

Deputy High Commission of Canada, Lagos

HVAC Refurbishment

**Specifications for Airconditioning and Ventilation
Systems**

February 2019

Revision

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NES - Introduction

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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 is 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 NES, clauses may appear within the specification.

A64 GENERAL CONDITIONS (SELF CONTAINED SPECIFICATION)

100.000 PROJECT PARTICULARS

100.010 THE PROJECT:

- Particulars of the project as a whole are
 - given in Main Contract Preliminaries, Section

100.020 THE EMPLOYER:

- Deputy High Commission of Canada, Lagos, Nigeria

100.040 CONTRACT ADMINISTRATOR:

The term Contract Administrator (CA) is used throughout this specification and his duties will be carried out by

-

100.050 PROJECT MANAGER:

-

100.060 THE ARCHITECT:

-

100.070 QUANTITY SURVEYOR:

-

100.090 MECHANICAL SERVICES CONSULTING ENGINEER:

- MFA Partnership
2nd floor,
Plot 10B, Block 132
DCS Street, U3 Estate,
Lekki Phase1, Lagos.
- Tel: 01-3429060

100.100 ELECTRICAL SERVICES CONSULTING ENGINEER:

100.120 STRUCTURAL ENGINEER:

100.170 DELEGATION:

The CA may delegate certain powers and duties. The CA will indicate the duties and powers of the following:

- Clerk of Works

200.000 DEFINITIONS

200.010 GENERAL:

Where used in the documentation the following definitions shall apply and shall be interpreted as such:

- Works: All services shown on the drawings and described in the specification shall be deemed to be included in the contract.
- Drawings: The tender drawings.
- Elsewhere: Detailed or specified elsewhere in other clauses, sections, shown on the drawings or contained in the specification or conditions of contract.
- Services: Services means the inclusion of one or more system.
- System: All equipment, accessories, controls, supports and ancillary items, including supply,

installation, connection, testing, commissioning and setting to work necessary for that section of the Works to function.

- Design process: All the activities necessary to convert design input into design output
- Review: Give notice and submit details to the CA for his comment and review, which shall be granted in writing only. In the event of the CA not accepting that submitted, resubmit alternative details for review or modify that submitted in accordance with the CA comments. Review of any submittal by the CA shall not mean that the CA is responsible for the correctness of the submittal or its suitability for purpose and does not relieve any contract responsibilities.
- Competent person: A person, by reason of theoretical and practical training or actual experience or both, is competent to perform the task or function or assume the responsibility in question and is authorised to perform such a task or function.
- Duct: An enclosed space specifically intended for the distribution of services, with direct access for personnel.
- Trench: A covered horizontal service space in the floor or ground with access from above.
- Cavity: A space enclosed within the elements of a building within which services are installed, e.g. the space between ceiling and floor above. See Building Regulations.
- Service Areas: Includes areas within a building with limited finishes such as loading bays, car parks etc.
- Concealed Services: Includes installations within ducts, trenches or cavities.
- Exposed Services: Includes installations outdoors or unprotected within service or occupied areas.
- Terminal Units: Terminal units such as radiators, convectors, fan coil units, induction units, variable or constant volume air boxes and other like equipment.
- Ancillaries: All specified fittings, accessories, inserts, test points, bracketing, terminal equipment connected to and installed in the engineering services system.
- CIBSE: The Chartered Institution of Building Services Engineers
- BSRIA: The Building Services Research and Information Association
- IET: The Institution of Engineering and Technology
- IOP: Institute of Plumbing
- FRS: Fire Research Station
- HSE: Health and Safety Executive

300.000 TENDERING INSTRUCTIONS

300.010 GENERAL:

This section outlines the tendering procedures and requirements.

300.020 SCOPE:

- These conditions are supplementary to those stated in the invitation to tender and on the Form of Tender and Agreement.

300.030 TENDER DOCUMENTS

The tender documents consist of the following:

- Invitation to tender.
- Form of tender.
- Project health and safety plan.
- Specification for the Works.
- Set of tender drawings for the Works.
- Pricing schedule for the Works.
- Declaration of non-collusion.
- Contract programme.

- Warranty.
- Draft log book.
- The tender drawings are
 - as listed on the drawings cover sheet

300.040 PRIVACY OF INFORMATION:

The information contained in the tender documentation shall be treated as private and confidential.

300.050 CHECKING DOCUMENTS:

Check the tender documentation for obvious errors and omissions. Should any such errors or omissions be discovered inform the office issuing the documents immediately in writing in order that a correction may be issued before the date for submission of the tender.

300.060 TENDER ACKNOWLEDGEMENT:

Acknowledge receipt of the tender documentation and confirm submission of a tender in accordance with the instructions to tender.

300.070 PERIOD OF VALIDITY:

Tenders must remain open for consideration (unless previously withdrawn) for a period from the date fixed for submission of tenders of not less than
The date for possession/commencement is

300.080 TENDER PROCEDURE:

Tendering procedure is in accordance with the principles of

300.090 ACCEPTANCE OF INSTRUCTIONS:

The submission of a tender will denote the acceptance of an undertaking to comply with all the clauses contained in the tender documentation unless items of non-compliance are identified as part of the tender submission.

300.100 ACCEPTANCE OF TENDER:

The Employer and his representatives

- Offer no guarantee that the lowest, or any tender, will be recommended for acceptance or accepted.
- Will not be responsible for any cost incurred in the preparation of any tender.

300.120 INSPECTION OF SUPPLEMENTARY DOCUMENTS:

Supplementary documents relating to the contract are available for inspection prior to the submission of the tender.

