REQUIREMENTS FOR PLANT COMMISSIONING:

Ensure that the BMS is pre-commissioned to allow the building services plant to operate under

"manual" running conditions.

Ensure that the control valves can be manually set in their fully open position to allow the balancing of pipework flows.

Ensure that dampers can be manually opened to allow the commissioning of air systems.

Y51.3150 BMS COMMISSIONING:

Ensure that the BMS is commissioned in accordance with the following requirements of CIBSE Code (Commissioning of automatic control systems).

Control strategy checking - C6.2

Checking procedures for basic control functions - C6.3

Lighting controls - C6.4

Operator workstations - C6.5

Occupant interfaces - C6.6

Communication networks - C6.7

Integrated systems - gateways - C6.8

Integrated systems - direct interoperability - C6.9

Integration with fire detection systems - C6.10

Security systems - C6.11

Interruption of electrical power supplies - C6.12

Valves - C7.1

Dampers - C7.2

Fans - single speed - C7.3

Fans - variable speed - C7.4

Pumps - C7.5

Y51.4010 SYSTEM PERFORMANCE TESTING:

Demonstrate the performance of installations including single, standby, multi-duty plants and systems, and of plants specified for future use.

Y51.4040B SANITARY SYSTEMS:

Comply with performance tests given in BS EN 12056.

Y51.4040E HYDRAULIC SYSTEMS:

Requirements

Comply with requirements as indicated.

Y51.4050 PERFORMANCE TEST RECORDS:

- Distribution
- Keep a systematic record of tests. Distribute records as indicated.

Y54 IDENTIFICATION – MECHANICAL

Y54.1000 GENERAL

1010 REQUIREMENTS:

Identify all pipework, ductwork, equipment, appliances and ancillaries comprising the various systems.

1020 NEW SYSTEMS:

Comprehensively label and colour code throughout works as indicated.

1030 EXISTING SYSTEMS:

Where identification details are incompatible with those required for new systems, obtain approval to mode of cross referencing.

1040 COLOURS:

As indicated to colour ranges given in BS 381C and BS 4800.

Y54.2010 PIPEWORK IDENTIFICATION:

Standards - Colour code and label to BS 1710.

Primary Identification

Apply colour bands, 300mm wide, to each pipe at least

Once in every room or enclosed area.

At intervals not exceeding fifteen metres.

At every junction.

At every valve.

At every inspection and access position into service shafts, false ceilings, bulkheads etc.

Secondary Identification

Apply colour bands, 50mm wide, and superimpose a legend identifying circuit, direction of fluid or gas flow, nominal pipe bore and, where appropriate, fluid or gas pressure.

Legends

Apply to colour bands by transfers of an approved type.

Y54.2020 DUCTWORK IDENTIFICATION:

Standards

Generally colour code and label to HVCA Specification DW 144 (Appendix B).

Primary Identification

Apply colour bands, 300mm wide, to each duct at least

Once in every room or enclosed area.

At intervals not exceeding fifteen metres.

At every junction.

At every damper.

At every inspection and access position into service shafts, false ceilings, bulkheads etc.

Secondary Identification

For ducts with longest side or diameter up to and including 225mm. Paint colour bands 50mm wide and superimpose legends.

For ducts with longest side or diameter over 225mm. Paint or apply transfers to identification triangles, or triangular plates. Superimpose or incorporate legends.

Triangular Plates

Attach to buckle bands or stool pieces and fix to ducting, with apex indicating direction of airflow. Submit details of plates and fixings for approval before painting and marking. Use equilateral triangle of side 150mm minimum.

Legends

Apply transfers of an approved type to colour bands or triangles or triangular plates. Identify floor and space served, associated equipment reference and direction of airflow.

Y54.2030B PLANT AND EQUIPMENT IDENTIFICATION, LAMINATED PLATES:

Standards

Identify each item of equipment by name and, where appropriate, by agreed reference characters. Provide colour identification as called for in work sections and, in all cases, colour fire fighting equipment red.

Identification Colours

Use primary and secondary identification colours of associated system.

Plates

Use rectangular metal or laminated plastic, securely fixed to each item of equipment.

Lettering

Laminated plates, multi-coloured with outer layer removed for lettering.

Legends

Engrave plates with an approved text. Incorporate operating duty of equipment where this is not incorporated in other labelling.

Y54.2035 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Graphical symbols for use on equipment to be created and applied in accordance with BS EN 80416-1, BS EN 80416-2, BS EN 80416-3.

Y54.2040 VALVE AND COCK IDENTIFICATION:

Standards

Identify each valve, cock, stop valve, air vent, drain cock etc. with disc engraved with numerical reference. Except where exposed in occupied areas.

Identification Colours

Use primary and secondary identification colours of associated system for painted or self colour discs.

Discs

Securely attach metal or laminated plastic discs, minimum diameter 35mm, to each item.

Legends

Engrave discs with permanent characters, minimum height 6mm.

Incorporate in operating instructions relating to regulating valves and flow measuring equipment, details of flow rate, pressure differential and setting, as appropriate.

Y54.2070 AIR VOLUME REGULATING AND CONTROL DAMPER IDENTIFICATION:

Standards

Identify each regulating and control damper. Except where exposed in occupied areas. On ductwork dampers, clearly indicate commissioning set point.

Identification colours

Use primary and secondary identification colours of associated system for painted or self colour discs.

Discs

Securely attach metal or laminated plastic discs, minimum diameter 35mm, to each item.

Legends

Engrave discs with permanent characters, minimum height 6mm.

Y54.2080 INSTRUMENT IDENTIFICATION:

Standards

Identify each instrument by name and, where appropriate, by agreed reference characters.

Plates

Use rectangular metal or laminated plastic, securely fixed to each instrument.

Legends

Engrave plates with an approved text.

Y54.2090 DANGER AND WARNING NOTICES:

Hazardous Systems

Colour code and label hazardous systems and equipment to requirements of Health and Safety Executive Guidance Notes.

Y54.2100A SYSTEM IDENTIFICATION INSTALLATION CHARTS, PERSPEX GLAZED FRAME:

System Schematics

Supply and fix a referenced schematic diagram (or diagrams) of all systems as installed, including equipment and ancillary schedules. Show scheduled information on diagram.
Identify all items by appropriate reference characters.

Control Schematics

Supply and fix a referenced schematic diagram (or diagrams) of all control systems as installed, including equipment and ancillary schedules. Show scheduled information on diagram.
Identify all items by appropriate reference characters.

Location

Fix in each boiler house, calorifier room, plant room or equipment room.

Finish

Perspex sheet glazing with surrounding frame and mounting attachments.

Y60 CONDUIT AND TRUNKING

Y60.1000 GENERAL

1010 STANDARDS:

Provide conduit and cable trunking in accordance with the relevant British Standards and in particular the requirements of BS 7671 Requirements for Electrical Installations (The IEE Wiring Regulations).

Y60.2010B CONDUIT SYSTEMS METAL RIGID CLASS 4:

- Fittings
 - 2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:
 - Use couplers to match conduit grade and finish.
 - Use solid couplers to join lengths of conduit.
 - Conduit fittings and adaptable boxes
 - Material - Malleable iron adaptable boxes.
 - Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
 - Ensure fittings are same class and finish as associated conduit system.
 - Supply covers for circular or adaptable boxes in the same material and finish as boxes.
 - Use steel dome or cheese headed screws to secure covers for Class 2 finish.
 - Use brass dome or cheese headed screws to secure covers for Class 4 finish.
 - Limit number of entry holes within loop-in boxes to four.
 - Adaptable box, minimum size - 100mm x 100mm x 50mm.
 - Connections
 - Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use solid couplers.
 - Conduit fixing saddles - Spacer bar.
 - Plugs - Hexagonal malleable iron.
 - Locknuts - Hexagonal steel.
 - 2020B RIGID CONDUIT SYSTEM - METALLIC CONDUIT AS DRAWINGS/SCHEDULES:
 - Use couplers to match conduit grade and finish.
 - Use solid couplers to join lengths of conduit unless inspection couplers are shown on the drawings or schedules.
 - Conduit fittings and adaptable boxes
 - Material - Malleable iron adaptable boxes.
 - Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
 - Ensure fittings are same class and finish as associated conduit system.
 - Supply covers for circular or adaptable boxes in the same material and finish as boxes.
 - Use steel dome or cheese headed screws to secure covers for Class 2 finish.
 - Use brass dome or cheese headed screws to secure covers for Class 4 finish.
 - Limit number of entry holes within loop-in boxes to four.
 - Adaptable box, minimum size - 100 mm x 100 mm x 50 mm.
 - Connections
 - Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use solid couplers.
 - Conduit fixing saddles - Spacer bar.
 - Plugs - Hexagonal malleable iron.
 - Locknuts - Hexagonal steel.

Provide conduit systems to BS EN 61386. Use conduit of each type from one manufacturer.

Material - Metal, steel.
Method of connection - Threadable.
Suitability for bending - Rigid, BS EN 61386-21.
Electrical characteristics - with electrical continuity.
Resistance against corrosive or polluting substances
 Conduits with same protection outside and inside
 High protection - Hot dip zinc coating. BS EN 61386-1 Table 10 Class 4.

Y60.2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit.
Conduit fittings and adaptable boxes
 Material - Malleable iron adaptable boxes.
 Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
 Ensure fittings are same class and finish as associated conduit system.
 Supply covers for circular or adaptable boxes in the same material and finish as boxes.
 Use steel dome or cheese headed screws to secure covers for Class 2 finish.
 Use brass dome or cheese headed screws to secure covers for Class 4 finish.
 Limit number of entry holes within loop-in boxes to four.
 Adaptable box, minimum size - 100mm x 100mm x 50mm.
Connections
 Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.

Y60.2080A CABLE TRUNKING AND FITTINGS:

Comply with BS 4678. Use trunking of each type from one manufacturer.

Y60.2090B METAL SURFACE TRUNKING - ZINC FINISH:

Material
 Steel trunking to BS 4678-1. Supply partitions and covers same material as trunking.
Gauge of metal - Table 1 BS 4678.
Trunking type
 Standard cable trunking with compartments.
Style
 Use trunking manufactured with inward return edge flanges and fitted with flange couplers which ensure that when the cover is removed a minimum of 80% of the nominal trunking or compartment width is available for access.
Protection to BS 4678-1
 Electroplated zinc having a minimum thickness of zinc coating of 0.0012mm inside and outside.
 Hot dip zinc coated steel to BS EN 10326, BS EN 10327 or BS EN 10143.
Finish - Manufacturer's standard, all surfaces.
Colour - Self Colour or Manufacturer's standard.
Fixings
 Use purpose made brackets to fix to structural steel or suspension rods.
 Provide external fixing lugs where specified protection for the installation is IP44 or greater.
Fittings
 Use bends, tees and angles of similar gauge, type and finish as trunking body and supplied by same manufacturer.
Partitions and Covers
 Ensure partitions are electrically continuous with the body of the trunking or provide a connector for a circuit protective conductor.
 Ensure gap between partitions and lids maintains segregation of circuits.

Provide individual mounting plates for each accessory mounted on trunking covers.

Material - Same material as trunking.

Joins

Use purpose made jointing pieces fixed with screws into captive nuts. Ensure screws do not protrude through the nuts.

Ensure rigidity of trunking is maintained across joint.

Ensure external dimensions of trunking are maintained and not reduced by more than 4% across joints between trunking lengths and/or fittings.

Use purpose made fittings of the same manufacture where trunking connects to switchgear and distribution boards.

Provide flanges for connection of flush floor trunking to vertical trunking to maintain the cross sectional area of compartments with 50 mm minimum radius.

Maintain electrical continuity at each joint by a copperlink, (tinned copper for galvanized trunking), fixed on outside of trunking, secured by screws, nuts and shakeproof washers. Screws must not project through the nut. Make provision for continuity to be achieved without need to remove paint from ferrous metal where trunking has a painted finish.

Screws, Nuts, Washers

Do not use self tapping screws. Use cheese or round head screws except where provision is made for the use of counter-sunk heads.

Material

Use steel zinc coated

- BS 3382 Parts 1 and 2.

Cable supports

Provide horizontal trunking with removable cable retainers or bridges to retain cables in situ.

Provide vertical trunking with pin racks to support cables at 3000 mm maximum spacing.

Use insulated pins or insulation sleeved pins on pin racks.

Y60.2130A PVC SERVICE TRUNKING - GENERAL PURPOSE:

Trunking to BS 4678-4

Mechanical properties, trunking for medium mechanical stress.

Temperature tolerances - BS 4678-4, Table 1.

Electrical characteristics

Without electrical insulating characteristics.

Resistance against ingress of solid objects

Protected against solid objects greater than 1.0mm (IP4X).

Resistance to ingress of water

Protected against dripping water (IPX2).

Resistance against corrosive or polluting substances

Medium protection.

Fittings

Use fittings from same manufacturer as trunking. Use 'snap-on' covers. Use trunking fittings and accessories suitable for jointing by solvent welding.

Use proprietary cable retaining clips at 500 mm maximum intervals on trunking that exceeds 1.8 m in length. Where junctions occur ensure first clip is not more than 300 mm from junctions.

Y60.2150A SEPARATE OR MULTI-COMPARTMENT TRUNKING:

Use separate trunking or multi-compartment trunking for segregation of services. Ensure steel partitions have a provision for connecting a circuit protective conductor.

Provide separation of wiring for circuits as required by BS 7671.

Y60.2170 SUPPORTS AND FIXINGS:

Provide proprietary suspension systems comprising channel sections with return lips and compatible fixing accessories made of material to BS EN 10162, BS EN 10210 and/or slotted angles to BS 4345. Ensure support components for Class 4 conduit have the same finishing method as the conduit carried out after manufacture. Ensure components in direct contact with conduit match profile of conduit.

Ensure all steel components such as studding, bolts and steel screws, bolts, nuts and washers are either cadmium plated and passivated or zinc electroplated to BS 3382 after manufacture. Do not use metal fixing components likely to deteriorate and/or cause damage through electrolytic action.

Y60.3010A GENERAL:

Ensure entire system is electrically and/or mechanically continuous, to BS 7671.

Fire barriers

Comply with the requirements of BS 7671 wherever the conduit or trunking passes through the perimeter of a fire compartment (wall, floor or ceiling).

Appearance

Arrange conduit, trunking and ducting to present neat appearance, parallel with other service runs and lines of building construction, except where in screed or in-situ concrete. Ensure plumb vertical runs.

Cable installation

Install cable in conduit, trunking or equipment enclosures only when completely erected throughout its length.

Do not use framework of partitions or similar unless indicated.

Building expansion and settlement

Make provision in conduit and trunking at expansion and settlement joints to allow for movement of building structure. Provide circular through or adaptable boxes no more than 300 mm either side of expansion or settlement joints for conduit crossing.

Join boxes with flexible steel conduit type C or conduits arranged to form a telescopic joint and cover overall with PVC sleeve to provide minimum degree of protection of IP44 or purpose made telescopic joint protected by a PVC sleeve to at least IP44.

Quality

Cut conduit clean and square with axis. Remove any burrs prior to erection.

Site form 90° in conduit wherever practical or use circular or adaptable boxes.

Construct bends and sets cold with a bending machine. Do not apply heat when forming sets or bends.

Use bending tools complying with British Standards appropriate to conduit material.

Ensure no indentation or reduction in cross sectional area occurs during installation.

Use correct tools to assemble conduit. Ensure no toolmarks or damage to components occurs.

Y60.3020 LAYOUT:

Ensure the maximum circuit lengths and groupings of cables indicated are not exceeded.

Conduit sizing

Where dimensions are not indicated select trunking and conduit sizes in accordance with Appendix A of Guidance Note I Selection and Erection published by the IEE (now IET).

Y60.3030 SPACING:

Install conduit, trunking and equipment clear of other services. Measure distance from external surface of any thermal insulation. Notify instances where minimum clearance cannot be achieved and bond items concerned. Minimum general spacings between conduits, trunking, equipment and

insulated steam services - 300 mm.

other services excluding steam - 150 mm.

above central heating radiators - 1000 mm.

ensure separation is in accordance with Appendix K of Guidance Note I Selection and Erection published by the IEE (now IET).

Y60.3040 CONDENSATION PREVENTION:

Install conduit and trunking systems to ensure internal condensation does not affect operation of associated circuits. Provide drainage points in accordance with BS 7671.

Where conduit passes through external wall between two areas of different ambient temperatures or in other locations likely to cause condensation, install a conduit or adaptable box. After wiring fill box with inert, permanently plastic compound with high insulation value.

Y60.3050A PROTECTION AND REPAIR OF STEEL COMPONENTS:

Paint joints of conduit and minor damages to finish of conduit and trunking immediately after erection or after damage occurs.

Use paint compatible with finish as follows

Galvanized finish, use two coats zinc rich paint.

Black enamelled finish, use two coats of good quality, air drying, black enamel paint.

Remove grease, oil, dirt and rust before applying protective paint.

Notify serious damage and repair or replace as instructed.

Y60.3060 EQUIPMENT CONNECTIONS:

Where surface mounted equipment is installed in conjunction with concealed conduit work, terminate concealed conduit at flush mounted conduit or adaptable box. Drill back of equipment, bush for back entry and mount equipment to conceal back box.