- No adjustment shall be made in the tender sum or claim for additional monies or an extension of time allowed due to failure to inspect the above documents and to make due allowance for the information contained therein.

300.130 SITE VISIT:

Before tendering, ascertain the nature of the site, access thereto and all local conditions and

restrictions likely to affect the execution of the Contract Works.

- Inspect any existing installations relevant to the works and study any relevant existing records.
- No claims will be allowed after submission of a tender for lack of information or other reasons which could have been resolved by such a visit to the site.
- Arrangements for visiting the site must be made with prior agreement through:
 - The office issuing the tender documentation.

300.140 RETURN OF DRAWINGS AND SPECIFICATIONS:

The complete tender documentation is to be returned to the office of issue when requested should the Tenderer not be successful in their bid.

300.150 ALTERATIONS TO TENDER DOCUMENTS:

No alterations or erasures to the text of any part of the tender documentation shall be permitted. Any tender containing such alterations or erasures may be rejected.

300.160 TENDER ERRORS:

• Errors in the priced subcontract specification will be dealt with in accordance with the Code of Procedure for Single Stage Selective Tendering 1996.

- Alternative 1.
- Alternative 2.

(The word 'specification' being substituted for 'bills of quantities').

- In the event of a Tenderer discovering a genuine error in their tender after it has been deposited, attention in writing may be drawn to the error and an amendment submitted. The amendment may be accepted if deposited on or before the time fixed for receipt of tenders.
- No adjustment shall be permitted to the sum inserted in the form of tender after the date and time fixed for receipt of tenders.

300.170 UNQUALIFIED TENDERS:

- Other than as part of an alternative offer as described elsewhere, no account will be taken of any qualification or special conditions that a Tenderer may impose on their tender.
- Any tender containing such additional conditions may be rejected.

300.180 ALTERNATIVES:

• Alternative equipment, specialists or methods of carrying out the works in addition to those described in the tender documents may be submitted. Alternative offers shall be indicated on the appropriate document and include:

- Details of the alternative equipment, specialist or method proposed.
- Full technical data for each such alternative together with details of any consequential amendments to the design and/or other parts of the works. Demonstrate compliance with any stated British (or other equivalent recognised International) Standards.
 - A detailed breakdown of any omissions or additions to the basic tender sum indicated on the appropriate document.
 - The impact of all proposed alternative equipment or materials on Part L compliance including
 - The CO₂ Target Emissions Rate.
 - The final 'as constructed' CO₂ Buildings Emissions Rate.
- Confirm equivalence in quality, operation and space requirements to those items which have been specified by name. Demonstrate the proposed alternative is fully equivalent to the specified item and identify any constructional, cost, programme, maintenance or other differences
- Include for all necessary measures to ensure alternative manufacturer's equipment and the total

installation is equivalent to that specified.

- The Tenderer shall include the costs necessary for re-sizing and reselection of associated equipment (including pipework, ductwork and cable sizes) resulting from the proposed alternative together with all resulting design and coordination.
- Alternative offers will only be considered if accompanied by a compliant tender.
- No alternatives will be permitted.

300.190 EXCLUSIONS:

If any part(s) of the Works cannot be tendered as defined in the tender documents, the CA must be informed as soon as possible, defining the relevant part(s) and stating the reasons for the inability to tender.

300.195 INTERPRETATION OF THE TENDER DOCUMENTATION:

- Should there be any doubt about the precise meaning of any item for any reason whatsoever, the tenderer must inform the office of issue of the tender documents in writing in order that the correct meaning may be given.
- Any clarification of the meaning or intent shall be issued in writing only and no other means of communication shall be valid. All Tenderers will be notified of any such explanation.
- No liability will be admitted, nor claim allowed, in respect of errors in a tender due to mistakes that should have been rectified in the manner described above.

300.200 PROCUREMENT OF MATERIALS:

Allow for the procurement of materials and equipment from suppliers at such a time, and in such a manner as may be necessary to allow for the completion of the Works in accordance with the contract programme.

Clearly state in the tender submission any foreseen difficulties with delivery periods for selected equipment or proposed alternatives.

- No additional costs resulting from non-compliance will be accepted.

300.201 A LIST OF PROPOSED MANUFACTURERS/SUPPLIERS:

A list of proposed manufacturers/suppliers of products, equipment and plant, including all items for which the choice of manufacturer/supplier is at the discretion of the Subcontractor, must be submitted

- With the Tender.

300.202 SELECTION OF MANUFACTURERS/SUPPLIERS:

- Where manufacturers, suppliers or installers of products are identified by name, or names, but reference is made to "Or approved" equivalent alternatives may be selected and shall be submitted to the CA for approval.
- Where manufacturers, suppliers or installers of products are identified by name, or names, but reference is made to "Or approved" equivalent the submitted tender must include the named or one of the named suppliers. Alternatives may be selected and shall be submitted to the CA for approval, separately

310.000 TENDER SUBMISSION

310.010 GENERAL:

This section details the particular tender submission requirements.

310.030 TENDER SUBMISSION DELIVERABLES:

- To be compliant the tender submission must include the following deliverables as detailed elsewhere:
 - A tender pricing schedule completed in full.
 - A Bill of Quantities completed in full.
 - Method statements.
 - Outline programme.
 - Form of tender.
 - Declaration of non-collusion

310.040 MAINTENANCE CONTRACT:

- Provide a maintenance contract for twelve months, from the date of Practical Completion, as detailed elsewhere

320.000 PRICING AND COSTS

320.010 GENERAL:

This section details particular requirements for the pricing of the tender documentation and cost procedures during the contract.