Connect to fixed equipment via conduit box located adjacent to termination point, using either solid or flexible conduit as indicated for final connection to equipment terminations.

Use conduit box as cable change point to facilitate changed wiring locally to adjacent equipment.

Connect trunking to equipment by specially fabricated connectors or by couplers and externally screwed brass bushes.

Y60.3070 CLEANING BEFORE WIRING:

Clean inside of conduits and trunking with swabs immediately before wiring.

Inspect all components and remove any foreign matter, fit temporary plugs to open ends of conduit and trunking to prevent ingress of water and solid material.

Y60.3080A WIRING:

Comply with BS 7671 when wiring installations.

Segregate circuits as indicated.

Ensure draw wires are left within empty conduits for use of specialist installers. Use draw wires comprising nylon tapes with fitted eyelets.

For concealed conduit ensure system is installed to enable re-wiring to be carried out from boxes for fittings or accessories only. Draw-in boxes will only be permitted with prior permission in writing.

Do not use tallow or any other substances to facilitate drawing-in of cables.

Y60.3090 BUILDERSWORK:

Ensure conduit is not concealed until work has been inspected and approved.

Obtain permission before horizontally chasing walls.

Ensure that conduit and fittings buried in concrete or behind plaster are protected against corrosion or electrolytic action prior to rendering.

Ensure conduit concealed in wall chases is covered by plaster and/or rendering to minimum depth of 12 mm.

Y60.4010 DRAW-IN BOXES:

Provide draw-in boxes in conduit at maximum intervals of 10 metres or after bends and/or sets totalling 180 degrees.

Y60.4020 INSTALLATION OF CAST IN OR BURIED CONDUIT:

Ensure cast-in conduits are firmly secured to reinforcing steelwork and that accessory and/or conduit boxes are secured so they do not move during subsequent building operations.

Ensure there is no blockage immediately shuttering is removed.

Check there is no mechanical damage to conduit in floor screed prior to screeding. Fix securely before screed is poured. Provide temporary protection to conduits until screeds are laid.

Ensure minimum amount of cross-overs occur dependent upon screed depth. Do not install draw boxes in floors.

Do not install conduits

- in screeds in areas indicated.
- within site blinding.
- in main structural slabs unless prior permission in writing is obtained.

Y60.4030 CONDUIT BOXES:

Ensure that wherever conduit boxes are cast in the face of the box is flush with the face of the concrete or plaster. Fit circular conduit boxes with extension rings to ensure a flush face with plaster or concrete or where terminal blocks are to be accommodated.

Ensure fixing holes are countersunk where material thickness allows or use round head screws to prevent damage to cables and remove burrs before cables are drawn in.

Use a minimum of two screw fixing for standard circular conduit boxes and four screws for large conduit boxes and adaptable boxes up to 150 mm x 100 mm.

Use back outlet boxes where surface conduits pass through walls, to outside accessories or lighting points.

Secure switch boxes and socket boxes using countersunk steel screws where provision is made for them or if not use round head screws. Use plug inserts and finally grout in position prior to plastering or screeding.

Y60.4040 FIXING CONDUIT:

Support conduit in accordance with Appendix I of Guidance Note I Selection and Erection published by the IEE (now IET).

Ensure conduit is not under mechanical stress. Fix conduit boxes independently of conduit. Make allowance for any additional mechanical loading supported by conduit boxes.

Where protection is specified as IP44 or greater ensure fixings of conduit boxes are suitable to maintain degree of protection.

Use following methods of fixing conduit:-

LOCATION	TYPE OF FIXING
Floor screeds.	Saddles or crampets.
Buried in plaster or render.	Crampets or saddles.
Above false ceilings.	Saddles.
Surface.	Saddles.

Y60.4050 FLEXIBLE AND PLIABLE CONDUIT:

Use flexible conduit for final connections to motors, other equipment subject to vibration or adjustment and to thermostats, motorised valves and similar items mounted in pipelines or ducts.

Use sufficient length between equipment and circular through box at end of conduit run (minimum 450 mm) to allow necessary full range of withdrawal, adjustment or movement.

Use solid type adapters to terminate flexible conduit.

Use PVC covered flexible conduit where installed externally, exposed to weather or in any position where ingress of moisture or condensation may occur.

Y60.4060 SCREWED STEEL CONDUIT:

Use materials clean and free from defects, rust, scale and oil. Obtain prior permission in writing for use of materials subject to remedial work before erection. Repair any damage caused by threading, bending or erection by painting with zinc rich paint before any rust occurs.

Ensure length of thread on conduit matches that in conduit couplers, fittings or equipment with no thread exposed after erection except at running couplers.

Ensure conduits butt inside couplers.

Use lubricant when cutting threads.

Use minimum number of running couplings

For running couplings in Class 2 conduit, use coupler and locknut. Paint exposed thread with zinc rich paint.

For running couplings in Class 4 conduit, use three piece conduit unions.

Y60.4070A NON-METALLIC CONDUIT:

Comply with manufacturer's instructions for bending, setting and jointing of conduit. Use plastic conduit only where indicated.

Do not install conduit when ambient working temperature is or will be below -5°C or above 60°C.

Use solvents recommended by manufacturer of conduit when using solvent welded joints and ensure spigots enter full depth of sockets. Hold joints rigid and in position until weld sets. Remove excess solvent before surface damage occurs.

Use slip joints as necessary, but not exceeding 6 metres on straight lengths to allow for expansion and contraction over temperature variation as indicated.

Use semi-mastic adhesive where expansion joints are formed.

Where fittings do not have shaped or smooth conduit entries connect with male bushes and external couplings.

Ensure special care is taken to prevent mechanical damage or warping to conduit where mechanical loads are imposed on conduit system, eg. lighting fittings.

Y60.5010 MANUFACTURE OF TRUNKING:

Take measurements on site before producing drawings for manufacture of trunking.

Y60.5020 ACCESS:

Arrange trunking to allow access to wiring. Locate covers on top or sides of trunking if practicable.

Arrange access so covers are on a continuous face and cables can be laid in throughout the length of the trunking. Notify where either condition cannot be achieved.

Y60.5030A FIXING TRUNKING:

Ensure trunking is independently fixed and supported from building fabric. Obtain approval for proposed fixings/supports.

Support trunking in accordance with the manufacturers requirements and/or Guidance Note 1 Selection and Erection published by the IEE now (IET).

Use two fixings minimum per standard length.

Y60.5040A STEEL TRUNKING:

Install steel trunking in accordance with the manufacturers requirements and those of BS 7671.

Use trunking to avoid multiple parallel conduit runs, subject to approval.

Cut trunking clean and square with axis, prepare ends and remove burrs and sharp edges. Ensure inside of trunking is free from anything liable to damage cables either during installation or after covers are fitted.

When trunking is held in a vice, ensure surfaces remain undamaged and components are not warped.

Avoid tool marking or damage to trunking system components.

Do not site fabricate trunking tees, bends, flanges and other accessories. Use only factory made accessories.

Form circular holes over 6 mm diameter in trunking body using correctly sized punch sets. Use twist drill for holes up to 6 mm maximum diameter.

Use only factory formed openings for accessories.

Line unprotected apertures in trunking with PVC or nylon edging strip.

Fit ends of runs with removable blanking plates.
Ensure connections are not made to covers unless indicated or approval obtained.
Provide fixed section of cover projecting 25 mm either side of fabric where trunking passes through wall, floors or ceiling.
Fit cable retaining straps at 500 mm intervals except where cover is on top.

Y60.5060 TRUNKING OF INSULATING MATERIAL:

Comply with manufacturer's instructions. Do not install trunking where ambient temperature is below - 5°C or working temperature is above 60°C.
Use solvents recommended by trunking manufacturer when making solvent welded joints. Remove excess solvent before surface damage occurs. Hold joints rigid and in position until welds set.
Use manufacturer's standard radiused bends, connector tees, off-sets, end plates and component parts of trunking system assembly.
Ensure no type of trunking other than that specified is installed without approval.
Trunking may be substituted for conduit at certain positions subject to approval.

Y61 HV/LV CABLES AND WIRING

Y61.1000 GENERAL

1010 CABLE MANUFACTURE:

Use new cables, delivered to site with seals intact, manufactured not more than one year prior to delivery, labelled with manufacturer's name, size, description, BS number, classification, length, grade and date of manufacture.

1020 CABLE CERTIFICATION MARKING:

Mark all types of cables with CENELEC cable certification marking or if included in British Approvals Service for Cables (BASEC) in accordance with BASEC regulations.

Y61.2005 LSOH SHEATHING:

Supply cables with Low Smoke Zero Halogen (LSOH) sheathing, tested in accordance with BS EN 50267 and BS EN 60332.

Y61.2020A STANDARD POWER SUPPLY CABLES, COPPER CONDUCTORS, THERMOSETTING INSULATION, SHEATHED:

Standard - BS 5467, Tables 4, 6, 8, and 10.
Mechanical protection - Unarmoured.

Y61.2020B STANDARD POWER SUPPLY CABLES, COPPER CONDUCTORS, THERMOSETTING INSULATION, SHEATHED AND ARMoured:

Standard - BS 5467, Tables 4, 6, 8, and 12.
Mechanical protection - Armour.

Y61.2020E STANDARD POWER SUPPLY CABLES, COPPER CONDUCTORS, LSF SHEATHED AND ARMoured:

Standard - BS 6724, Tables 4, 6, 8, and 10.
Mechanical protection - Armour.

Y61.2020G STANDARD CABLES FOR CONDUIT AND TRUNKING, COPPER CONDUCTORS, LSF INSULATED:

Standard - BS 7211, Tables 3(a) and 4(a).
Mechanical protection - Conduit and trunking.

Y61.2040A LIGHT DUTY MINERAL INSULATED CABLES, THERMOPLASTIC OUTER COVERING:

Standard - 500V light duty to BS EN 60702-1, section 14.

Outer covering

Thermoplastic to BS EN 60702-1, section 8.2.

Y61.2040B LIGHT DUTY MINERAL INSULATED CABLES, LSF OUTER COVERING:

Standard - 500V light duty to BS EN 60702-1, section 14.

Outer covering

Halogen free material to BS EN 60702-1, section 8.3.

Y61.2050A PAIRED, UNSCREENED AND UNARMoured CONTROL CABLES:

Standard - BS 5308-1, Tables 2, 4 and 8.

Mechanical protection - Unarmoured, Type 1.

Y61.2050B PAIRED, UNSCREENED AND ARMoured CONTROL CABLES:

Standard - BS 5308-1, Tables 2, 4 and 8.

Mechanical protection - Armour, Type 2.

Y61.2050C PAIRED, SCREENED AND UNARMoured CONTROL CABLES:

Standard - BS 5308-1, Tables 3, 5 and 9.

Mechanical protection - Unarmoured, Type 1.

Y61.2050D PAIRED, SCREENED AND ARMoured CONTROL CABLES:

Standard - BS 5308-1, Tables 3, 5 and 9.

Mechanical protection - Armour, Type 2.

Y61.2050E MULTI-CORE UNARMoured AUXILIARY CABLES:

Standard - BS 5308-2, Tables 2, 3 and 6; BS 6346, Table 19.

Mechanical protection - Unarmoured, BS 5308 Type 1.

Y61.2050F MULTI-CORE ARMoured AUXILIARY CABLES:

Standard - BS 5308-2, Tables 2, 3 and 6; BS 5467, Table 18; BS 6346, Table 19.

Mechanical protection - Armour, BS 5308 Type 2.

Y61.2050G MULTI-CORE UNARMoured LSF, SHEATHED AUXILIARY CABLES:

Standard - BS 7211, Table 6

Mechanical protection - Unarmoured.

Y61.2050H MULTI-CORE ARMoured LSF, SHEATHED AUXILIARY CABLES:

Standard - BS 6724, Table 18.

Mechanical protection - Armour.

Y61.2050I CONTROL AND AUXILIARY CABLES WITH DEFINITE FIRE PERFORMANCE:

- Drawing/schedule reference
- Standard - BS 7629; type as shown on drgs/schedules.
Fire performance approval - LCPB.
Sheath colour - red.
Mechanical protection, as shown on drgs/schedules.

Y61.2050K FIRE ALARM CABLE:

Standard - BS 7629-1.
Mechanical protection - Unarmoured.
Fire performance - BS 5839-1 Standard.

Y61.2070A STANDARD FILLED COMMUNICATIONS CABLES FOR OUTDOOR AND UNDERGROUND:

Standard - BS 3573, Tables 7, 8, 9, 10 and 11.

Y61.2070B STANDARD COMMUNICATIONS CABLES FOR INDOOR USE:

Standard - BT CW 1308; BT CW 1370; BT CW 1700; and BT CW 1750.

Y61.2080A STANDARD COAXIAL CABLES, FOR BROADCAST RECEIVING:

Standard - BS EN 50117.

Y61.2100A INFORMATION TECHNOLOGY CABLES - STRUCTURED WIRING:

Provide IT cables in accordance with the IT system suppliers specification.
Type of system - Structured cabling - EIA/TIA 568-B.
Specification - EIA/TIA 568-B.
Termination reference - EIA/TIA 568-B.
Cable construction - Multi pair; unshielded (UTP).

Y61.3010A CABLES GLANDS - UNARMoured CABLES, INDOORS:

Cable type
Flexible; wiring and power; control and auxiliary; and communications.
Standard - BS EN 50262 non-metallic, cable retention, IP54; A1P.
Environment - Indoor.

Y61.3010B CABLES GLANDS - UNARMoured CABLES, OUTDOORS:

Cable type
Flexible; wiring and power; control and auxiliary; and communications.
Standard - BS EN 50262 non-metallic, cable retention, IP54; A2P.
Environment - Outdoor.

Y61.3010C CABLES GLANDS - ARMoured CABLES, DRY INDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 50262 metallic, cable retention Class A, protective connection to earth, IP54.
Environment - Dry indoors.

Y61.3010D CABLE GLANDS - ARMoured CABLES, INDOORS:

Cable type

Wiring and power; and control and auxiliary.
Standard - BS EN 50262 metallic, cable retention Class A, protective connection to earth, IP54.
Environment - Indoor.

Y61.3010E CABLE GLANDS - ARMOURED CABLES, OUTDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 50262 metallic, cable retention Class A, protective connection to earth, IP54 with shroud.
Environment - Outdoor.

Y61.3020D CABLE SEALS AND GLANDS - LIGHT DUTY MINERAL INSULATED CABLES - TEMPERATURES UP TO 105 DEGREES CENTIGRADE:

Use seals and glands for mineral insulated cables in accordance with BS EN 60702-2 recommended or supplied by cable manufacturer.
Gland Type
Cable grip type, internally threaded, with bush.
Gland Shroud
Thermoplastic or LSF material to match sheath.
Seal type - Plain or earth tail and self-threading pot.
Pot closure - Plastic stub cap.
Pot sealant - Compound, 105°C
Conductor insulation sleeving - Plain PVC.
Seal maximum temperature rating - 105°C.

Y61.3040A CABLE TERMINATING AND JOINTING SOCKETS:

- Connection type
 - As shown on drawings/schedules
- Standard and type - compression to BS EN 61238-1.

Y61.3050A LSF INSULATING TAPE:

Standard - BS 3924, LSF material.

Y61.3060A CABLE JOINTS AND TERMINATIONS:

Use only cable joints as supplied or recommended by cable manufacturer.
Cable type - Power or control and auxiliary.
Joint arrangement - Straight through or tee.
Joint type - BS 6910, cold pour or heat shrink.
Accessories - Armour bonds, BS 7197; filling compounds.
Environment - Underground.

Y61.3080A CONNECTORS FOR COAXIAL CABLES - BROADCAST RECEIVING:

BS 3041-2 or UHF to BS 3041-12.

Y61.3110A CABLE DUCTS:

Standard
BS 65, DN 90; BS 4660 provided by Electricity Supply Company.

Y61.3120A CABLE SLEEVES:

Supply and hand to others for installation non ferrous cable sleeves for incorporation into the structure where cables pass through fire compartment floors and walls.

Packing material

Weak mix mortar; intumescent, plaster or mastic; solid intumescent material; or intumescent granule filled bags.

Y61.3130A CABLE COVERS AND MARKERS:

Material - Recovered plastic, integral tape.

Marking - Electricity or telephone.

Plastic marker tape

Yellow, marked electricity or telephone.

Y61.4010 CABLE INSTALLATION - GENERAL:

Use and install cables only as directed in the appropriate standard or as directed by the manufacturer in writing. Lay cables in one length unless otherwise indicated. Obtain permission from supervising officer for all through joints, and where overall length requirement exceeds practical drum size. Install cables when ambient temperature is 5°C or greater, using cables stored at or above this temperature for not less than 24 hours.

Use drum stands, drum axles, fair leads, rollers, cable stockings and other equipment as recommended by the cable manufacturer and as appropriate to the method of installation.

Y61.4020 CABLE INSTALLATION IN LOW TEMPERATURES:

Install cables at lower installation temperatures when authorised by manufacturer in a written statement.

Y61.4030 INSTALLATION OF LSF CABLE:

Install LSF cables in accordance with manufacturer's instructions. Ensure ambient temperature is above 5°C. Ensure oversheaths are not damaged by abrasion or scuffing.