320.030 TENDER PRICING DOCUMENT:

Alterations and qualifications to the specification must not be made without the written consent of the CA. Tenders containing such alterations or qualifications may be rejected.

Costs relating to items in the specification that are not priced will be deemed to have been included elsewhere in the tender.

The Tenderer shall complete all sections of the tender pricing document in full.

Items described in the pricing document are abbreviated for the purpose of the schedule. The Tenderer is to make full allowance for all works associated with the installation of a particular element.

Items entered in the pricing document shall be deemed to include all costs involved in carrying out the Works.

- Where required the Tenderer must identify separately the cost of all items specifically described under preliminaries.
- Provisional items will be adjusted at the final agreed rates when information is issued in respect of these items.

320.035 SUBMISSION OF PRICED CONTRACT SPECIFICATION:

The priced contract specification must be submitted

- with the Tender.

320.040 SCHEDULE OF RATES:

A schedule of rates must be submitted

- With the tender.
- The schedule of rates must include rates for all significant items of work.
- Rates to include Contractor's cash discount.

A quantified schedule of rates accepted by the CA shall only constitute part of the contract in the following respects:

- The descriptions of the works and the rates and prices contained therein shall be used for the purpose of adjusting variations

- The quantities contained therein shall be used to facilitate the preparation and the checking of interim applications for payment
- The provisional and prime cost sums contained therein shall be subject to adjustment in accordance with the rules and procedures contained in the contract conditions.

320.070 PRIME COST SUMS:

The term Prime Cost Sum shall mean the net cost paid for an item or items of equipment or material or work executed.

The Tenderer shall indicate the percentage addition required for any profit and costs for handling, ordering and Main Contractor's discount, etc., in addition to P C Sum in

- the forms of tender
- Where prime cost sums are included these shall be at the disposal of the CA who shall give written instructions for their expenditure and the CA shall have the power to nominate persons or firms to execute work or supply goods against such sums.
- All prime cost sums shall be adjusted by the CA in the final account, the work undertaken or goods supplied against such sums being charged on the basis of the net accounts of the installers or suppliers, plus the percentage addition stated in the tender to cover profit.

320.100 INSTRUCTIONS AND VARIATIONS:

All instructions shall be issued in writing and confirmed in a similar manner.

Submit the cost of each variation showing the quantities and rates applicable for all materials, etc. employed in accordance with the agreed contract schedule of rates. Submit to the CA

- Within 10 working days of the receipt of written instructions.

No work will be certified for payment until all the necessary information is provided.

400.000 CONTRACT CONDITIONS

400.060 WARRANTIES:

- Enter into the following warranties:

410.000 PARTICULAR CONDITIONS

410.042 CO-OPERATION WITH OTHERS:

Ensure that the contract works integrates with that of others and that full co-operation is maintained during the execution of the Works with that of others.

Co-operate with the Contractor, other subcontractors, suppliers, local authorities and statutory undertakings in the execution of the Works.

- In the event of any extra costs being caused by failure to programme and arrange the execution of the Works so that it fully integrates with that of others, the installer of the Works may be liable for any additional costs thereby incurred.

410.280 DEFECTS LIABILITY:

Liability for making good defects in the Works shall be for a period of six (6) months from the date of issue of the certificate of practical completion for the installations.

If it is necessary to replace or renew any portion of the contract works as part of liability for defects, the defects liability period in respect of that portion of the contract Works shall be deemed to commence from the date of such replacement or renewal.

The CA may require that new tests be carried out to demonstrate that the plant is continuing to work satisfactorily if the replacement or renewal may affect the efficiency of the Works or any portions thereof.

In the remedying of defects in the contract Works take all necessary precautions to minimise the risk of damage to the buildings, the decorations, the fittings and the equipment.

- In the event of such damage occurring bear the cost of replacement or making good, subject to the proviso of being granted the benefit of any settlement in respect of such damage accepted by the insurers under the insurance policies taken out in accordance with the requirements of the contract.
- Agree with the CA a programme for the carrying out and the completion of any work not finally finished at the time of the contract Works being offered for acceptance and which does not prejudice the issue of a practical completion certificate. This work may be requested to be executed out of normal hours and no additional costs will be accepted for this action.
- Prior to practical completion submit a method statement for the approval of the CA outlining how the defects which arise during the defects liability period will be rectified to ensure that disruption to the use of the building is kept to a practical minimum.
- No additional costs will be accepted for undertaking works executed out of normal hours.
- Prepare and submit records of failures or malfunctions of any part of the contract Works during the defects liability period, together with details of remedial action taken, subsequent re-testing and the results.
- Notify the CA of damage, failures or malfunctions to the contract Works demonstrably caused by incorrect operation of the installations, vandalism or other actions by a third party.
- Inform the CA in writing when all defects are finally rectified so that an inspection may be carried out prior to the issue of a Final Certificate.

410.290 RIGHT OF ACCESS DURING DEFECTS LIABILITY PERIOD:

Right of access will not be unreasonably withheld, at all reasonable working hours and at own risk and expense, to any part of the contract works for the purpose of inspecting the working of the installations or to the records of the working and the performance thereof.

Subject to CA approval, that shall not be unreasonably withheld, undertake any tests considered necessary at own risk and expense.

During the defects liability period and all necessary remedial works and/or rectification of defective materials and equipment liaise closely with the Employer's staff. All such work shall be carried out in such a manner as to avoid or minimise shut-down time and inconvenience to the Employer.

430.000 QUALITY

430.020 WORKMANSHIP AND MATERIALS:

All materials, articles and workmanship shall be of the best quality and execution as detailed in the specification and drawings.

All equipment and materials to be installed shall be new unless otherwise indicated.

All equipment shall be installed in accordance with the manufacturer's written instructions and recommendations.

All materials considered by the CA to be unsound or not in accordance with the specification shall immediately be removed and properly replaced to the satisfaction of the CA at no additional cost.

All work carried out imperfectly or with faulty materials must be immediately removed and properly replaced to the satisfaction of the CA at no additional cost.

The manufactured articles specified shall serve as a quality standard.

Where manufactured items are not specified by name submit with the tender all necessary details of proposed articles. The CA shall approve these articles before their use is permitted.

500.000 ORGANISATION AND DESIGN MANAGEMENT

510.000 SUBMITTALS AND APPROVALS

510.010 GENERAL:

This section outlines the requirements and procedures for submittals to the CA.

510.020 SUBMITTALS:

Prior to any orders being placed the CA shall review all drawings and manufacturer's details. Submittals shall be in a clear, definable and easily read format with the specified technical details, notes, performance data and calculations where applicable all in the English language.

Where drawings are to be examined the manufacturer's details shown on the drawings must have been previously approved.

Include all costs for attending meetings associated with the submittal review procedure. Meetings will be held at Mechanical consultant's office.

Agree with the CA where samples of materials offered for review are to be sent.

Issue progressively drawings, calculations and submittals as agreed in advance with the CA for review.

All correspondence related to the examination and review procedure shall be directed through the office of the mechanical consultant.

The timescale for review or comment or otherwise on all submittals shall be

- before installation

510.030 SCHEDULE OF DRAWINGS AND SUBMITTALS:

Provide a schedule of all proposed drawings and submittals required for comment. The schedule shall be provided

- 4 weeks from contract appointment

Indicate as a minimum the following information on the schedule:

- Drawing number and revision number
- Drawing title and service
- Scale
- Latest date required on site and/or for manufacturing purposes
- Date required for final comment
- Date for submission for comment
- Date of commencement of drawing production

The schedule shall be updated as necessary on a regular basis at intervals agreed with the CA during the contract period.

The programme for production of drawings and other submittals should include the necessary time for:

- Submission
- Examination
- Alterations and re-submission in the event of the initial submission not being accepted
- Final issue

Allow adequate time in the programme in order not to cause delays.

The full extent of all submittals shall be indicated in the schedule.

Group submittals for a particular part of the building or building engineering service as agreed with the CA.

510.080 SAMPLES:

Provide free of charge samples of material and workmanship proposed to be used in the Works. Samples shall include all alternative finishes available if required.

In the case of articles of special construction:

- drawings may be temporarily substituted for the samples
- drawings when approved will be retained until the articles concerned are supplied, as a sample

The samples submitted and approved, shall remain the property of the Employer until the

completion of the contract.

Approval of the CA shall be obtained before equipment is placed on order

- The CA will undertake to approve samples within agreed weeks from receipt.
- Samples to be submitted:
- Include all alternative finishes available for the following samples:

520.000 OBLIGATIONS AND RESPONSIBILITIES

520.045 COMMISSIONING:

- Undertake the testing, commissioning, regulation and setting to work of the Works.
- Design all necessary facilities required for setting to work commissioning and testing of the completed installations.
- Appoint an independent specialist responsible for the testing and commissioning.
- Ensure that the commissioning requirements are compatible with any project restraints concerning sectional handover/ phasing.
- Review all designs to ensure that systems are commissionable and highlight for review by the CA any considerations in respect of commissioning.
 - Provide a statement
 - On appointment.
 - Prior to commencement of the Works.
- Provide a report signed, by a competent person confirming, prior to installation that all system designs can be commissioned.
- Incorporate into the systems design the essential components and features necessary to enable the proper preparation and commissioning of the building services.
- Prepare comprehensive commissioning method statements including procedures, logic diagrams and risk assessments for:
 - Pre-commissioning checks.
 - Setting to work.
 - Commissioning and testing.
 - System proving.
 - Environmental testing of the Works.
 - Prepare flushing, chemical cleaning and water treatment method statements, logic diagrams and programme
 - Prior to commencement of Works.
 - Produce a detailed commissioning programme
 - Prior to commencement of Works.
- Establish procedures with all parties to allow the demonstration of normal, emergency, shutdown and standby mode operation of plant and systems.
 - Prepare method statement
- Provision of all necessary facilities to enable tests to be witnessed and inspections carried out including all necessary instruments and recorders to monitor systems during the commissioning and environmental proving period.
 - Produce record pro-forma documentation for review by the CA relating to the commissioning and testing of plant and systems
 - Prior to commencement of the Works.
- Co-ordinate the activities of:
 - Specialists.
 - Manufacturer's.
- Measure and reconcile noise levels to verify compliance with the design criteria:
 - external noise levels.
 - internal noise levels.
- Ensure all certification is attained and witnessed as necessary for inclusion in the record documentation.

- Maintain a log of all significant activities during the testing, commissioning and system proving process.
- Record all plant and system settings.
- Provide and submit a report for every test, demonstration, balance or commissioning activity witnessed, together with an engineering appraisal on the performance, either on or off-site.
- Provide a final commissioning report, signed by a competent person, detailing the results of the commissioning and commenting on the performance of systems. The report to confirm that each installation is correctly tested and commissioned, achieves the specified performance and in accordance with CIBSE Code M.
- Demonstrate that equipment is capable of the performance and method of operation specified.
- Demonstrate that the overall and complete systems perform correctly in the required manner and as intended by the specification.