Y61.4040 INSTALLATION OF UNARMoured CABLES:

Install and use unarmoured cable to BS 6004, BS 6007, BS 6500, BS 7211 and BS 7919 in accordance with BS 7540-1, BS 7540-2, BS 7540-3 or the manufacturer's written instructions.

Y61.4050A CABLE TRENCHES:

Ensure that trenches for cables and cable ducts are prepared, backfilled and reinstated.

Supervise all work to cable trenches by others.

Carry out walk over survey of trench route, dig trial hole in any area considered to be potentially difficult. Establish location of any other underground service adjacent to cable route.

Re-plan cable routes after survey and trial holes. Submit report of survey and trial holes.

Carry out any instructed work to adjacent services. Set out cable trenches, excavate trench carefully setting aside any materials required for backfilling or reinstatement.

Minimum cover in cable trenches

HV cables 800mm; LV cables 500mm; communications cables 500mm; all cables 800mm under roadways.

Trench

Common trench for all underground services.

Grade trench bottom to a maximum slope of 1:12.

Clear trench bottom of loose stones and place bedding to full width of trench.

Bedding

Riddled earth 6mm grid for cables; riddled earth 12mm grid for ducts; imported soft sand; or pea shingle, for ducts.

Bedding thickness - 75mm; or 100mm for ducts.

Install cables or ducts. Haunch cables or ducts in bedding material to a minimum depth of 75mm above highest cable or duct.

Cable or duct identification

Warning tape - Yellow with black legend.

Backfill trench using two layers 100mm thick hand rammed. Complete backfilling in layers and reinstate trench.

Backfill material - as excavated from trench.

Y61.4060 CABLE INSTALLATION IN TRENCHES:

Lay cables on newly prepared bedding. Ensure multiple layers of cable are separated vertically by a 50mm layer of hard rammed bedding material.

When using a power winch ensure tension on the cable is taken by element of the cable designed for that purpose, that is armour or conductor cores as appropriate and not plastic sheath, metal sheath or core insulation.

When hand pulling cable ensure no kinks are formed and that flaking, when used, is done in the correct direction.

Do not allow cable to twist during installation. Use swivels to connect pulling bond to cable stocking or equivalent fitting.

Check drum is suitable for jacking before commencing installation. If drum or reel is unsuitable for jacking, flake cable in correct direction in maximum size turns from drum or reel before commencing installation. Use skilled labour to supervise all unreeling, flaking or running of cable from a drum.

Lay cables in the formation shown, ensure spacing is not reduced below that indicated.

Bind trefoil groups at 1m intervals. Bind any associated earth or protective conductor to its cable or trefoil group at 1m intervals.

Ensure installation radii and permanent bending radii are not less than those recommended by the manufacturer.

Do not lay cables to BS 6004, BS 6007, BS 6500, BS 7211 or BS 7919 direct in the ground.

Y61.4070A CABLE DUCTS:

Duct work

Supervise the laying of ducts by others.

Lay ducts in the formation shown, on to newly prepared bedding. Joint ducts in accordance with the manufacturer's instructions.

Ensure that ducts slope no more than 1:60 vertically or 1:30 horizontally.

Ensure that pre-formed duct bends used at ends of duct routes meet the requirements of the cable manufacturer for bending radii.

Construct manholes, draw pits and jointing chambers.

Prove alignment of completed duct run by drawing through a mandrel 7mm diameter less than nominal duct bore for minimum length 250mm. Clean completed duct run by drawing through a circular wire brush 12mm diameter more than nominal duct bore.

Install a draw wire of corrosion resistant material and minimum breaking strength 550N in each empty duct.

Plug and seal all ducts with proprietary duct plugs, on completion.

Y61.4080 CABLE INSTALLATION INTO DUCTS:

Install cables into newly proved and cleaned duct. Use lubricants, recommended by the cable manufacturer in writing, to assist drawing process.

Flake cable if drums or reels are not suitable for jacking. At intermediate draw pits with exit duct more than 15 degrees off line of entry duct, flake cable before entering or provide comprehensive system of corner plates, roller and blocks. Use maximum practical size of turns when flaking and ensure direction is correct.

Do not exceed manufacturer's installation tension on cable and ensure the pulling tension is taken on cable elements designed for that purpose, that is armour or conductor cores and not on other elements, such as plastic sheath or conductor insulation.

Do not allow cables being pulled into ducts to twist. Use appropriate swivel between pulling bond and cable stocking or similar appliance.

Bind trefoil groups of single core cables installed into a single duct at 1m intervals. Install earth or protective conductors into the same duct as the associated cable where practical, through manholes, draw pits and jointing chambers. Bind the two cables together. Pull all cables in one duct as a group. Ensure group does not twist or cross over. Report any damage to cable sheath during installation and carry out any instructed work to remedy the damage. Seal between cable and duct ends after cable installation. Ensure cable ends in jointing chambers are temporarily sealed where required.

Y61.4090A CABLE INSTALLATION IN CONDUIT AND TRUNKING:

Install cables so that they are orderly and capable of being withdrawn.
Arrange single core wiring generally using the loop-in method.

Trunking

In vertical trunking provide pin racks at 3m intervals. Use ties at 2m intervals for all wires of the same circuit reference. Mark ties with circuit reference number at 10m intervals.

Conduit

Provide cable clamps in conduit boxes at 10m intervals in vertical conduit.

Allow for full range of movement at building construction movement joints. Make all joints to wiring at terminal blocks in conduit boxes.

Y61.4100 CABLE INSTALLATION ON TRAY AND RACK:

Place cables side by side or as indicated. Fix using cleats or cable ties so that any cable may be individually removed. Use metallic ties on cables with specified fire performance.

Y61.4110A CABLE SURFACE INSTALLATION:

Dress cables flat, free from twists, kinks and strain, and align parallel to building elements. When glands and clamps are not required, take sheathing of cables into accessory boxes and equipment and protect against abrasion using grommets or similar sharp edge protection.

Y61.4120A CABLE EMBEDDED INSTALLATION:

Dress cables flat, free from twists, kinks and strain, and align parallel to building elements. When glands and clamps are not required, take sheathing of cables into accessory boxes and equipment and protect against abrasion using grommets or similar sharp edge protection.

Ensure plaster or screed over cable is a minimum of 12mm. Protect embedded cables with metal capping or PVC oval conduit.

Y61.4130A CABLE INSTALLATION - MINERAL INSULATED CABLES:

Straighten and dress cables using methods and tools recommended by cable manufacturer.

Use thermoplastic or LSF sheathed cables in location indicated, and where cables may come into direct contact with any material that may be corrosive to copper.

Do not allow extra length on installed cables to allow for cutting back of moisture affected ends. Store mineral insulated cables in the form as supplied by manufacturer.

Y61.4140 CABLE INSTALLATION - FLEXIBLE CORDS:

Grip cords securely at connections. Where they do not form an integral part of the connected accessory or equipment, provide separate proprietary cord grips.

Y61.4150A CABLE JOINTING AND TERMINATING GENERALLY:

Ensure all joints and terminations are made by appropriately qualified cable jointers, using jointing materials, components and workmanship recommended by the cable manufacturer and the jointing accessory manufacturer. Install cable glands in accordance with BS 6121-5.

Cold pour resin and heat shrink joints.

Cut all cable ends immediately prior to jointing or terminating. Seal cables left unconnected for more than 24 hours to prevent the ingress of moisture. Seal plastic sheathed cables using proprietary shrink on end caps. Seal lead sheathed cables by a plumbed dressed lead cap with an airspace to allow conductor movement.

Strip cables to bring out the cores and expose conductors, for the minimum length required for connection, to leave no exposed length of conductor after termination. Ensure that strands are not damaged when stripping cable cores. Twist strands together. Do not reduce number of strands. Secure all strands at terminations.

Clean armour thoroughly prior to jointing or terminating.

At connections to equipment and switchgear without integral cable clamping terminals, use compression or solder type lugs for bolted terminal connections, of correct bore.

Form all compression connections to components using tools that cannot be released unless the correct degree of compression has been achieved.

Install and inspect compression and mechanical connectors on conductors in accordance with BS EN 60228 and BS 7609.

Bolt core terminations with lugs to equipment using washers or proprietary shakeproof devices.

Do not bunch more than three cores at clamping terminals or bolted connections.

Mark cable conductor phasing, or other core identification, at each end of all cables, and at all joints, maintaining consistency of marking with any existing system.

Connect all cores, including multicore cable spare cores, at all joints and terminations. Bond any unused cores or multicore cables to earth at both ends, unless otherwise indicated.

Y61.4170 CABLE JOINTING AND TERMINATING - ELASTOMER AND PLASTIC INSULATED CABLES:

Joint cables using glands of the type indicated, in accordance with the manufacturer's instructions.

Use shrouds at all glands, unless otherwise instructed.

At core connections to equipment without integral clamping terminals use compression lugs unless otherwise indicated.

Y61.4180A TERMINATING - MINERAL INSULATED CABLES:

Use terminations in accordance with BS EN 60702-2 and components and materials recommended or supplied by cable manufacturer.

Use seals with maximum temperature rating indicated, stub caps to the largest size available, and drilled caps and headed sleeves for larger sizes.

Use glands of type indicated. At terminations to accessory boxes within a plaster or render finish, cable clamps fixed to accessory box and firmly gripping cable sheath may be used. Use earth tail seals with sheath grip type accessory boxes.

At equipment not provided with threaded entries secure glands using lock washers and locknuts or brass conduit bush. Use gland shrouds when plastic covered MI cables are used.

Using PVC, PIB or LSF material tape to BS 3924 or BS EN 60454 to match sheath, tape overall gland any bare copper sheath and form seal to cable sheath under all shrouds.

Mark core sleeving with appropriate identification.

Install voltage surge suppressors in accordance with manufacturer's recommendations and surge suppressors to BS 7671, Section 331-01-01.

Y61.4190A CABLE JOINTS - MINERAL INSULATED CABLES:

Joint mineral insulated cables using methods and materials recommended by cable manufacturer.

Terminate cables in externally threaded glands using seals with temperature rating indicated. Join conductors using crimped connectors.

Insulate connectors using PVC tape to BS 3924 or BS EN 60454, ensuring good seal to conductor sleeving. Make off glands into either end of internally threaded brass sleeve of correct size. Protect brass sleeve using heat shrink sleeve.

Y61.4200A COMMUNICATIONS COAXIAL, OPTICAL FIBRE AND IT CABLE INSTALLATION, JOINTING AND TERMINATING:

Use methods approved by cable and accessory manufacturers.

Employ labour certified by acceptable body as qualified to install and make joints and terminations in the referenced cable. Obtain in writing approval of cable manufacturer for accessories not supplied by them.

Identify cables using structured numbering scheme.

Install communication, coaxial, optical fibre and IT cables in accordance with BS EN 50174-1, BS EN 50174-2 and BS EN 50174-3.

Y61.4210 CABLE SLEEVES:

Pack sleeves with fire resistant material after cable installation.

Y63 SUPPORT COMPONENTS - CABLES

Y63.1000 GENERAL

1010 APPLICATION:

Cables referred to in this section are only those types that can be installed without further mechanical protection.

Y63.2010A CABLE SUPPORTS AND FINISHES:

Cable supports

Support all cables throughout their length using conduit; or trunking and enclosures; or cable tray; or cable racking; or special support systems; or cleat or clip fixing direct to building fabric as indicated on the drawings/schedules.

Ensure tray, racking and special support systems are continuous and firmly fixed to building fabric. Allow space for additional cables as indicated on the drawings/schedules.

Ensure cable support system allows for spacing in accordance with BS 7671 for the design current of the cable.

Fixings finishes

Ensure finish for all support components, fixings, hangers and accessories is as cable support system or manufacturer's standard.

Y63.2020A CABLE SUPPORT SYSTEM - PERFORATED TRAY:

Type - Flanged or return flanged.

Perforations

Admiralty pattern for light or medium duty; GDCCD pattern standard 23; or manufacturer's standard pattern.

Thickness - Manufacturer's standard thickness for type.

Fittings

Use factory made fittings throughout of same material, type, pattern, finish and thickness as cable tray.

Use reducers, inside angles and outside angles as manufacturer's standard.

Use flat bends, equal tees, unequal tees and crosses with corners gusseted.

Join lengths of tray and fittings using manufacturer's standard shouldered ends, fish plates, or couplers, with galvanized or zinc plated slotted domed head 'roofing' bolts, nuts, washers and shakeproof washers.

Material

Hot rolled steel galvanized after manufacture to BS EN ISO 1461; or bending and profiling quality hot dipped galvanized steel to BS EN 10326, BS EN 10327 or BS EN 10143.

Finish - Self colour galvanized.

Y63.2020B CABLE SUPPORT SYSTEM - CABLE RACK:

Proprietary system of channel sections with return lip and compatible jointing and fixing accessories
Fittings

Use factory made fittings throughout of same material finish and section as rack, for risers, bends, reducers, tees, crosses and drop outs.

Material

Hot rolled steel galvanized after manufacture to BS EN ISO 1461; or bending and profiling quality hot dipped galvanized steel to BS EN 10326, BS EN 10327 or BS EN 10143.

Finish - Self colour galvanized.

Y63.2020C CABLE SUPPORT SYSTEM - CABLE CLEATS:

One piece or single way pattern or claw pattern or two bolt pattern.

Material

Die cast aluminium alloy; moulded black polyethylene; or nylon.

Finish - Self finish.

Y63.2025A CABLE SUPPORT SYSTEM - PROPRIETARY CABLE TIES:

Two piece cable tray pattern, on cable tray only. Wrap round self locking non releasable pattern on everything except cable trays.

Y63.2025B CABLE SUPPORT SYSTEM - CABLE CLIPS:

Polypropylene surface type with pre-fixed hardened steel pin for general use except on mineral insulated cables.

For mineral insulated cables use bright copper one hole 'P' clips for unsheathed mineral insulated cables, PVC covered for sheathed mineral insulated cables.

Y63.2025C CABLE SUPPORT SYSTEM - TWO WAY SADDLES:

Bright copper for unsheathed mineral insulated cables. PVC covered bright copper for sheathed mineral insulated cables.

Y63.2025D CABLE SUPPORT SYSTEM - CABLE BASKET:

Proprietary system of wire basket with compatible jointing and fixing accessories.

Fittings

Use factory made fittings throughout of same material finish as basket, for risers, bends, reducers, tees, crosses and drop outs.

Y63.3010 CABLE TRAY INSTALLATION:

Support from building fabric with minimum clearance behind of 20mm. Install fixings at regular intervals to prevent visible sagging when loaded, with maximum spacing 1.2m and 230mm from fittings.

Keep cutting of cable tray to a minimum. Cut along a line of unperforated metal. Make good finish with zinc rich paint, primer and top coat, or two pack epoxy paste, as appropriate to tray material and finish.

Fit holes cut in tray for passage of cables with grommets, bushes or other lining.

Install all bolts, fixings and hangers with threaded portion away from cables.

Y63.3020A CABLE CLEATS, TIES, SADDLES AND CLIPS INSTALLATION:

For cables on horizontal tray use ties for each circuit. Use tie manufacturer's special tensioning tool where available. Crop off tie ends.

For cables on vertical tray use cleats bolted to tray for paper, plastic or elastomeric insulated cables and saddles or clips for mineral insulated cables. Use cleats sized to grip cables firmly without undue pressure or strain on cable, but preventing slipping.

For cables on vertical or horizontal rack use proprietary fixings to rack for paper, plastic or elastomeric insulated cables and saddles or clips for mineral insulated cables. On continuous flat surfaces of wood, plaster, brick etc.

Use polypropylene surface fixing clips with prefixed hardened steel pin for PVC insulated and sheathed cables and sheathed or bright mineral insulated cables. Use round or flat or flat twin pattern as appropriate, manufactured specifically for cable being fixed.

Use one hole 'P' clips or two way saddles of bright copper for unsheathed mineral insulated cable.

Use PVC covered for sheathed mineral insulated cables.

Space cleats, ties, saddles and clips

As Appendix G of Guidance Notes 'Selection Erection' published by the IEE (now IET).

Y71 LV SWITCHGEAR AND DISTRIBUTION BOARDS

Y71.1000 GENERAL

Y71.1020A 3 PHASE ELECTRICITY SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for 3 phase power supply to BS 7697.

Y71.1020B SINGLE PHASE ELECTRICITY SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for single phase power supply to BS 7697.

Y71.2010A CUBICLE SWITCHBOARD - LV SWITCHGEAR AND CONTROLGEAR ASSEMBLY:

Standard - BS EN 60439-1.

External design - Cubicle type assembly.

Usage - Switchboard.

Conditions of installation - Indoors.

Electrical characteristics

Rated operational voltage 400V +10% -6%

Service conditions

Ambient air temperature and altitude as BS EN 60439.

Y71.2020B WALL MOUNTED ASSEMBLY CONSTRUCTION:

Enclosure standard - BS EN 62208.

Material of enclosure - Manufacturer's standard.

Terminals for external conductors, main power circuits

Accommodate cross-sectional area of copper cables in accordance with BS EN 60439-1.