520.050 HANDOVER:

- Prepare log book(s) in accordance with the requirements of the specification and Building Regulations
 - Use CIBSE TM 31 template.
- Appoint an independent specialist author for the production of operating and maintenance manuals. Identify four specialists as part of the tender return.
- Prepare operation and maintenance manuals in accordance with the specified requirements. Ensure that information needed for inclusion in the operating and maintenance manuals is obtained as the works progress. Identify individual sources of information.
- Produce record drawings.
- Modify the record drawings as the works progress so that all alterations from the installation drawings are recorded as the work proceeds
- Modify and update operating details to reflect commissioning results.
- Record all water, gas and electricity meters on completion of the works.
- Prepare planned preventative maintenance schedules for
 - 12 months from practical completion.
- Instruct the Employer's staff in the use, operation and maintenance of the installations.
- Fully operate and maintain the installations in accordance with the Employer's normal occupational requirements prior to practical completion.
- Prepare a schedule of all spare parts require for the works including recommendations of any others not stated in the specification.
- Prepare a schedule of all tools require for the works including recommendations of any others not stated in the specification.
- Supply and handover over:
 - All tools.
 - Spares
 - Keys

530.000 LOCAL AUTHORITY REQUIREMENTS

530.010 GENERAL:

This section details the requirements for compliance with Local Authority By-laws.

540.000 HEALTH AND SAFETY

550.000 BUILDING REGULATIONS REQUIREMENTS

600.000 THE SITE

600.010 GENERAL:

This section outlines information on the site.

600.020 SITE LOCATION:

The site is located at 4, Anifowoshe Street, Victoria Island, Lagos

600.030 DESCRIPTION OF THE SITE:

The structure is an office building comprising of ground and first floor

600.040 THE BUILDING:

The building fabric is

- Concrete wall
- Refer to architectural and structural engineering drawings for full details.

610.000 EXISTING SERVICES

700.000 DESCRIPTION OF THE WORKS

700.020 SCOPE OF WORKS:

The engineering services included in the Works and covered by this contract comprise:

- HVAC Refurbishment services.

700.040 DESCRIPTION OF THE WORKS:

710.000 GENERAL DESIGN CRITERIA AND STANDARDS

710.110 STANDARDS AND REGULATIONS:

- Ensure all equipment and systems are designed and installed in accordance with the relevant standards and that operational compatibility exists between the systems and any other system installed in the same location.

720.000 BUILDERS WORK

740.000 COMMISSIONING AND TESTING

740.010 DEFINITIONS:

Where used in the documentation the following definitions shall apply and shall be interpreted as such:

- Commissioning: The advancement of an installation from the stage of static completion to working order to the specified requirements
- Testing: The measurement and recording of specified quantifiable characteristics of an installation or parts thereof and includes off site testing.
- Setting to work: The process of setting a static system in motion
- Regulation: The process of adjusting the rates of fluid flow in a distribution system to achieve specified values
- Environmental testing: The measurement and recording of internal environmental conditions
- System proving: the measuring, recording, evaluating and reporting on the seasonal

performance of the systems against their design values

- System demonstration: Demonstrating the capability of the installation to achieve and maintain the specified performance criteria
- Fine-tuning: The adjustment of the system where usage and system proving has shown such a need and includes the re-assessment of design values and control set points to achieve the required system performance.

740.040 COMMISSIONING AND TESTING:

When the contract works or parts thereof are ready for testing and commissioning notify the CA in writing.

All necessary facilities shall be provided to enable tests to be witnessed and inspections carried out including all necessary instruments and recorders to monitor systems during commissioning system proving and environmental testing.

Provide information where access is required into ceiling voids, service risers etc and ensure these points are not closed up until the commissioning and testing is complete.

Where commissioning, testing, balancing, adjustment, is undertaken in an area of the building taken over and occupied by the Employer, then take all necessary precautions against and be responsible for any damage caused whilst working in such areas for that purpose.

Prior to witnessing and inspection by the CA the contract works shall be fully tested, commissioned and be fully operational

Where portions of the work are required to be commissioned and tested separately, then upon final completion, demonstrate to the CA that all the several portions are capable of proper simultaneous operation in accordance with the requirements of the specification.

If testing demonstrates that the plant and equipment is not properly installed and/or not functioning correctly carry out such remedial measures and adjustments as may be necessary and repeat the commissioning and testing procedure to the satisfaction of the CA.

Complete all tests before any paint, cladding or similar materials are applied or before services are concealed.

Ensure all requirements such as cleanliness, protection from harmful external and internal elements are provided prior to commencement of commissioning

Undertake to:

- Commission, test, regulate and set to work the installations that form the contract works.
- Prepare comprehensive programmes, commissioning plans, schedules and method statements and procedures supported by risk assessments for the pre-commissioning checks, setting to work, commissioning, system proving and environmental testing of the contract works.
- Comply with the requirements of the Building Regulations (Approved Document Part L2) for the inspection and commissioning of the building services systems. Prepare all necessary submittals including commissioning plans and reports. Obtain all compliance approvals from the building control bodies.
- Provide all specialist personnel including manufacturer's representatives and coordinate their activities, together with providing any attendance required.
- Prior to commencement of the works submit to the CA for approval sample pro-forma for the various commissioning record and certification documentation.
- Provide reports detailing progress of testing and commissioning activities at intervals agreed with CA.
- Maintain a diary/log of significant commissioning and testing activities.
- Measure and reconcile noise levels at agreed locations to verify compliance with design criteria.
- Submit to the CA all certification documents prior to any system being offered for final acceptance
- Confirm in writing to the CA that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.
- Ensure all certification is attained and witnessed as necessary for inclusion in the record documentation.
- Submit a report for every test, demonstration, balance or commissioning activity witnessed,

together with an engineering appraisal on the performance, either on or off-site.

- Co-ordinate and liaise with the Employer's representative.

Maintain on site full records of all testing, commissioning and performance testing.

The extent and proportion of results to be witnessed by the CA will be at the discretion of the CA.

- The CA will
 - examine subsequent to setting to work and regulation of the contract works the results of the commissioning and the documentary records thereof.
 - only witness test proceedings to establish a level of confidence in the commissioning results being presented.
 - confirm recorded results
 - determine if the specified requirements have been satisfied.

800.000 DRAWING DEFINITIONS

800.010 GENERAL:

This section defines each of the main drawing types and outlines the extent and content of drawn information.

800.070 INSTALLATION DRAWING:

A drawing based on the detailed drawing or co-ordination drawing with the primary purpose of defining that information needed by the tradesman on site to install the works. The main features of installation drawings should be as per co-ordinated working drawings plus:

- Allowances should be made for inclusion of all supports and fixings necessary to install the works.
- The drawing should make allowances for installation details provided from manufacturer's drawings.
- Allowances should be made for plant and equipment. This includes any alternatives to the designers original specified option that have been chosen.

800.120 RECORD DRAWING:

Drawing showing the building and services installations as installed at the date of practical completion. The main features of the record drawings should be as follows.

- The drawings should be to a scale not less than that of the installation drawings
- Locations of all mechanical, electrical and public health systems and components installed including ducts, pipes, cables, busbars, plant items, pumps, fans, valves, dampers, control devices, strainers, terminals, electrical switchgear and components, security and fire sensors and control equipment.
- The drawing should be labelled with appropriate pipe, duct and cable sizes, pressures and flow rates.
- The drawings should have marked on them positions of access points for operating and maintenance purposes.
- The drawings should not be dimensioned unless the inclusion of a dimension is considered necessary for location.

800.130 BUILDER'S WORK DETAILS:

Drawing to show requirements for building works necessary to facilitate the installation of the engineering services.

Unless stated or agreed with the CA the following builder's work details can be marked out on site:

- Holes less than the threshold dimension stated elsewhere.
- Electrical socket and switch boxes.

- Openings that are best cut into blockwork and partitions.
Builder's work drawn information to be provided shall include:
- Details of all bases for plant formed in concrete, brickwork or blockwork to a scale of not less than 1:20
- Details of all attendant builders work, holes, chases, etc for conduits, cables and trunking etc and any item where access for a function of the installation is required to a scale of not less than 1:100
- Details of all-purpose made brackets for supporting service or plant/equipment to a scale of not less than 1:50
- Details of all accesses into ceilings, ducts, etc at a scale of not less than 1:50
- Details of all special fixings, inserts, brackets, anchors, suspensions, supports etc at a scale of not less than 1:20

800.170 PLANTROOM SCHEDULES AND SCHEMATICS:

Provide good quality plant and switch room drawings, schedules, schematics and instructions and hang in the respective plant room or any other appropriate location or where directed by the CA.

Protect surfaces of such information by

- Pressure lamination.
- Framing under glass or other rigid, transparent, cleanable and protective surface.
Hang using suitable fixings and provide backboards if necessary
A sample shall be submitted for approval to the CA prior to commencing production.
- Schematic drawings of circuit layouts showing:
 - Location, identification and duties of equipment.
 - Location of controls devices.
 - Circuit layout.
- Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.
- Control schematics.
- Location of mechanical and electrical plant and equipment items.
- First aid instructions for treatment of persons after electric shock.
- Location of isolating switch for electricity supply.
- Location of main incoming gas valve serving gas meter and isolation point.
- Location of main incoming water main and isolation point.
- Location of sprinkler fire main control valve.
- Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
- All other items required under Statutory or other regulations.

810.000 RECORD DOCUMENTATION

810.020 RECORD DOCUMENTS:

Provide:

- Record drawings and schedules.
- Plant room and switch room drawings, schedules and schematics.
- Operating and maintenance manuals.
- Blank maintenance logs.
- Log books
 - in compliance with the Building Regulations.
 - in accordance with CIBSE TM 31.
- Ensure record documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.
- Ensure record documents make it possible to comprehend the extent and purpose of the Works

and the method of operation thereof.

- Ensure record documents set out the extent to which maintenance and servicing is required and how, in detail, it should be executed.
- Ensure record documents provide sufficient, readily accessible and proper information to enable spares and replacements to be ordered.
- Correlate record documents so that the terminology and the references used are consistent with those used in the physical identification of the component parts of the installations.
- Demonstrate as required throughout the execution of the contract works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.
- Ensure that building log books contain all the information necessary to comply with the Building Regulations Approved Document Part L2.

810.030 RECORD DRAWINGS AND SCHEDULES:

- Prepare record drawings and schedules based on the As Installed Drawings maintained on site during the progress of the contract works.
 - The scale of the drawings shall be not less than 1:100.
- Each record drawing shall show the following information:
 - The name of the contract and, where appropriate, the zone or floor designation.
 - Description of drawing, drawing reference and scale.
 - Name and address of the installer and the consultant.
- Endorse all such documents
 - 'Record drawings'
- Where agreed with the CA certain detailed information may be provided in schedule form.
- Where portions of the work are to be concealed, draft copies of record drawings shall be supplied to the CA before the work is concealed in order to facilitate checking and examination.
- Prepare electrical drawings in accordance with BS EN 61082-1.
- Issue at practical completion the complete approved package of record drawings in the following numbers and format:
 - CAD format on CD disk. Each CD shall be labelled and the CD jewel cases shall be labelled identifying project title, issue date and index of contents.
 - Number of sets of complete record drawings (no) 4
 - 'White' prints.
 - Number of sets of complete record drawings (no) 4
- Provide reduced scale copies for inclusion in the operating and maintenance manuals as stated elsewhere.