Terminals for external conductor, control and auxiliary circuits

Terminal block. Mounting as manufacturer's standard.

Size of neutrals on three phase supplies - Full sized.

Degree of protection to BS EN 60529, IP31 for assembly.

Protection against direct and indirect contact

Manufacturer's standard.

Accessibility for inspection

Arrange for following operations to be performed when assembly is in service and under voltage

Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.

Adjusting and re-setting of relays, releases and electronic devices.

Replacement of fuselinks and indicating lamps.

Fault location by voltage and current measuring.

Accessibility for maintenance

Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.

Removable parts and withdrawable parts as manufacturer's standard.

Internal separation - Form 4.

Input voltage variations for electronic equipment supply - BS EN 60439.

Supply frequency deviation - BS EN 60439.

Mounting - Wall mounted.

Y71.2030A ENCLOSURE FINISH:

Apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.

Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.

Finish - Manufacturer's standard.

Colour - Manufacturer's standard colour.

Y71.2040A TYPE TESTS:

Provide certificates of verification.

Y71.2060 SITE BUILT ASSEMBLIES:

Ensure that components of site assemblies are part of a proprietary system and type tested as appropriate.

Install assemblies in accordance with manufacturer's drawings and instructions.

Y71.2070 SITE MODIFICATION:

Do not make site alterations unless authorised. Where site modifications to assemblies are authorised make in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for arrangement of components.

Y71.2100A SWITCH DISCONNECTORS:

Supply switch disconnectors in accordance with BS EN 60947.

Standard - BS EN 60947-3

Details of equipment - Switch-disconnector.

a.c. Interrupting medium - Air.

Rated and limiting values for the main circuit.

Rated voltage (Volts) 230/400.

Rated frequency 50 Hertz.

Utilisation category - AC 23A.

Enclosure degree of protection IP 65.

Fit each switch with facility to padlock in OFF position.

Provide switches with auxiliary contacts as indicated. Where switches isolate final connections between a starter and its motor, fit one set of contacts to open starter coil circuit when switch is opened.

Y71.2100B FUSE COMBINATION UNITS:

Supply fuse combination units in accordance with BS EN 60947. Fit fuse combination units with cartridge fuse links in accordance with BS EN 60269 (BS 88).

Standard - BS EN 60947-3.

Details of equipment - Fuse combination unit.

a.c. Interrupting medium - Air.

Rated and limiting values for the main circuit

Rated voltage (Volts) 230/400.

Rated frequency 50 Hertz.

Utilisation category - AC23A

Enclosure degree of protection IP 31.

Fit removable neutral link in switches controlling circuits with neutral conductor.

Fit solid links in isolating switches.

Fit each switch with facility to padlock in OFF position.

Ensure that withdrawable chassis isolating type switches are provided with fully shrouded fixed contacts or insulated coverplates, to prevent accidental contact with live parts.

Ensure that switches in individual enclosures have an earth terminal, meet the degree of protection for the switchboard and have operating mechanisms interlinked with access door.

Provide switches with auxiliary contacts as indicated. Where switches isolate final connections between a starter and its motor, fit one set of contacts to open starter coil circuit when switch is opened.

Y71.2150A INSTRUMENTS AND METERS:

Standards

Comply with BS 89 and BS EN 60051-1 for voltmeters, ammeters, watt meters, frequency indicators and power factor indicators.

Comply with BS 7856, BS EN 62053-11, BS EN 62053-22 or BS EN 62053-21 for kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters, and BS EN 62053-23 for KVAhr meters.

Protect wiring to voltmeters by separate fuses.

Protect potential coils of watt meters, frequency indicators, power factor indicators and kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters by separate fuses.

Supply instruments and meters suitable for flush mounting and type, size and accuracy as indicated.

Ensure that indicating scales for all instruments comply with BS 3693.

Supply so that normal indication is 50% to 75% of full scale deflection.

Completely segregate all instruments in instrument compartments. Panel mount meters on front of instrument compartment.

Y71.2210A DISTRIBUTION BOARDS:

Comply with BS EN 60439-1 or BS EN 60439-3 as appropriate. Make internal separation Form 1 unless otherwise indicated. Make fuseboards fully shrouded. Fit each distribution board with an isolating switch.

Install busbars in same position relative to their fuse carriers or miniature circuit-breakers (MCBs) for each pole. In TPN distribution boards supply neutral busbars with one outgoing terminal for each outgoing circuit.

Provide a multi-terminal earthing bar for circuit protective conductors for both insulated and metal-cased boards, with one terminal for each outgoing circuit. Connect directly to earthing terminal without dependence on exposed conductive parts of enclosure.

Identify each fuseway and MCB way by numbering. Identify each terminal on neutral busbar and earthing bar with its respective fuseway or MCB way.

Where specific ratings are indicated incorporate fuses or MCBs, otherwise leave ways blank for future additions.

Enclosures finish

Finish - Manufacturer's standard.

Colour - Manufacturer's standard colour.

Y71.2220A CONSUMER UNITS:

Comply with BS EN 60439-3. Supply consumer units with minimum degree of protection in accordance with BS EN 60529, IP 31.

Provide fuses or miniature circuit-breakers and means of isolation.

Y71.2230A MINIATURE CIRCUIT BREAKERS:

Standard - BS EN 60898-1.

Supply miniature circuit-breakers with voltage and current ratings, type according to instantaneous tripping current, energy limiting class, category of duty and frequency in accordance with BS EN 60898-1.

Y71.2240A RESIDUAL CURRENT DEVICE:

Comply with BS EN 61008. Supply residual current devices (RCCDs) with rated voltage, rated current, rated tripping current, rated tripping time and rated breaking capacity as indicated.

DC component

Ensure dc component does not affect operation.

Overcurrent protection

Fit RCDs with integral overcurrent protection.

Y71.2242 RESIDUAL CURRENT MONITORS:

Supply residual current monitors.

Standard - BS EN 62020.

Y71.2245 COMBINED RESIDUAL CURRENT/OVER CURRENT OPERATED CIRCUIT BREAKERS:

Supply combined residual current/over current operated circuit breakers (RCBOs) in accordance with BS EN 61009.

Y71.2250 CABLE TERMINATIONS:

Ensure that switchgear and distribution boards are provided with facilities to terminate size, number and type of cable indicated. Where necessary use fabricated steel extension boxes for glanding large and multiple cables.

Provide non-ferrous metal glanding plates for single core cable terminations.

Y71.3010 FIXING:

Fix all equipment independently of wiring system. Use cadmium or zinc electroplated bolts, nuts, washers and screws.

Y71.3020 MOUNTING HEIGHT:

Mount single items of equipment 1450mm above finished floor level to centre of equipment, unless otherwise indicated.

Arrange groups of equipment, other than floor mounted assemblies, so that all parts of equipment requiring access for operation or maintenance are at least 500mm and no more than 2000mm above finished floor level, unless otherwise indicated.

Y71.3030 ACCESS:

Ensure that clearance in front of switchgear and controlgear is not less than 1m, or as indicated.

Y71.3040A MARKING AND DRAWING:

Number terminals, cables and component parts to correspond with manufacturer's certified drawings.

Y71.3050 CABLE TERMINATIONS:

Terminate paper-insulated cable by means of switchboard manufacturer's standard compound filled cable boxes.

Terminate PVC SWA PVC and MICS cables inside enclosure by securing cables to switchboard with glanding plates or glanding brackets; and outside enclosure with glanding plates or fabricated steel extension boxes.

Y71.3060A INSTALLATION AND COMMISSIONING:

Install and commission switchgear and controlgear in accordance with the appropriate standard and the manufacturer's recommendations. Include CT Polarity check in commission tests.

Y72 CONTACTORS AND STARTERS

Y72.1000 GENERAL

Y72.1010A 3 PHASE SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for 3 phase power supply to BS 7697.

Y72.1010B SINGLE PHASE ELECTRICAL SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for single phase power supply to BS 7697.

Y72.2070A ISOLATING SWITCHES:

- Isolation as shown on drawings/schedules

Standard - BS EN 60947-3.

Provide independent manual operation type isolating switches with rated duty, rated operational current and utilization category compatible with contactor.

Y72.2080A CONTROL SELECTOR SWITCHES:

Standard - BS EN 60947-5-1

Provide panel mounting independent manual operation rotary type switch to select local/off/remote control.

Ensure switch rated thermal current, rated operational current, and utilization category are compatible with contactor control circuit characteristics and circuit protection device.

Y72.2090A IN-BUILT PUSH BUTTONS:

Provide panel mounting type push buttons with actuator colours to BS EN 60073.

Standard- BS EN 60947-5-1.

Pattern

Supply flush button type start/on and reset push buttons. Supply mushroom actuator type stop/off push buttons released by turning the actuator.

Ensure rated thermal current, rated operational current and utilization category of push button contacts are compatible with contactor control circuit characteristics and circuit protection device.

Y72.2100A INDICATOR LIGHTS:

Supply lamps of same type throughout. Provide indicator lamps with lamp test facility.
Standard - BS EN 842 and BS EN 60947-5-1.

Details

Supply interchangeable indicators for respective units. Provide neon indicators. Provide 230V indicator circuits and lamps.

Protect wiring to indicator lamp units by separate cartridge fuses.

Lens colour - In accordance with BS EN 60073.

Y72.2110A CONTACTOR CONTROL RELAYS:

Standard BS EN 60947-5-1, install relays in contactor enclosure.

Relay enclosure protection to BS EN 60529

Compatible with contactor enclosure.

Y72.2120A CONTROL AND INDICATOR LIGHT CIRCUIT FUSES:

Provide in contactor enclosure separate low voltage fuse bases, fuse carriers and cartridge fuses for protection of control circuits and indicator light circuits.

Fuses

Fully shrouded impact resistant moulded plastic fuse bases and carriers in accordance with BS EN 60269 (BS 88). Supply category gG cartridge fuses to BS EN 60269 (BS 88).

Y72.2130A MOTOR STARTERS - MOTORS BELOW 0.37 KW:

Provide fuses or circuit breakers for motors below 0.37 kW.

Y72.2130B MOTOR STARTERS - MOTORS OF 0.37KW AND ABOVE:

Provide starters incorporating overcurrent protection for motors of 0.37kW and above.

Provide starter with manual reset, adjustable, inverse time delay, and ambient temperature compensated thermal overcurrent release to BS EN 60947-4-1. Ensure overcurrent release is compatible with starting, accelerating and running characteristics of motor, starter and driven machine combination. Use phase unbalance protection on three phase equipment.

Y72.2140 CURRENT LIMITING MOTOR STARTERS:

Use static type thyristor voltage control starter to provide reduced current starting.

Provide adjustable ramp times.

Provide contactor for switching and disconnect for isolation.

Provide details of harmonic distortion content prior to ordering.

Y72.2150 DIRECT-ON-LINE MOTOR STARTERS:

Use direct-on-line starter to BS EN 60947-4-1, with single phase motors and three phase motors.

Y72.2160 STAR DELTA MOTOR STARTERS:

Use star delta starter to BS EN 60947-4-1 with three phase motors.

Incorporate adjustable time delay contactor relays, to control star delta changeover, ensuring electrical endurance compatible with starter contactors. Ensure starting sequence activated on voltage restoration.

Y72.2170A AUTO-TRANSFORMER MOTOR STARTERS:

Use auto-transformer starter to BS EN 60947-4-1 with three phase motors.

Provide 2 step closed transition auto transformers suitable for 3 operating cycles per hour.

Provide auto transformers with three tapplings for selection of motor starting voltage. Arrange tapplings to limit motor starting current to 80 per cent, 65 per cent and 50 per cent of full voltage starting current. Incorporate adjustable time delay contactor relays, to control automatic changeover from selected reduced voltage to full voltage, having an electrical endurance compatible with starter contactors. Ensure starting sequence activated on voltage restoration.

Y72.2180A STATOR ROTOR MOTOR STARTERS:

Use stator rotor starter to BS EN 60947-4-1 with three phase motors.

Provide starter resistors suitable for indicated operating cycles per hour.
Incorporate adjustable time delay contactor relays, to control starter resistor short circuiting contactors, having electrical endurance compatible with starter contactors. Ensure starting sequence activated on voltage restoration.

Y72.2190A CONTROL PANEL INVERTOR MOTOR STARTERS:

Supply inverters to control speed of standard AC Squirrel cage motors.

Inverter type - Digital PWM.

Location - Control panel.

Control range - 0.5 to 120 Hz

Power factor - 0.95 or better.

Starting current - Not to exceed 1 x FLC.

Characteristics

Ensure acceleration and deceleration ramps are independently adjustable.

Allow connection to a turning motor without braking to a standstill.

Allow connection to a reverse windmilling fan without causing tripping and return fan to correct speed. Ensure inverters require no additional means for starting. Supply inverters that do not require electrical matching to motor. Ensure inverters are capable of running motors in parallel.

EMC characteristics to BS EN 61800.

Mains interruption

Ensure inverter does not cause tripping through a mains interruption of 200 msec.

Protection

Ensure inverter incorporates the following protection to cause electronic shut down without operating circuit protective devices.

Motor phase to phase fault; motor phase to earth fault; overvoltage; undervoltage; inverter overheat; motor overheat; loss of control signal; loss of auxiliary control voltage; current limit.

Inverter controls - Local/remote facility.

Display

Make provision for inverter to display externally, external and internal faults following a failure.

Show 1st, 2nd and 3rd up sequential faults.

Provide digital readout to show output frequency Hz; reference 1 (Hand); reference 2 (Auto); motor current (% or Amps); fault memory.

Provide volt free remote signalling contacts to indicate common fault; running/stopped conditions; healthy/tripped conditions.

Ensure parameters can be set and fault memory interrogated with door closed, and without additional instrumentation.

Y72.2190B MOTOR CONTROL CENTRE INVERTER MOTOR STARTERS:

Supply inverters to control speed of standard AC Squirrel cage motors.

Inverter type - Digital PWM.

Location - Motor control centre.

Control range - 0.5 to 120 Hz Power factor - 0.95 or better.

Starting current - Not to exceed 1 x FLC.

Characteristics

Ensure acceleration and deceleration ramps are independently adjustable.

Allow connection to a turning motor without braking to a standstill.

Allow connection to a reverse windmilling fan without causing tripping and return fan to correct speed. Ensure inverters require no additional means for starting. Supply inverters that do not require electrical matching to motor. Ensure inverters are capable of running motors in parallel.

EMC characteristics to BS EN 61800.

Mains interruption

Ensure inverter does not cause tripping through a mains interruption of 200 msec.

Protection

Ensure inverter incorporates the following protection to cause electronic shut down without operating circuit protective devices.

Motor phase to phase fault; motor phase to earth fault; overvoltage; undervoltage; inverter overheat; motor overheat; loss of control signal; loss of auxiliary control voltage; current limit. Inverter controls - Local/remote facility.

Display

Make provision for inverter to display externally, external and internal faults following a failure.

Show 1st, 2nd and 3rd up sequential faults.

Provide digital readout to show output frequency Hz; reference 1 (Hand); reference 2 (Auto); motor current (% or Amps); fault memory.

Provide volt free remote signalling contacts to indicate common fault; running/stopped conditions; healthy/tripped conditions.

Ensure parameters can be set and fault memory interrogated with door closed, and without additional instrumentation.

Y72.2260A STARTER AND CONTROL PANEL INTERNAL WIRING:

Standard - BS 6231.

Wiring coding - Random colours and CPC green/yellow.

Control wiring

Segregate control wiring from power circuits. Contain control wiring in ventilated plastic trunking.

Identify each end of each wire with a unique number.

Power wiring

Take account of thermal effects of grouping when routing power wiring. Identify each end of each wire with a unique number.

Y72.2270A COMPONENT MOUNTING:

Mount all components of the switchgear and controlgear in accordance with the manufacturer's instructions.

Mount control components on top hat rails (35mm) to BS 5584 (EN 50022).

Y72.2280A CONTROL SYSTEM FUNCTION CHARTS:

Prepare function charts for the control system in accordance with BS EN 60848. Obtain approval of function chart before design of system hardware or writing control software.

Function chart format - Combined function chart/circuit diagram.

Y72.3010 INSTALLATION:

Install control panels, motor control centres, contactors and starters in accordance with BS EN 60947 and manufacturer's recommendations.

Y73 LUMINAIRES AND LAMPS

Y73.1000 GENERAL

1010 STANDARDS:

Supply luminaires and lamps to standards as appropriate.

Y73.2165 TYPES OF HIGH EFFICIENCY LAMP FOR NON-DAYLIT AREAS:

Light Source	Type
High pressure sodium	All ratings above 70W
Metal halide	All ratings above 70W
Tubular fluorescent	All 26mm diameter (T) lamps and 16mm (T5) lamps rated above 11W, provided with low loss or high frequency control gear. 38mm diameter (T12) linear fluorescent lamps 2400mm in length
Compact fluorescent	All ratings above 26W

Y73.2170A TUNGSTEN FILAMENT LAMPS:

Comply with BS EN 60064, BS EN 60432-1 and BS EN 60630. Supply electronic step-down converters for filament lamps to BS EN 61047 and BS EN 61347-2-2. Comply with BS EN 61549 for double capped and ELV lamps.