Record drawings and schedules must include, but are not limited to:

- Location, including level if buried, of utility service connections, including those provided by the appropriate Authority, indicating points of origin and termination, size and material of service, emergency shut-off isolation locations, pressure and/or other relevant information.
- Disposition and depth of all underground systems.
- Schematic drawings of each system indicating principal items of plant, equipment, zoning, means of isolation, etc. in sufficient detail to make it possible to comprehend the system operation and the inter-connections between various systems.
- Details of the principles of application of automatic controls and instrumentation.
- Diagrammatic dimensioned plans and sections of each system or service showing sizes and locations of all ancillaries, plant, equipment controls, test points, and means of isolation etc. including any items forming an integral part of the engineering systems provided by others (such as plenum ceilings, builders' work shafts, chimneys etc.).
- Identification of all terminals/cables etc. by size/type and duty/rating as recorded from the approved commissioning results.
- Detailed wiring drawings/diagrams/schedules for all systems, including controls, showing origin, route, cable/conduit size, type, number of conductors, length, termination size and identification,

and measured conductor and earth continuity resistance of each circuit. Ensure routes indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, above false ceiling etc.

- Details of co-ordination of wiring and connections with cable core identification, notation of fire alarm, security, control and instrumentation and similar systems provided as part of the Works.
- Details to show inter-connections between the Works and equipment or systems provided by others to which wiring and connections are carried out as part of the Works.
- Location and identity of each room or space housing plant, machinery or apparatus.
- Dimensioned plans and sections of plantrooms, service subways, trenches, ducts and other congested areas where in the opinion of the CA smaller scale drawings cannot provide an adequate record. Indicate the location, identity, size and details of each piece of apparatus.
 - The scale of drawings to be 1:20
- Manufacturer's drawings of equipment indicating
 - general arrangement and assembly of component parts which may require servicing.
 - internal wiring diagrams together with sufficient physical arrangement details to locate and identify component parts.
- Schedules as required to locate, reference and provide details of ratings and duty of all items incorporated into the Works together with all fixed and variable equipment settings established during commissioning.
- For each programmable control item
 - schedules indicating for each input and output point connected
 - full data in respect of that point including reference
 - type of input/output
 - connected equipment reference
 - set values of temperature or pressure etc
 - set values of start/stop/speed change times etc
 - alarm priority
 - control specification reference
 - any other such applicable parameters
 - Each spare input and output point including reference, type of input/output and space for future entry of appropriate parameters as listed above.
- Logic flow diagrams for each individual control or monitoring specification and for each building services engineering system to illustrate the logical basis of the software design.
- Schedules setting out details of all initial values of user-defined variables, text statements for alarm messages etc.

810.060 PRESENTATION OF THE OPERATING AND MAINTENANCE MANUALS:

- Agree format and contents with the CA.
- Provide the operating and maintenance manuals in the following form:
 - Encase the manuals in A4 size, plastic-covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover- titled. Fold drawings larger than A4 and include in the binder so that they may be unfolded without being detached from the rings.
 - Electronic format stored on CD
- Provide copies of the operating and maintenance manual as follows:
 - Draft copies for comment (no) 2
 - Final copies for Client use (no) 4
- Provide a draft copy of the operating and maintenance manual to the CA for comment
Timescale:
 - Weeks before the contract completion date (no) 4 weeks
- The draft copy of the manual shall conform to the final format required by the specification to enable all relevant comments to be made by the CA.

810.070 OPERATING AND MAINTENANCE MANUALS:

The operating and maintenance manuals must include:

- A full description of each of the systems installed, written to ensure that the Employer's staff fully understand the scope and facilities provided.
- A description of the mode of operation of all systems including services capacity and restrictions.
- Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- A photo-reduction of all record drawings together with an index. Reduced size of drawings to be of appropriate size
- Legend of all colour-coded services.
- Schedules (system by system) of plant, equipment, valves, etc., stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.
- The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.
- Manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.
- A copy of all test certificates, inspection and test Records, commissioning and performance test records including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests, for the installations and plant, equipment, valves, etc., used in the installations.
- A copy of all manufacturer's guarantees or warranties, together with maintenance agreements offered by subcontractors and manufacturer's.
- Copies of insurance and inspecting Authority certificates and reports.
- Starting up, operating and shutting down instructions for all equipment and systems installed.
- Control sequences for all systems installed.
- Schedules of all fixed and variable equipment settings established during commissioning.
- Procedures for seasonal change-overs and/or precautions necessary for the care of apparatus subject to seasonal disuse.
- Detailed recommendations for the preventative maintenance frequency and procedures which should be adopted by the Employer to ensure the most efficient operation of the systems.
- Details of lubrication for lubricated items including schedules of lubricant type, frequency, etc.
- Details of regular tests to be carried out (e.g. water analysis for pseudomonas.)
- Details of procedures to maintain plant in safe working conditions.
- Details of the disposal requirements for all items in the works.
- A list of normal consumable items.
- A list of recommended spares to be kept in stock by the Employer, being those items subject to wear or deterioration and which may involve the Employer in extended deliveries when replacements are required at some future date.
- A list of any special tools needed for maintenance cross-referenced to the particular item for which required.
- Procedures for fault finding.
- Emergency procedures, including telephone numbers for emergency services.
- Hospital Operational Policy.
- Back-up copies of any system software.
- Documentation of the procedures for updating and/or modifying software operating systems and control programmes.
- Instructions for the creation of control procedure routines and graphic diagrams.
- Details of the software revision for all programs provided.
- Two back-up copies of all software items, as commissioned.
- Copies of relevant HSE/CIBSE/IET Guidance notes etc.
- Contractual and legal information including but not limited to