Y73.2180A FLUORESCENT LAMPS:

Internationally specified tubular fluorescent lamps to BS EN 60081.
UK tubular fluorescent lamps to BS 1853-2.
Single capped fluorescent lamps to BS EN 60901 and BS EN 61199.
Double capped fluorescent lamps to BS EN 60081 and BS EN 61195.
Self ballasted lamps to BS EN 60969 and BS EN 60968.

Y73.2185A TUNGSTEN HALOGEN LAMPS:

Comply with BS EN 60432-2 or BS EN 60357.

Y73.2190 HIGH PRESSURE MERCURY VAPOUR LAMPS:

Comply with BS EN 60188 and BS EN 62035.

Y73.2195 METAL HALIDE LAMPS:

Comply with BS EN 62035 where appropriate.

Y73.2200 HIGH PRESSURE SODIUM VAPOUR LAMPS:

Comply with BS EN 62035.

Y73.2210 LOW PRESSURE SODIUM VAPOUR LAMPS:

Comply with BS EN 60192 and BS EN 62035.

Y73.2220A TRANSFORMERS FOR LV LUMINAIRES:

- Type
 - Electronic.
 - Single luminaire.

- Duty
 - Input voltage 230 volts.
 - Output voltage to suit lamp.
 - Single phase.
 - Frequency 50Hz.
 - Rating (kVA) to suit lamp.
- Standards
 - BS EN 55014.
 - BS EN 61000.
 - BS EN 61047.
 - BS EN 61347-2-2.
 - or BS EN 61558 as appropriate.
- Construction
 - Manufacturer's standard.
- Protection
 - Thermal cut out with automatic reset.
- Location
 - Be accessible.
- Cabling
 - Secondary maximum cable length as manufacturer's recommendations.
 - Separate transformer from secondary low voltage cables (m)
- Connections to luminaires
 - Hard wired
 - Plug and socket

Y73.2230 LAMP MANUFACTURER:

Ensure that lamps of each type are from same manufacturer.

Y73.2240A SUPPORT SYSTEM - CONDUIT:

Use not less than 20mm conduit of same type as main conduit system.
Material - steel.

Y73.2250A SUPPORT SYSTEM - ROD:

Use continuously threaded rods with matching washers and nuts.
Diameter - 6mm.
Material - Cadmium plated steel.

Y73.2260A SUPPORT SYSTEM - CHAIN:

Use cadmium plated steel chain with load carrying capacity of not less than twice weight of complete luminaire.

Y73.2270A SUPPORT SYSTEM - FLEXIBLE CORD:

Use size and type as indicated.
Confirm temperature rating is suitable for operating temperature of luminaire or lampholder. Confirm that cord is adequate for mass to be supported.

Y73.2280A SUPPORT SYSTEM - WALL BRACKETS:

Provide wall brackets. Confirm wall brackets are suitable for supporting luminaire.

Y73.2290 SUPPORT SYSTEM - BALL AND SOCKET:

- Installation
 - 4160 SUSPENSION:
 - Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.
 - 4200 SUSPENSION BY BALL AND SOCKET:
 - Install cable through ball and socket connected to conduit box.
 - Height
- Provide ball and socket as top support, complete with cover fixed to circular conduit box.

Y73.2295 SUPPORT SYSTEM - WIRE ROPE:

- Installation
 - 4160 SUSPENSION:
 - Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.
 - 4205# WIRE ROPE SUSPENSION SYSTEM:
 - Type
 - Application
 - Manufacturer and reference
 - Or approved equivalent
 - Standards
 - BS EN 12385-1.
 - BS EN 13411-3.
 - BS EN 13411-4.
 - DIN 3093.
 - BSRIA COP 22/2002.
 - Dimensions
 - Safe working load (kg)
 - Length
 - Components
 - Wire rope
 - Safe working load (kg)
 - Length (mm)
 - Material
 - Stainless steel grade 316
 - Galvanised
 - Fastener
 - Components
 - Springs - stainless steel grade 302
 - Adjustment
 - Tamperproof
 - Fixing
 - Loop
 - Safe working load (kg)
 - Length (mm)
 - Stud (permanently fixed to wire rope length)
 - Single toggle
 - Double toggle
 - Double karabiner
 - Hook
 - Accessories
 - Setting keys
 - Span/bearer supports
 - Ceiling clip fixings
 - Threaded adaptors

- Anchor bolts
- Anchor for stud fixings
- Ceiling fixing kit
- Corner saddle
- Fastener dÃ©cor cover
- Height

Provide wire rope support system. Confirm wire rope is suitable for supporting luminaires.

Y73.2300A STEEL COLUMNS AND BOLLARDS:

- Finish as shown on drawings/schedules

Standards - BS EN 40-2 and BS EN 40-5.

Material - Steel.

Bracket - Match column.

Earthing

Include earthing terminal fixed within service compartment.

Column base plate - Standard.

Y73.2300C ALUMINIUM COLUMNS AND BOLLARDS:

Standards - BS EN 40-2 and BS EN 40-6.

Material - Aluminium.

Bracket - Match column.

Earthing

Include earthing terminal fixed within service compartment.

Column base plate - Standard.

Y73.4050 INSTALLATION OF WALL MOUNTED FITTINGS:

Install luminaires at height indicated.

Y73.4120 SUPPORT FROM CONDUIT:

Where luminaire is supported from conduit provide a conduit box forming an integral part of conduit system at each point of suspension. Ensure suspensions are vertical.

Where conduit enters luminaire use back-nuts and washers to secure luminaire body to conduit support. Provide tube with corrosion resistance equal to conduit system.

Do not support luminaires directly from conduit boxes made from non-metal or heat sensitive materials, where the temperature of the material may exceed 60°C or the mass suspended exceeds 3kg.

Y73.4160 SUSPENSION:

Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.

Y73.4170 SUSPENSION BY ROD:

Use washers, nut and lock-nut at top and bottom of rod. Paint cut ends with calcium plumbate primer or zinc rich paint.

Y73.4180 SUSPENSION BY CHAIN:

Use hook cover for suspension from circular conduit box. For connection to luminaires use luminaire manufacturer's own chain hook, but if not available use hook with standard screw threaded body to be secured to luminaire body with nuts and washers. Where indicated use captive hooks.

Y73.4190 SUSPENSION BY FLEXIBLE CORD:

Suspend cord from ceiling rose.

Y73.4200 SUSPENSION BY BALL AND SOCKET:

Install cable through ball and socket connected to conduit box.

Y73.4210A COLUMNS AND BOLLARDS:

Location - Confirm location before excavation.

Bases - Install bases in accordance with bollard or column manufacturer's instructions.

Mounting

Mount column or bollard on base as recommended by manufacturer.

Ensure columns and bollards are vertical unless otherwise indicated.

Earthing

Install circuit protective conductor to connect luminaire to earthing terminal in service compartment; size circuit protective conductor same as live conductors. Bond accessible metal parts of column or bollard to earthing terminal.

Y73.4220 CONNECTIONS TO LUMINAIRES

Cable Protection

Use appropriate size of grommet where cables enter through hole in luminaire body.

Earthing

Ensure that the earthing terminal of Class 1 luminaires is connected to the conduit protective conductor of the supply circuit.

Loose Wiring

Clip or tie back with suitable proprietary devices loose wiring within luminaire, at 300mm intervals.

Y73.4230A CONNECTIONS TO LUMINAIRES - DIRECT TO CONDUIT - TERMINAL BOX:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire.

Y73.4230B CONNECTIONS TO LUMINAIRES - DIRECT TO CONDUIT - AT LUMINAIRE:

Terminate circuit wiring at supply terminals of luminaire. Take all conductors through same cable entry into luminaire.

Y73.4270 CONNECTIONS TO LUMINAIRES - CONDUIT SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cable from terminal block to luminaire, installed within tube.

Y73.4280 CONNECTIONS TO LUMINAIRES - ROD OR CHAIN SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire and clip cable to one of the rods or chains, do not weave cable through links of the chain.

Y74 ACCESSORIES FOR ELECTRICAL SERVICES

Y74.1000 GENERAL:

1010 APPLICATION:

Supply fixed electrical wiring accessories for use with fixed and portable peripheral equipment using either power or signalling cables.

1020 SAMPLES:

- Submit samples of proposed materials and equipment for approval before work is started. Label

each sample with name, catalogue number and reference to the use or services.

Y74.2010A ACCESSORIES COMMON REQUIREMENTS - WHITE PLASTIC PLATES GRID, FLUSH INSTALLATION:

Area of installation - Interior.

Enclosure pattern - Flush.

Accessory mounting

Adjustable steel grid for grid switches or direct to enclosure for all other accessories.

Enclosure material- Pressed steel.

Enclosure finish - Galvanized.

Coverplate finish, all accessories to match

Moulded plastic, colour - white.

Coverplate pattern - Overlapping; with architrave where indicated.

Ancillaries

Earthing terminal integral within switch box.

Neon indicator with red lens, illuminated in "ON" position, for connection units.

Switch rocker bar colour - white.

Operating keys for key operated switches, minimum number 2.

Fuses to BS 1362.

Blank inserts for spare ways on grid switches.

Marking

Method - engraving. Mark front plate to indicate equipment served on connection units.

Conduit and cable entries

Knockouts side, top and rear.

Cable termination - Manufacturer's standard.

Y74.2010B ACCESSORIES COMMON REQUIREMENTS - MATT CHROME FINISH METAL PLATES, FLUSH INSTALLATION:

Area of installation - Interior.

Enclosure pattern - Flush.

Accessory mounting

Adjustable steel grid for grid switches or direct to enclosure for all other accessories.

Enclosure material - Pressed steel.

Enclosure finish - Galvanized.

Coverplate finish, all accessories to match

Brass with matt chrome surface.

Coverplate pattern - Overlapping; with architrave where indicated.

Ancillaries

Earthing terminal integral within switch box.

Neon indicator with red lens, illuminated in "ON" position, for connection units.

Switch rocker bar colour as indicated.

Operating keys for key operated switches, minimum number 2.

Fuses to BS 1362.

Blank inserts for spare ways on grid switches.

Marking

Method - engraving. Mark front plate to indicate equipment served on connection units.

Conduit and cable entries

Knockouts side, top and rear.

Cable termination - Manufacturer's standard.

Y74.2010C ACCESSORIES COMMON REQUIREMENTS - WHITE PLASTIC PLATES, EMBEDDED CABLES, SURFACE INSTALLATION:

Area of installation - Interior.

Enclosure pattern - Surface.

Accessory mounting - Direct to enclosure.

Enclosure material - White moulded plastic.

Coverplate finish, all accessories to match

 Moulded plastic, colour - white.

Coverplate pattern - Surface type.

Ancillaries

 Earthing terminal integral within switch box.

 Neon indicator with red lens, illuminated in "ON" position, for connection units.

 Switch rocker bar colour as indicated.

 Operating keys for key operated switches, minimum number 2.

 Fuses to BS 1362.

Marking

 Method - engraving. Mark front plate to indicate equipment served on connection units.

Conduit and cable entries

 Knockouts side, top and rear.

Cable termination - Manufacturer's standard.

Y74.2010D ACCESSORIES COMMON REQUIREMENTS - METAL CLAD PLATES, SURFACE STEEL CONDUIT INSTALLATION:

Area of installation - Interior.

Enclosure pattern - Surface.

Accessory mounting - Direct to enclosure.

Enclosure material

 Pressed steel or cast iron.

Enclosure finish

 As conduit system or galvanized.

Coverplate finish, all accessories to match

 Metal clad.

Coverplate pattern - Surface type.

Ancillaries

 Earthing terminal integral within switch box.

 Neon indicator with red lens, illuminated in "ON" position, for connection units.

 Switch rocker bar colour as indicated.

 Operating keys for key operated switches, minimum number 2.

 Fuses to BS 1362.

Marking

 Method - engraving. Mark front plate to indicate equipment served on connection units.

Conduit and cable entries

 Threaded entries, top, bottom or side to suit conduit system.

Cable termination - Manufacturer's standard.

Y74.2010E ACCESSORIES COMMON REQUIREMENTS - SURFACE, STEEL CONDUIT, WEATHERPROOF INSTALLATION:

Area of installation - Exterior.

Enclosure pattern - Surface and weatherproof.

Accessory mounting - Direct to enclosure.

Enclosure material - Cast iron.

Enclosure finish - As conduit system or galvanized.

Coverplate finish, all accessories to match

 As enclosure.

Coverplate pattern - Surface type.

Ancillaries

 Earthing terminal integral within switch box.

 Neon indicator with red lens, illuminated in "ON" position, for connection units.

 Screwed weathering cap and chain for socket outlets.

 Operating keys for key operated switches, minimum number 2.

 Fuses to BS 1362.

Marking

 Method - engraving. Mark front plate to indicate equipment served on connection units.

Conduit and cable entries

Threaded entries, top, bottom or side to suit conduit system.

Cable termination - Manufacturer's standard.

Y74.2010F ACCESSORIES COMMON REQUIREMENTS - SURFACE, PLASTIC, WEATHERPROOF INSTALLATION:

Area of installation - Exterior.

Enclosure degree of protection to BS EN 60529, IP 54.

Enclosure pattern - Surface and weatherproof.

Accessory mounting - Direct to enclosure.

Enclosure material - Impact resistant plastic.

Enclosure finish - Natural or self coloured.

Coverplate finish, all accessories to match

Moulded plastic, colour as indicated.

Coverplate pattern - Surface type.

Ancillaries

Earthing terminal integral within switch box.

Neon indicator with red lens, illuminated in "ON" position, for connection units.

Protective shrouds to rocker bars.

Screwed weathering cap and chain for socket outlets.

Switch rocker bar colour as indicated.

Operating keys for key operated switches, minimum number 2.

Fuses to BS 1362.

Conduit and cable entries

Threaded entries to suit cable/conduit system.

Cable termination - Manufacturer's standard.

Y74.2010G ACCESSORIES COMMON REQUIREMENTS - BRONZE FINISH METAL PLATES GRID, FLUSH INSTALLATION:

Area of installation - Interior.

Enclosure pattern - Flush.

Accessory mounting

Adjustable steel grid for grid switches or direct to enclosure for all other accessories.

Enclosure material - Pressed steel.

Enclosure finish - Galvanized.

Coverplate finish, all accessories to match

Brass with BMA/bronze surface.

Coverplate pattern - Overlapping; with architrave where indicated.

Ancillaries

Earthing terminal integral within switch box.

Neon indicator with red lens, illuminated in "ON" position, for connection units.

Switch rocker bar colour as indicated.

Operating keys for key operated switches, minimum number 2.

Fuses to BS 1362.

Blank inserts for spare ways on grid switches.

Marking

Method - engraving. Mark front plate to indicate equipment served on connection units.

Conduit and cable entries

Knockouts side, top and rear.

Cable termination - Manufacturer's standard.

Y74.2020A INTERIOR LIGHTING SWITCHES - GENERAL PURPOSE MOULDED PLASTIC:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rocker bar - moulded plastic.

Rating - 6A.

Gangs as indicated.

Switch mechanism - Snap action microgap.

Pole configurations

Single pole, double pole, 2 way or intermediate as indicated.

Y74.2020B INTERIOR LIGHTING SWITCHES - GRID MOULDED PLASTIC:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rocker bar - moulded plastic.

Rating - 6A.

Switch mechanism - Snap action microgap.

Pole configurations

Single pole, 1 way, 2 way or intermediate as indicated.

Y74.2020C INTERIOR LIGHTING SWITCHES - PULL CORD:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Cord to BS EN 61058-2-1.

Rating - 6A. Pole configurations - Single pole.

Y74.2020D INTERIOR LIGHTING SWITCHES - GENERAL PURPOSE SECRET KEY:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rocker bar - secret key.

Rating - 6A.

Gangs as indicated.

Switch mechanism - Snap action microgap.

Pole configurations - Single pole, double pole, 2 way or intermediate as indicated.

Y74.2020E INTERIOR LIGHTING SWITCHES - GENERAL PURPOSE DIMMER:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rocker bar - dimmer.

Rating - 6A.

Gangs as indicated.

Switch mechanism - Snap action microgap.

Pole configurations - Single pole, double pole, 2 way or intermediate as indicated.

Y74.2020F INTERIOR LIGHTING SWITCHES - GRID SECRET KEY:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rocker bar - secret key.

Rating - 6A.

Switch mechanism - Snap action microgap.

Pole configurations - Single pole, 1 way, 2 way or intermediate as indicated.

Y74.2030A EXTERIOR LIGHTING SWITCHES - METAL CLAD ROTARY:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rotary disc or lever operating through sealing gland.

Rating - 6A.

Gangs as indicated.

Action - Two position.

Pole configurations as indicated.

Y74.2030B EXTERIOR LIGHTING SWITCHES - SEALED ROCKER BAR:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rocker bar with sealed in plastic membrane.
Rating - 6A.
Gangs as indicated.
Action - Two position.
Pole configurations as indicated.

Y74.2040A TIME SWITCHES - 24 HOUR:

Wire timer and switch circuits to separate terminals.
Standard - BS EN 60730-2-7.
Time switch type - Quartz stabilized solid state 50 hour nickel cadmium battery backup.
Contacts duty - Inductive.
Contacts rating - 15A.
Special programme facilities
 Number of 'ON' and 'OFF' operations - 4
Programme repeat cycle - 24 hour.

Y74.2040B TIME SWITCHES - 7 DAY:

Wire timer and switch circuits to separate terminals.
Standard - BS EN 60730-2-7.
Time switch type
 Quartz stabilized solid state 50 hour nickel cadmium battery backup.
Contacts duty - Inductive.
Contacts rating - 15A.
Special programme facilities
 Number of "ON" and "OFF" operations - 4
Programme repeat cycle - 7 day.

Y74.2050A LUMINAIRE CONNECTORS - GENERAL AND EMERGENCY LIGHTING:

Rating - 2A.
Connector type
 Fixed terminal strip, screw cover and cord grip to BS 67.
Load carrying capacity to match selected luminaire.

Y74.2050B LUMINAIRE CONNECTORS - GENERAL LIGHTING:

Rating - 2A.
Connector type
 3 pin plug/socket to BS 546.
Load carrying capacity to match selected luminaire.

Y74.2050C LUMINAIRE CONNECTORS - CORD GRIP GENERAL AND EMERGENCY LIGHTING:

Rating - 2A.
Connector type
 Cord grip type plug/socket and screw on retaining cover to BS 5733 3 pin or 4 pin.
 Luminaire supporting coupler to BS 7001.
Load carrying capacity to match selected luminaire.

Y74.2080A FUSE CONNECTION UNITS - SWITCHED:

Standard - BS 1363-4, enclosure box to BS 4662 and switched.
Unit type - Rocker bar - plastic.
Pole configuration - DP.
Ancillaries
 Cord outlet or cord grip and fuse as indicated.

Y74.2080B FUSE CONNECTION UNITS - UNSWITCHED:

Standard - BS 1363-4, enclosure box to BS 4662 and unswitched.

Pole configuration - DP.

Ancillaries

Cord outlet or cord grip and fuse as indicated.

Lockable fuse carrier.

Y74.2090A SOCKET-OUTLETS - SINGLE, SWITCHED:

Standard - 13A socket-outlet to BS 1363, enclosure box to BS 4662.

Switching - Switched.

Switch type - Rocker bar - plastic.

Rating - 13A.

Ancillaries

Plug tops 25% of number of sockets, fused as indicated.

Gangs - 1

Y74.2090B SOCKET-OUTLETS - SINGLE WITH INTEGRAL RCD, SWITCHED:

Standard - Enclosure box to BS 4662, BS 7288.

Switching - Switched

Switch type - Rocker bar - plastic.

Rating - 13A.

Ancillaries

RCD, BS 7288. Mains failure trip, sensitivity 30mA. Plug tops 25% of number of sockets, fused as indicated.

Gangs - 1

Y74.2090C SOCKET-OUTLETS - DOUBLE SWITCHED:

Standard - 13A socket-outlet to BS 1363, enclosure box to BS 4662.

Switching - Switched

Switch type - Rocker bar - plastic.

Rating - 13A.

Ancillaries

Plug tops 25% of number of sockets, fused as indicated.

Gangs - 2

Y74.2090D SOCKET-OUTLETS - SINGLE, UNSWITCHED:

Standard - 13A socket-outlet to BS 1363, enclosure box to BS 4662.

Switching - Unswitched.

Rating - 13A.

Gangs - 1

Y74.2090E SOCKET-OUTLETS - SINGLE WITH INTEGRAL RCD, UNSWITCHED:

- Standard
 - Enclosed box to BS 4662, BS 7288.
 - HBES systems BS EN 50428, enclosure box to BS 4662.

Switching - Unswitched.

Rating - 13A.

Ancillaries

RCD, BS 7288. Mains failure trip, sensitivity 30mA.

Gangs - 1

Y74.2100A COOKER CONTROL UNIT - WITH INTEGRAL SOCKET:

Standard - BS 4177, enclosure box to BS 4177.

Unit type - With integral 13A switched socket-outlet and pilot lamp.

Pole configuration - DP.

Rating - 45A.

Y74.2170A AERIAL SOCKETS - TV AND DAB AERIALS:

Standard - BS 3041-2.

Circuit configurations - Dual TV and DAB.

Ancillaries

Safety isolation to BS 6330 for communal aerial systems.

Y74.2170B AERIAL SOCKETS - SINGLE TV AERIALS:

Standard - BS 3041-2.

Circuit configurations - Single TV.

Ancillaries

Safety isolation to BS 6330 for communal aerial systems.

Y74.3010 EARTHING:

Ensure metal framework of equipment is bonded to main earth point. Ensure that cable CPC's are connected to earth bar.

Provide earth CPC between earth lug on metal box and accessory casing except where accessory is encased in plastic.

Y74.3020 PROTECTION:

Ensure there is no physical or electrical damage to accessories when they are removed from their packaging and during installation.

Provide masking covers for surface mounted accessories to protect surface from paint.

Where accessories are flush mounted install front plate after painting is finished.

Y74.3030 FIXING:

Align accessories horizontally and vertically. Where accessories are grouped, mount horizontally in line and parallel to each other and equidistant.

Fix cover plates to boxes with brass fixing screws.

Y74.3040 MEASURING MOUNTING HEIGHTS:

Take measurement for position of electrical accessories to the centre line of equipment from either finished floor or worktop. Where specified height coincides with top of tiling, leave a clear gap of 50mm above tiling.

Mount equipment below a worktop 100mm below underside of worktop.

Y74.3050 STANDARD ACCESSORIES MOUNTING HEIGHTS:

Accessory	Location	Height (mm)
Lighting switch		1200
Socket outlet	General	450
	Kitchen	1000
	Above worktop	200

Shaver socket outlet		1000
Fused connection unit	General	450
	Above worktop	200
Fused connection unit controlling	Radiator heater, wall	1800
	Radiator heater, focal point	450
	Tubular heater	450
	Clock	1900
Cooker control unit	Above worktop	200
Cooker connection unit		600
Safety isolating transformer		1200
Room thermostat		1400
Telephone outlet		450
Radio/TV outlet		450
Push button		1200
Fire alarm manual call point		1200
Bell or buzzer		2000
Visible alarm indicator		2000

In car parks and garages comply with appropriate petroleum regulation for mounting heights of socket outlets.

Y74.3070 ACCESSORIES MOUNTING HEIGHTS:

Provide switches and socket outlets for lighting and other equipment in habitable rooms at appropriate heights between 450mm and 1200mm from finished floor level, in accordance with Building Regulations Approved Document M and BS 8300.

Y80 EARTHING AND BONDING COMPONENTS

Y80.1000 GENERAL

1010 MATERIALS GENERALLY:

Use materials and installations methods in accordance with BS 6651, BS 7671, BS 7430, Electricity Safety, Quality and Continuity Regulations and Local Electricity Supply Authority Requirements as appropriate.

Y80.2010A CONDUCTORS FOR LIGHTNING PROTECTION SYSTEMS - HORIZONTAL AIR TERMINATIONS:

- Covering colour

Use - Horizontal air termination or down conductor.

Minimum dimension - BS EN 50164-2 Table 1.

Form - Strip.

Material - Copper, annealed.

Coverings - None or PVC.

Accessories - Ridge Saddle; conductor clips - non-metallic; glazing bar holdfast; slate holdfast; backplate holdfast; all accessories sized to suit conductors.

Y80.2010B CONDUCTORS FOR LIGHTNING PROTECTION SYSTEMS - SELF SUPPORTING AIR TERMINATIONS:

Use - Air termination, vertical.

Minimum dimension - BS EN 50164-2 Table 1.

Form - Rod.

Material - Copper, hard drawn.

Coverings - None.

Accessories - Terminal base; ridge saddle; rod brackets; rod to tape coupling.

Y80.2010C CONDUCTORS TO EARTHING SYSTEMS TO BS 7430:

Use - Earthing conductor.

Minimum dimension - BS 7430, current density 50A/mm².

Form - Strip.

Material - Copper, annealed.

Coverings - None.

Accessories - Conductor clips, metallic.

Y80.2020A LIGHTNING PROTECTION CONDUCTOR JOINTS:

First Conductor

Form - strip; material - copper.

Dimensions - To BS EN 50164-2 Table 1 minimum for lightning protection system.

Second conductor

Form - rod; material - copper.

Dimensions - To BS EN 50164-2 Table 1 minimum for lightning protection system.

Solid joint - Brazed or welded, thermic.

Disconnecting test joint

Square clamp, oblong clamp, plate clamp or screw-down clamp.

Y80.2020B EARTHING SYSTEMS CONDUCTOR JOINTS:

First Conductor

Form - strip; material - copper.

Dimensions - For conductor current density 50A/mm² earthing systems.

Second conductor

Form - rod; material - copper.

Dimensions - For conductor current density 50A/mm² earthing systems.

Solid joint - Brazed or welded, thermic.

Disconnecting test joint

Square clamp, oblong clamp, plate clamp or screw-down clamp.

Y80.2030A TAPE FIXING DEVICES:

Secure bare conductor tape to structure with fixing devices which avoid piercing tape and ensure 3mm (minimum) clearance of tape from structure, at 450mm maximum, centres.

Material for lightning protection systems

Non-conducting.

Material for system earthing

Bronze.

Y80.2040A ROD EARTH ELECTRODES FOR LIGHTNING PROTECTION SYSTEMS:

Standard - BS 6651. Form - Roll threaded rod.

Dimensions

Rod Diameter - 15 mm - nominal.

Rod Length - 2.4m (2 x 1.2) minimum.

Earth electrode couplings

Use silicon bronze alloy or aluminium bronze alloy, counter bored to completely enclose rod threads. Ensure rods meet in centres of coupling.

Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.

Interconnect electrodes using 25 x 3 mm bare copper tape.

Earth electrodes in drawpits

Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases. Material, minimum size as BS 7430 Table 4

Molecularly bonded copper clad steel rods to BS 7430 or BS 6651.

Accessories

Rod to tape clamp or U-bolt clamp. Accessories sized to suit earth rod and connector.

Y80.2040B ROD EARTH ELECTRODES FOR SYSTEM EARTHING:

Standard - BS 7430.

Form - rod with female thread each end.

Dimensions

Rod Diameter - 15 mm - nominal.

Rod Length - 2.4m (2 x 1.2) minimum.

Earth electrode couplings

Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.

Interconnect electrodes using bare copper tape 25mm x 6mm.

Earth electrodes in drawpits

Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases. Main earth conductor connection

Connect main earth conductor to first electrode using heavy duty purpose made silicon aluminium bronze body conductor clamp and high tensile phosphor bronze bolt.

Material, minimum size as BS 7430 Table 4 - Copper.

Accessories

Rod to tape clamp. Sized to suit earth rod and connector.

Y80.2040C BUILDING OR STRUCTURAL ELEMENT EARTH ELECTRODES FOR LIGHTNING PROTECTION SYSTEMS:

Standard - BS 6651.

Form - Building or structural element.

Earth electrode couplings

Use silicon bronze alloy or aluminium bronze alloy, counter bored to completely enclose rod threads. Ensure rods meet in centres of coupling.

Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.

Interconnect electrodes using 25 x 3 mm bare copper tape.

Earth electrodes in drawpits

Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases. Material, minimum size as BS 7430 Table 4

Molecularly bonded copper clad steel rods to BS 7430 or BS 6651.

Accessories

Rod to tape clamp or U-bolt clamp. Accessories sized to suit earth rod and connector.

Y80.2040D BUILDING OR STRUCTURAL ELEMENT EARTH ELECTRODES FOR SYSTEM EARTHING:

Standard - BS 7430.

Form - Building or structural element.

Earth electrode couplings

Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.

Interconnect electrodes using bare copper tape 25mm x 6mm.

Earth electrodes in drawpits

Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases.

Main earth conductor connection

Connect main earth conductor to first electrode using heavy duty purpose made silicon aluminium bronze body conductor clamp and high tensile phosphor bronze bolt.

Material, minimum size as BS 7430 Table 4 - Copper.

Accessories

Rod to tape clamp. Sized to suit earth rod and connector.

Y80.2060A EARTH ELECTRODE CLAMPS:

Connect tape to electrode head using heavy duty purpose made silicon aluminium bronze body connector clamps or leaded gunmetal body connector clamps, and high tensile phosphor bronze bolts to BS EN 12163.

Y80.2070A EARTH ELECTRODE INSPECTION FACILITIES:

Provide enclosure for each connection between earth conductor and associated earth electrode system. Install so that top is flush with finished ground or floor level. Ensure enclosure provides adequate access for testing purposes. Provide pit details for builders work.

Labelling - Wording, Earth.

Y80.2080A EARTH ELECTRODE TANK PENETRATION SEAL:

Dimensions

Screed depth (mm) 54 minimum.

Slab depth (mm) 158 maximum.

Flange area (m²) 0.125 minimum.

Form - Earth rod to tube seal by compression ring and seal.

Slab former - Standard earth rod pit.

Y80.2090A MAIN EQUIPOTENTIAL BONDS:

Provide main equipotential bonds in accordance with BS 7430 and BS 7671.

Material - Insulated cable, single core to BS 6004.

Use no joints in main equipotential bonds.

Y80.2100A SUPPLEMENTARY EQUIPOTENTIAL BONDS:

Provide supplementary equipotential bonds to BS 7430 and BS 7671. Joints not allowed in these bonds.

Material - Insulated cable, single core to BS 6004.

Y80.2110A CIRCUIT PROTECTIVE CONDUCTORS:

Material

Insulated cable, single core to BS 6004 as indicated; metallic screwed conduits (excluding flexible); metallic trunking with tinned copper links; armouring and/or metallic sheathing of armoured cables or integral conductor of multi-core cable.

Size

Provide protective conductors sized in accordance with BS 7671 (IEE Regulations) 543-01-03 and Tables 54B, 54C, 54D, 54E and 54F or provide protective conductors sized in accordance with BS 7671 (IEE Regulations) 543-01-04 and Table 54G.

Y80.2120 EARTHING CLAMPS:

Use clamps complying with BS 951, for bonding pipes and lead sheathed cables.

Y80.2130A EARTH BUSBARS:

Material

Manufacture earth busbars from hard drawn, tinned, high conductivity copper bar.

Substation Earth busbar

75 x 13mm cross section 600mm minimum length.

Main Earth Terminal busbar

25 x 6 mm minimum for incoming live conductor not exceeding 50mm and 50 x 6 mm minimum for incoming live conductor over 50mm².

Y80.2140 TEST LINKS:

Provide two test links, in connections between main earth conductors and earth busbar. Fabricate each from two additional sections of earth busbar. Mount one section on stand-off insulators matching earth busbar; use remaining section as removable test link. Secure 12mm high tensile brass studs to fixed sections of busbar and drill corresponding clearance holes in test links and provide brass washers, nuts and locking devices to secure frame/neutral earthing and test links.

Y80.2150 LUGS/TAGS:

Provide lugs or tags to enable connection of bonding conductors to equipment earth terminals.

Y80.2160 PROTECTIVE CABLE TERMINATIONS:

For bolted connections use crimp type lugs compressed by automatic tool to achieve correct pressure and crimp depth.

Y80.2170 PROTECTIVE CONDUCTOR WARNING NOTICES/LABELS:

Provide a permanent label durably marked in letters 4.75mm minimum height "SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE", in visible position, at each bonding conductor connection to extraneous conductive parts.

Y80.2180 MAIN EARTH CONDUCTOR - WARNING TAPES:

Provide green/yellow PVC tapes labelled "EARTHING CONDUCTOR" over complete external lengths of main earth conductors at 300mm depth below finished ground.

Y80.2190 EARTH BAR LABEL:

Label earth bar "SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE" with wall mounted laminated plastic tablet engraved in 10mm high red letters on white ground.

Y80.3010 CLEAN EARTH DISTRIBUTION:

Install clean earth distribution in double insulated cables from earth electrodes to equipment points. Mount all busbars with insulators and separate from other earthing systems.

Y80.3020 DISSIMILAR METALS:

Ensure, where dissimilar metals are used for system, that purpose made jointing materials are used such that corrosion and deterioration of the electrical connection are not caused. Ensure bonding connections to other metal parts of building are electrolytically compatible with those metal parts. Use the guidance given in BS 7430 Table 8 when bonding dissimilar materials.

Y80.3030A COPPER TAPE JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint copper tapes by brazing, using zinc-free brazing metal with melting point at least 600°C or thermic welding.

Y80.3030B ALUMINIUM TAPE JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint aluminium tapes by welding to BS EN 1011-4.

Y80.3040 STRANDED CONDUCTOR JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint copper stranded conductors with compression joints to BS EN 61284.

Y80.3050A PROTECTIVE CABLE TERMINATIONS:

For bolted connections use crimp type lugs compressed by automatic tool to achieve correct pressure and crimp depth.
Make connections between tape and equipment using high tensile grade brass bolts with brass nuts, washers and locking devices. Use phosphor bronze bolts, nuts and washers where connections are liable to corrosion.

Y80.3060A EARTH ELECTRODES:

Location

Locate electrodes not less than 2m distant from building/structure protected, and away from telecommunication and pilot cables and metallic fences.

Driving

Drive rods vertically into ground with purpose designed electric hammer. (Where impenetrable strata encountered at shallow depth, drive at 30° to horizontal).

Depth of rod

2.4m minimum below finished ground surface.

Depth of Electrode heads

Locate electrode heads just below ground level.

Spacing

Where electrodes are installed in a group ensure minimum distance between electrodes is twice depth of rods. Where rods for clean earth are installed ensure distance from any other system rods is six times depth of clean rods.

Tape Depth

Install interconnecting or electrode tape 750mm below finished ground level, rising vertically at each electrode.

Connect groups of electrodes to main earth conductor via bolted link in inspection pit as BS 7430 for test purposes.

Y81 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

Y81.1000 GENERAL

1010 INSPECTION AND TEST PROCEDURE:

Comply with BS 7671 Requirements for Electrical Installations (the IEE Wiring Regulations), IEE Guidance Notes Number 3 Inspection Testing and other British Standards as appropriate.

1020 SUPPLY CHARACTERISTICS:

Obtain information called for in BS 7671 about supply characteristics from Supplier, other than where to be measured as part of testing procedure.

1030 DESIGN INFORMATION:

Obtain all design assumptions, calculations and any other information to enable compliance with BS 7671 to be verified.

Y81.2010A INCORPORATED EQUIPMENT CHARACTERISTICS:

Obtain and use information from manufacturers of equipment provided.
Use information provided, for equipment supplied by others and incorporated into installation.

Y81.2020A PROSPECTIVE SHORT CIRCUIT CURRENT:

Determine values of I_p by measurement, unless other means are indicated. Determine I_p at all necessary points within installation to confirm correct equipment selections.
Obtain from supply undertaker written confirmation of maximum and minimum values of I_p at origin of installation. Adjust subsequent measured values of I_p accordingly.

Y81.2030A INITIAL VERIFICATION:

Carry out detailed inspection to verify the requirements of BS 7671, Section 712 in the order given in clause 712-01-03 for New Installation or Altered or Added Installation as appropriate.

Y81.2040A TEST EQUIPMENT AND CONSUMABLES:

Provide test equipment and consumables to complete tests satisfactorily, and to retest any failed installations following corrective measures.

Test equipment quality assurance requirements to BS EN ISO 10012.

Y81.2050A TESTING

Carry out in the same order as published the tests required by BS 7671, Section 713 for New Installation or Altered or Added Installation as appropriate.

Y81.2060A CONTINUITY OF PROTECTIVE CONDUCTORS:

Confirm continuity. Use ac source or dc source.

Y81.2070A EARTH FAULT LOOP IMPEDANCE:

Use 25 A test current. Measure and record source impedance (Z_E).
If alternative LV supply arrangements are available, measure Z_s when using supply with highest impedance.
Measure Z_s with main equipotential bonding conductors connected. Do not summate values of several parts of each loop.

Y81.2080 SETTINGS AND ADJUSTMENTS:

Confirm characteristics and settings of protective devices are within maximum and minimum specified tripping times. Check correct operation of devices. Confirm interlocks and sequences operate safely and as indicated.

Y81.2090A STANDBY GENERATORS:

Perform works tests on standby generators and provide test certificates. Comply with BS 5000-3 and BS 5000-11 or BS EN 60034-3 as appropriate.

Y81.2100A HV AND LV TRANSFORMERS:

Perform works tests on HV and LV switchgear in accordance with BS EN 62271-200 and BS EN 60439-1, as appropriate, and provide test certificates.

Y81.2110A HV POWER TRANSFORMERS:

Perform works tests on HV power transformers in accordance with BS EN 60076-3, BS EN 60076-4 and BS EN 60076-5. Provide test certificates.
Perform all routine tests.

Y81.2120A FIRE DETECTION AND ALARM INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for fire detection and alarm systems in accordance with BS 5839-1.

Y81.2120B LIGHTNING PROTECTION INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for lightning protection installations in accordance with BS 6651.

Y81.2120C FIRE PROTECTION OF ELECTRONIC DATA PROCESSING INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for fire protection of electronic data processing installations in accordance with BS 6266.

Y81.2120E EMERGENCY LIGHTING INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for emergency lighting installations in accordance with BS 5266 and BS EN 50172.

Y81.2130 CALIBRATION:

Provide current certificates of calibration for all instruments used during test procedures. Record particular instrument identity on record sheets.

Y81.2140A CERTIFICATION AND REPORTING:

Complete and hand over to the Client a Completion and Inspection Certificate to BS 7671 Appendix 6 for New Installation or Altered or Added Installation as appropriate.

Y81.2150A INSTALLATION CERTIFICATES:

Provide installation certificates for electrical installations in accordance with BS 7671 (IEE Regulations).
Record details of departures from BS 7671 (IEE Wiring Regulations) on certificate.
Provide copies of calculations justifying departure from BS 7671 (IEE Wiring Regulations) and attach to certificates.

Y81.2160 RECORDS:

Record all results and instrument readings on approved Record Sheets and hand over to the client two copies for each inspection and test.
Hand over copies of complete Record Sheets to

- Client.

Provide copies of Record Sheets

- 2.

Y81.3010 CONDUCTIVE PARTS:

Test conductive parts simultaneously accessible with exposed conductive parts of extraneous conductive parts. Establish that they are either not an extraneous conductive part, or that they are reliably connected by metal to main equipotential bonding.

Confirm conductive parts which are not extraneous conductive parts are separated from earth by an impedance greater than 50,000 ohms. Confirm other conductive parts are bonded to equipotential zone earthbar by an impedance not exceeding 0.1 ohms.

Y81.3020 PHASE SEQUENCE:

Check and confirm correct polarity of all conductors in all circuits.

Y81.3030A HIGH VOLTAGE TESTS:

Conduct high voltage tests for equipment indicated. Comply with BS 923-1, BS EN 61180 and BS EN 60060-2. Comply with BS EN 61180.

Y81.3040A LV BURIED CABLES:

Test continuity and insulation of buried cables immediately after back-filling. Test continuity and insulation of buried cables prior to handover.

Y81.3040B HV AND LV BURIED CABLES:

Test continuity and insulation of buried cables immediately after back-filling. Test continuity and insulation of buried cables prior to handover. Perform HV tests on buried HV cables prior to handover.

Y81.3050 CONDUIT, TRUNKING AND DUCTING:

Test and confirm electrical continuity before installing cables.

Y82 IDENTIFICATION - ELECTRICAL

Y82.1000 GENERAL

Y82.2010A LABELS AND NOTICES:

Apply identification labels and notices in accordance with BS 7671 (IEE Wiring Regulations), Clause 514 to all electrical cables plant and equipment including components of mechanical systems.

Identification of protective devices.

Diagrams, charts or tables to comply with Clause 514-09.

Warning notices, voltages in excess of 250 volts.

Periodic inspection and test notices.

Residual current device notices.

Earth electrode safety electrical connection label.

Bonding conductor connector point to extraneous conductive parts label.

Earth free local equipotential bonding areas warning notice.

Electrical separation areas warning notice.

Outdoor equipment socket outlet notice.

Y82.2020A MATERIALS:

Use materials for labels and notices with a predicted life equal to or greater than the design life of the electrical cables, plant, equipment or installation to which it refers.

External

Signwritten, or stencil in paint compatible with surface.

Colour - Background, plant standard finish. Lettering, white.

Internal

Engraved thermosetting plastic laminate.

Colour - Background, white or red. Lettering, red or white.

Y82.2030A FIXING - INTERNAL:

Fix labels and notices using materials compatible with label or notice and surface to which it is fixed by screws into tapped hole or bolted complete with washer nut and locking device.

Y82.2040A ARRANGEMENT:

Obtain approval prior to manufacture, with regard to style, colour, lettering, size and position of all labels and notices.

Provide sample showing style, colour, lettering and size, for approval.

Y82.2050A LETTERING AND SIZE OF LABELS AND NOTICES:

Ensure that all lettering and symbols comply with the requirements laid out in BS 7671 (IEE Wiring Regulations), paragraph 514 and BS 5499. Use BS 5499-1 for height of lettering where not otherwise indicated. Ensure labels and notices of adequate size for the lettering required, and allow a minimum margin around all lettering of one line space vertically and two letter spacing horizontally.

Font - Helvetica Medium.

Size - BS 5499-1 or 5mm minimum high letters.

Y82.2060A CONDUCTOR ARRANGEMENT:

Arrange circuit polarity so that phases read in phase rotation order followed by the neutral, if any, from top to bottom in horizontal conductor layouts and left to right in vertical conductor layouts. Ensure flat horizontal arrays have leading phase to the left and neutral to the right from left to right when viewed from supply point. Arrange phase or live pole of two wire apparatus at top or left hand and neutral and earth both at bottom or right hand side. In all cases, ensure conductor arrangements defined are when viewed from front face of all equipment and terminating facilities. Apply identification markers in accordance with BS 7671 (IEE Wiring Regulations), Clause 514 to all conductor termination points.

Y82.2070A SAFETY SIGNS:

- Details of supplementary or text signs as indicated on drawing

Label all electrical plant and equipment using safety sign 8.A.0044 of BS 5499-5 where voltages above ELV exist.

Provide supplementary or text signs complying with BS 5499-5 with each safety sign 8.A.0044 as indicated.

Label all electrical plant and equipment with the labels specified in the appropriate British Standards for that plant or equipment.

Identify each substation and main switchroom with safety sign 8.A.0044 to BS 5499-5 with supplementary signs to BS 5499-5, notices and signs required by BS 5499-5 for any fire extinguishing system and notice giving details of,

Name of the Substation or switchroom

The presence of Medium and Low Voltages.

Administrative instructions for access.

Location and method of contacting controlling authority.

Actions to be taken in an emergency.

Y82.2080A PLANT AND EQUIPMENT LABELS:

Fit labels on all items of plant, equipment, switches, etc., include the following information: service controlled, circuit reference, voltage, type of supply and phase etc., circuit protection type and rating.

Y82.2085 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Graphical symbols for use on equipment to be created and applied in accordance with BS EN 80416-1, BS EN 80416-2, BS EN 80416-3.

Y82.2090 MAINTENANCE NOTICES:

Equipment

Fix notices giving warning of, and instructions on, any special maintenance procedures to plant and equipment.

Y82.2100 COLOUR CORRECTED LIGHT FITTINGS:

Fix a warning or identification disc to light fittings containing colour corrected fluorescent tubes or other colour corrected light sources to ensure that maintenance staff install the correct lamps.

Y82.2110A MOTORS AND STARTERS LABELS:

Fit identification labels to all motors, starters and starter panels. Ensure positive identification of respective motors and starters. Provide motors with non-corrodible labels attached adjacent to each bearing giving details of the lubricant to be used. Mark direction of normal rotation on motor casing. Provide labels to identify motor equipment fitted with surge suppressors and thermistors stating that insulation test voltages must not be applied to thermistors and thermistor control units. Ensure labelling is compatible with schematic and wiring diagrams, and complies with BS EN 60034-8.

Y82.2120A ENGRAVED ACCESSORY PLATES:

Engrave switchplates, spur units, pushes and special plates for bed head units, call systems, fire alarms, etc. Use 6mm high letters with engraving coloured red.

Y82.2130A SWITCHGEAR:

Fit labels on switchgear as required by BS 7671 and BS EN 60439 to indicate duty of unit, its voltage, phase and current rating, protective device rating size of conductor involved, and all other necessary details.

Use an agreed serial coding system, provide at the switch a key to the coding system.

Y82.2140 DISTRIBUTION BOARDS:

On each distribution board identify every outgoing way with a renewable circuit chart in a transparent plastic envelope permanently fitted inside distribution board cover. Clearly indicate in typed script, circuit identification number, cable size, fuse or circuit breaker rating and a description of item supplied and area supplied by circuit.

Y82.2180A CONDUIT AND TRUNKING COLOUR CODING:

In areas of mechanical plant or voids accommodating mechanical services, or where otherwise indicated, identify electrical conduits and ducts in accordance with BS 1710. Apply colour orange to BS 4800 by painting on service as a band over 150mm or applying an adhesive tape type wrap around services over a length of 150mm.

Place identification colours at bulkheads, wall penetrations and any other place where identification is necessary.

Y82.2190A CABLE IDENTIFICATION:

Provide all cables, other than final sub-circuit wiring enclosed in conduits or trunking, with labels fixed at each end of cable either side of wall and floor penetrations at approximately 12m intervals at convenient inspection points by means of non-releasable plastic straps, minimum width 4mm. Ensure labels show the reference number of cable.

Y82.2200A TERMINAL MARKING AND CONDUCTOR IDENTIFICATION:

Provide for switchgear and control gear elements whose terminals are marked in accordance with BS 5472 (EN 50005) and BS 6272 (EN 50042). Use a unique reference to identify each element in the switchgear or control gear. Mark on or adjacent to each element its reference. Identify each terminal for connection to external wiring or cabling using a reference system complying with BS EN 60445 based on the element reference and the appropriate element terminal reference.

Adjacent to terminals.

Use lettered or numbered ferrules or sleeves to BS 3858 to mark each auxiliary conductor or control cable core with the identity of the terminal to which it is connected and the reference of plant or equipment to which it is connected and the identity of the terminal at the remote end. Ensure that main circuit conductors are identified in accordance with BS 7671 (IEE Wiring Regulations) paragraph 514. Ensure that all identification of terminals and conductors is recorded and included on record drawings and in operation and maintenance documentation.

Y82.2210A UNDERGROUND CABLE IDENTIFICATION:

Identify external underground cable routes by means of approved markers along their length at distances not exceeding 50m and where a change of direction occurs on such routes. Provide cables markers with a brass plate or impress concrete to clearly indicate the reference of group of cables or reference number of cable and operating voltage of cable. Provide key to any reference system used at switchgear. Mark and protect direct buried cables with plastic tape yellow printed black "DANGER ELECTRIC CABLES" elsewhere.

Y82.2220A CABLE CONDUCTOR COLOUR CODING:

Identify cable conductors in accordance with BS 7671 (IEE Wiring Regulations) paragraph 514, note that a lighting sub-circuit switch wire is a phase conductor in a single phase circuit.

All single phase final sub-circuit phase wiring coded Brown.

Y82.2230 CABLE JOINTING AND TERMINATION:

Connect all cables in the installation so that the correct sequence of phase rotation is maintained throughout. Where straight through joints are approved joint medium voltage conductors as they lie, ensuring their complete length is phased out on completion. Ensure connections at terminations of MV cables are made in the correct phase rotation and ensure cable conductor termination marking if any, complies with this phase sequence. Where straight through joints are approved on low voltage cables, whether power cables or control or auxiliary cables, joint conductors strictly in accordance with their colour or numeric coding. Where such joints are approved on mineral insulated or other non-coded conductor cables, identify each core at the joint and make the joint core to core.

Y82.2240A CABLE SHEATH IDENTIFICATION - INTERNAL:

Use to identify coloured cables sheaths for various services as follows.

- Fire alarm, red;
- Clock circuits, brown;
- Telecommunications, grey;
- Data as system suppliers requirements;
- Control, black;
- LV, black;
- LV mineral insulated, orange;
- MV red.

Code cables for various services using alpha numeric symbols as follows.

Code letters preceding cable reference.
Fire alarm, FA.
Clock, CL.
Telecommunications, T.
Data, D.
Control, C.
Low voltage, LV.
Extra low voltage, ELV.
LV Essential circuits EM.
Medium voltage, HV.

Y82.2250A CABLE SHEATH IDENTIFICATION - EXTERNAL:

Identify cable sheaths for various services in accordance with NJUG Guidelines on the Positioning and Colour Coding of Utilities' Apparatus, as follows.

MV Red; LV Black; telecommunications and data, Grey.

Y82.2250B CABLE SHEATH IDENTIFICATION - EXTERNAL, SCOTLAND:

Identify cable sheaths for various services in accordance with NJUG Guidelines on the Positioning and Colour Coding of utilities' Apparatus, as follows.

MV Red; LV Purple; telecommunications and data, Grey.

Y82.2260A ADDITIONAL SAFETY SIGNS:

Provide at locations shown or as appropriate safety signs to BS 5499 with colours and dimensions as of BS 5499-1.

Application

For main switch and electrical plant room access doors. BS 5499-5, complete with supplementary signs as shown.

6.C.0019. 6.A.002, with supplementary sign "Authorised persons only".

7.A.022

Application

For use with permit to work systems, BS 5499-5, complete with supplementary signs as shown.

6.C.0021. Printed on rigid plastic, with hanging loop, with supplementary wording "Do not operate. Work in progress".

Application

For use at each emergency stop. BS 5499-5, complete with supplementary signs as shown.

9.B.0097. With supplementary sign "Emergency stop push-button".

Y90 FIXING TO BUILDING FABRIC

Y90.1000 GENERAL

1010 PREPARATION:

Mark-out, set-out and firmly fix all equipment, components and necessary brackets and supports.

1020 MANUFACTURER'S DRAWINGS:

Use manufacturer's drawings and templates for purposes of marking and setting out.

1030 FIXINGS:

Ensure structure and fixings are suitable for items to be fixed.

1040 LOADING DETAILS:

Provide loading details for all fixing types.

1050 BUILDING-IN BY OTHERS:

Provide all necessary assistance to enable any item of building-in type to be built in by others.

1060 SIZE OF FIXING:

Use largest size of bolt, screw or other fixing permitted by diameter of hole in item to be fixed.

1070 GREASING OF FIXINGS:

Ensure all bolts, screws or other fixings used are greased or lubricated in accordance with manufacturer's instructions.

Y90.2010 STANDARDS:

Ensure that fixings such as expanding anchors are tested for tensile loading in accordance with BS 5080-1.

Y90.2020 PLUGS:

Use plugs of suitable size and length for fixings. Use plastic, fibrous or soft metal non-deteriorating plugs to suit application. Do not use wood plugs.

Ensure that when screw is in place, threaded length is in plug. Ensure plugs used for screw fixing are set-in to correct depth prior to final tightening.

Y90.2030 SCREWS:

Use screws to BS 1210. Generally use sherardized steel wood screws for fixing to concrete, brickwork or blockwork.

In damp or exposed situations use greased brass wood screws.

Y90.2040 CAST-IN FIXINGS:

Where cast-in fixings are permitted, mark out and set fixings in accordance with manufacturer's instructions.

Y90.2050 SHOT FIRED FIXINGS:

Obtain approval prior to using shot fired type fixings.

Y90.2060 SELF ADHESIVE FIXINGS:

Obtain approval prior to using self adhesive type fixings.

Y90.2070 PROPRIETARY CHANNEL INSERTS:

Provide proprietary channel inserts for casting in where indicated.

Y90.2080 NON-PENETRATIVE SUPPORT SYSTEMS FOR ROOF MOUNTED EQUIPMENT:

- Manufacturer and reference
 - Or approved equivalent

Obtain approval prior to using non-penetrative support systems for roof mounted equipment.

Y90.3010 DRILLING:

Drill holes squarely. Use drills of requisite size and depth, and appropriate to fabric. Do not flame-cut holes in metal work.

Y90.3020 PROPRIETARY FIXINGS:

Comply with manufacturer's instructions for all fixings.

Y90.3030 FIXING TO REINFORCED CONCRETE:

Take precautions to avoid fixing through reinforcement.

Y90.3040 FIXING TO BRICKWORK:

Do not fix to unsound material or mortar between brickwork courses.

Y90.3050 FIXING TO TIMBER RAILS:

Fix equipment, brackets and supports by drilling hole through timber rail and fixing with bolt, back plate, washer and loose nut.

Y90.3060A FIXING TO HOLLOW STUD/TILE/BLOCK WALLS:

Fix equipment, brackets and supports where there is access at rear of wall, by drilling hole through wall and fixing with bolt, back-plate, washer and loose nut.

Fix equipment, brackets and supports where there is no access at rear of wall, drill hole and use screw anchor type fixing or gravity type toggle fixing.

Y90.3070A FIXING TO CONCRETE, BRICKWORK OR BLOCKWORK:

Fix equipment, brackets and supports using wood screws in plugs.

Drill holes and fix using steel bolts of grouted bolt type or expanding bolt type fixing.

Y90.3080A FIXING TO METALWORK:

Fix equipment, brackets and supports by drilling holes and fixing using set screws or bolts complete with washers, shakeproof washers and loose nuts.

Y90.3090A FIXING TO STRUCTURAL STEELWORK AND CONCRETE STRUCTURES:

Provide manufacturer's information on recommended fixing. Obtain approval for any fixing to structure steel work and concrete structures.

Generally use proprietary fixings to structural steelwork and concrete structures.

Obtain approval to cut holes in structural steelwork or concrete structures or weld to structural steelwork.

SERVICES TENDER BREAKDOWN

SERVICES TENDER BREAKDOWN

NOTE: ANY QUOTATIONS PREPARED DURING THE PREVIOUS PROJECT STAGES ARE DEEMED TO BE OUT OF DATE AND THE CONTRACTOR MUST ENSURE THEY ISSUE CURRENT TENDERING INFORMATION TO MANUFACTURERS WHEN OBTAINING QUOTATIONS.

The tenderer is required to fully complete both tender schedule forms and return them with the required tender documentation along with a full schedule of rates for all items to be installed.

<u>Item</u>	<u>Description</u>	<u>Cost</u>
1.	Working drawings	£
2.	Preliminaries	£
3.	Programming and co-ordination	£
4.	Method statements	£
5.	New utility connection to the site	£
5a	L.V connection to building	£
6.	Main switchgear	£
7.	Sub mains and distribution boards	£
8.	General power. Wiring and accessories	£
9.	Lighting inc emergency - Wiring and accessories	£
10.	Lighting inc. emergency - Luminaires and lamps	£
11.	General cable management (including conduit, trunking installation and cable tray)	£
12.	Wiring to mechanical services	£
13.	Earthing and bonding	£
14.	Lightning conductor installation	£
15.	Fire alarm installation	£
16.	Data & Telephone (Wiring)	£
17.	Data & Telephone (Cable management)	£
17a	BT connection to the site (Duct system only)	£
17b	BT connection to the site (Cabling)	£ By others
17c	Educational network connection to the site (Duct system only)	£
17d	Educational network connection to the site (Cabling)	£ By others

**KINGS ACADEMY
MECHANICAL AND ELECTRICAL SERVICES PERFORMANCE SPECIFICATION**

18.	Disabled Call system	£
19.	Disabled Refuge system	£
20.	CCTV Installation	£
21.	Security Installations	£
22.	External Lighting Installation	£
23.	PV Installation	£
24.	Design and co-ordination of M&E services	£
25.	Compliance with CDM Regulations	£
26.	Biomass boiler installation (inc fuel delivery system)	£
27.	Heating System flues	£
28.	Domestic Hot Water System	£
29.	Domestic Cold Water System	£
30.	Above Ground Drainage System	£
31.	Assembly Hall General Supply / Extract Vent Systems	£
32.	Kitchen supply/extract ventilation system	£
33.	Music room supply and extract ventilation system	£
34.	Toilet extract and general supply/extract ventilation systems	£
35.	Natural ventilation system	£
36.	Thermal Insulation	£
37.	Controls Installation	£
38.	DX Air source heat pump systems (comms room)	£
39.	Gas fired heating system boiler plant	£
40.	Heating system installations	£
41.	Solar collector installation	£
42.	Natural Gas Installations (from meter)	£
43.	Utility gas supply	£
44.	Utility water supply (inc hydrant provision)	£
45.	BREEAM requirements and provision	£

KINGS ACADEMY
MECHANICAL AND ELECTRICAL SERVICES PERFORMANCE SPECIFICATION

46.	Any other items (Please specify)	£
47.	As fitted drawings and O & M Manuals	£
48.	Testing and Commissioning	£
	Sub Total	£
	Add 1/39th Main Contractors Discount	£
	GRAND TOTAL £	

ELECTRICAL ENGINEERING SERVICES
SCHEDULE OF DAYWORK CHARGES

(To be submitted with tender)

Daywork Basic Labour Rates

In the event of acceptance of our tender, we agree that where extra work is to be valued at Daywork Prices, materials and labour shall be charged at net cost plus the following percentages which cover all establishment charges, profit and discount.

Labour plus	%
Materials plus	%
Plant plus	%
Expenses plus	%

The names of the workmen concerned will be included on vouchers specifying the time spent on the work and any materials used shall also be detailed on the voucher. We will obtain a signature to verify the time spent and material used from a representative of the Employer on site and submit a signed voucher to the Engineer not later than the end of the week following that in which the work has been executed.

The following net basic rates of labour exclusive of all allowances, on costs and profit are applicable to the various operatives as stated below.

Foreman	p per hour
Senior Electrician	p per hour
Approved Electrician	p per hour
Electrician	p per hour
Mate	p per hour
3 rd Year Apprentice	p per hour

Signature of Authorised Person _____

Designation _____

On Behalf Of _____

Address _____

Date _____

MECHANICAL ENGINEERING SERVICES
SCHEDULE OF DAYWORK CHARGES

(To be submitted with tender)

Daywork Basic Labour Rates

In the event of acceptance of our tender, we agree that where extra work is to be valued at Daywork Prices, materials and labour shall be charged at net cost plus the following percentages which cover all establishment charges, profit and discount.

Labour plus	%
Materials plus	%
Plant plus	%
Expenses plus	%

The names of the workmen concerned will be included on vouchers specifying the time spent on the work and any materials used shall also be detailed on the voucher. We will obtain a signature to verify the time spent and material used from a representative of the Employer on site and submit a signed voucher to the Engineer not later than the end of the week following that in which the work has been executed.

The following net basic rates of labour exclusive of all allowances, on costs and profit are applicable to the various operatives as stated below.

Foreman	p per hour
Senior Fitter	p per hour
Approved Fitter	p per hour
Fitter	p per hour
Mate	p per hour
3 rd Year Apprentice	p per hour

Signature of Authorised Person _____

Designation _____

On Behalf Of _____

Address _____

Date _____

APPENDICES

APPENDIX A – Mechanical Services - Schedule of Suppliers

APPENDIX B – Electrical Services – Schedule of Suppliers

APPENDIX C – Indicative Tender Drawings

APPENDIX D - Indicative Part L2A BRUKL

Appendix A - Mechanical Services - Schedule of Suppliers

Schedule of Preferred Electrical Manufacturers and Suppliers of Plant and Equipment.

The tender must be based upon the preferred schedule of manufacturers and suppliers.

If the Tenderer wishes to propose an alternative this shall be submitted as an option for consideration stating cost change and reason for deviating from the schedule.

The Sub-Contractor shall provide and install plant and equipment in accordance with the schedule of manufacturers and suppliers.

Where more than one manufacturer or range is identified the Sub-Contractor shall obtain the engineers written agreement on the equipment to be used before proceeding.

It still remains the Sub-Contractors responsibility to ensure all equipment supplied is correct in all respects for the intended application. Any and all deviations from this schedule must be authorised in writing by the engineer.

Where a standard does not appear on the schedule or in the specification text for any item of plant or equipment the Sub-Contractor shall submit full details of the proposed type and obtain approval from the engineer before proceeding.

The following list details approved suppliers for various work elements. The list shall be read as equal and approved. Any deviations shall be agreed with Waterman Building Services Engineer.

Mechanical Services

FANS	NU-AIRE AIR SOURCE AIR HANDLERS NORTHERN SWEGON
AIR HANDLING UNIT	AIR HANDLERS NORTHERN AIR SOURCE NUAIRE SWEGON
GRILLES, DIFFUSERS, LOUVRES	TECHNICAL AIR SERVICES NORTHERN GILBERTS HALTON
NATURAL VENTILATION DAMPERS	GILBERTS MISTRAL
DX AIR SOURCE HEAT PUMP UNITS	SANYO MITSUBISHI
TRACE HEATING	RAYCHEM ISOPAD
VALVES	CRANE HATTERSLEY TOUR AND ANDERSON OVENTROP
GAS SOLENOID VALVES	BRYAN DONKIN

AUTOMATIC CONTROLS	MATRIX CONTROLS SYSTEMS
DOSING POTS	ARROW VALVES
THERMOSTATIC MIXING VALVES	PEGLER MARTIN ORGEE
DIRT/AIR SEPARATORS	WESSELS SPIROVENT ENGINEERING APPLIANCES
ATTENUATORS	IAC
FIRE DAMPERS/SMOKE DAMPERS	ACTIONAIR
EXTERNAL LOUVRES	GILBERTS SINGLE BLADED HIGH PERFORMANCE LOUVRE IAC
PRESSURE DIFFERENTIAL CONTROL VALVES	OVENTROP TOUR ANDERSON
BOILER	HAMWORTHY BROAG
BIOMASS BOILER	BY GBBS PREFERRED SUPPLIER (TO BE ADVISED BY GBBS)
KITCHEN VENT UV & ELECTROSTATIC FILTERS	PURIFIED AIR LTD (UVC & ESP)
KITCHEN VENT ODOUR NEUTRALISER UNIT	PURIFIED AIR LTD
SOLAR COLLECTORS	WORCHESTER

Appendix B – Electrical Services – Schedule of Suppliers

Schedule of Preferred Electrical Manufacturers and Suppliers of Plant and Equipment.

The tender must be based upon the preferred schedule of manufacturers and suppliers.

If the Tenderer wishes to propose an alternative this shall be submitted as an option for consideration stating cost change and reason for deviating from the schedule.

The Sub-Contractor shall provide and install plant and equipment in accordance with the schedule of manufacturers and suppliers.

Where more than one manufacturer or range is identified the Sub-Contractor shall obtain the engineers written agreement on the equipment to be used before proceeding.

It still remains the Sub-Contractors responsibility to ensure all equipment supplied is correct in all respects for the intended application. Any and all deviations from this schedule must be authorised in writing by the engineer.

Where a standard does not appear on the schedule or in the specification text for any item of plant or equipment the Sub-Contractor shall submit full details of the proposed type and obtain approval from the engineer before proceeding.

The following list details approved suppliers for various work elements. The list shall be read as equal and approved. Any deviations shall be agreed with Waterman Building Services Engineer.

Electrical Services

SWITCHGEAR (DEVICES)	SCHNEIDER
MAIN SWITCH PANELS	MARDIX AF SWITCHGEAR
METERS	SCHNEIDER
FINAL DISTRIBUTION	SCHNEIDER
CABLES AND INSULATION	BICC DRAKA PRYSMIAN
METAL TRUNKING, CONDUIT & TRAY	LEGRAND MITA

KINGS ACADEMY
MECHANICAL AND ELECTRICAL SERVICES PERFORMANCE SPECIFICATION

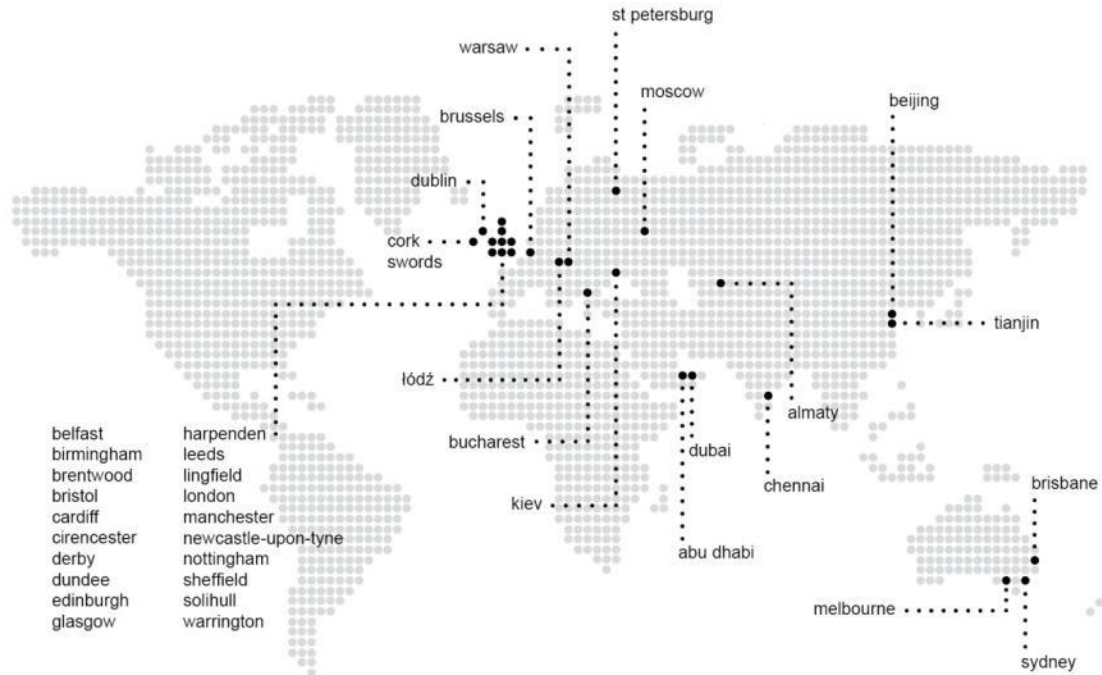
PVC TRUNKING	MK MARSHALL TUFFLEX LEGRAND
FIRE RESISTANT SOFT SKIN CABLES	PRYSMIAN FP PLUS ENHANCED DRAKA FIRETUFPLUS ENHANCED
LV WIRING ACCESSORIES	MK LOGIC PLUS – ALL AREAS METAL CLAD PLANTROOMS AND HOSTILE AREAS
FIRE ALARMS	PROTEC
DISABLED REFUGE COMMUNICATION	BALDWIN BOXALL
INTERNAL LIGHTING	WHITECROFT OR LUXONIC
EXTERNAL LIGHTING	KINGFISHER OR WHITECROFT
LIGHTING CONTROLS	EX-OR OR WHITECROFT OR LUXONIC
SECURITY/CCTV/DOOR ENTRY	INITIAL
LIGHTNING PROTECTION	BEST OMEGA RED
INDUCTION LOOP SYSTEM	P.E.L SERVICES TONE TEC PAS SOUND ENGINEERING (TEL: 0845 430 0546)
PV INSTALLATION	ENERGI HOLDINGS PLC

APPENDIX C – Indicative Tender Drawings

(see seperate drawing issue sheets and accompanying drawings)

APPENDIX D – Building Regulations Indicative Part L2A BRUKL
(REFER TO SEPARATE DOCUMENT)

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