- details of local and public authority consents
- details of design team, consultants, installation contractors and associated subcontractors
- start date for installation, date of practical completion and expiry date for the defects liability period
- details of warranties for plant and systems including expiry dates, addresses and telephone numbers.
- A provision for update and modification.

900.000 COMPLETION AND HANDOVER

910.000 MAINTENANCE

BS APPENDIX

U19 VENTILATION (SELF CONTAINED SPECIFICATION)

100.000 SYSTEM DETAILS

100.010 SYSTEM DESCRIPTION

This section includes the provision of adequate ventilation (both extract and fresh air) for the building

100.020 DESIGN PARAMETERS

- System classification in accordance with BS EN 13779.
- Fire precautions for air distribution systems in accordance with BS EN 15423.
- Specification of types of air
- Classification of air
 - Outdoor air
 - Supply air
 - Indoor air: general
 - Indoor air: indirect classification by the rate of outdoor air per person 5l/s
 - Indoor air: indirect classification by the rate per floor area 7ac/hr
- System tasks and basic system types
- Pressure conditions
- Specific fan power

100.030 CONTROL REQUIREMENTS

100.040 SYSTEM DRAWINGS

The drawings are listed on the drawings coversheet

- As schedule reference A11-Drawings

200.000 PLANT AND EQUIPMENT

200.001 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.

200.060 TOILET EXTRACT UNIT:

- Type B
- Application To remove vitiated air from toilet
- Manufacturer and reference XPELAIR
 - Or approved equivalent
- Duty as schedule reference Y41-fans
- Duty as schedule reference
- Duty
 - Air volume (m³/s)
 - Resistance (Pa)
 - Sound Power Level

- Operation
 - Single fan.
 - Twin fan.
 - Twin with automatic changeover.
- Location
 - Ceiling mounted.
 - Duct mounted.
 - Rooftop.
- Materials
 - Galvanised steel.
 - Manufacturer's standard.
- Electrical safety to BS EN 60335-2-80.
- Motor
 - Electrical supply to BS 7697
 - Single phase.
 - Three phase.
- Motor starter
 - Location
- Accessories
 - Access - provide access via
 - hinged casing.
 - removable panel.
 - Controls
 - Provide speed controller to match fan.
 - On/off, autochangeover.
 - Silencers.
 - Back-draught dampers.
 - Anti-vibration mounts.
 - Guards.
- Testing
 - Where fans approved under CAME scheme are used provide certified data for type.
 - Where fans are not approved under CAME scheme provide results of aerodynamic performance tests in accordance with BS ISO 14695.

200.080 GRILLES AND DIFFUSERS:

- Type A
- Application Ventilation
- Manufacturer and reference TROX
 - Or approved equivalent
- As schedule reference Y46-Grilles-diffusers
- As schedule reference
- As indicated on drawings
-

200.090 PLANT AND EQUIPMENT WORKMANSHIP:

Install all plant and equipment in accordance with manufacturer's instructions.

300.000 DUCTLINES AND ANCILLARIES

300.010 DUCTWORK FABRICATION:

Prepare fabrication drawings and carry out fabrication of ductwork in accordance with DW 144

and DW 154 as appropriate.

300.020 DUCTWORK DIMENSIONS:

Sizes of ductwork are internal dimensions. Where applicable make allowance for any internal lining.

300.030 INSTALLER SELECTION:

- Use a member of the HVCA specialising in the trade of manufacturing and installing ductwork.
- Use one of the specialist companies listed below.
 -
 - Or approved equivalent.

300.040 DUCTWORK AND FITTINGS:

- Type
 - Application Ventilation
- Design Information
 - Supply ductwork in accordance with classification in DW 144 Table 1.
 - Ductwork Classification and Air Leakage limits
 - Low pressure - Class A - Positive.
 - Low pressure - Class A - Negative.
 -
- Ductwork air leakage testing
 - Carry out ductwork air leakage testing on high pressure ductwork in accordance with DW 144 as procedures set out in DW 143.
 - Test medium pressure ductwork in accordance with DW 144, A5.
 - Test low pressure ductwork
 -
 - Testing plant items, DW 144, Part 8, A.8.
- Plant connections.
 - Make connection between air handling assembly and ductwork system in accordance with DW 144.
- Flanged connections.
 - Provide bolted flanged joints for connecting ductwork to flanged items of plant, builder's work frames and where removable sections of ductwork are required.

300.050 DUCTWORK TO DW 144:

- Type
- Application Ventilation
- Material, DW 144 Part 2 - Standards, paragraph 7.
 - Zinc-coated steel.
 - Mild steel.
- Protective finishes - DW 144 Part 7 - General, Section 27.
 - Galvanizing after manufacture.
 - Metal spraying.
 - Paints
 - Protective requirements for ducts made from mild steel
- Construction
 - Rectangular ductwork - DW 144 Part 3.
 - Circular ductwork - DW 144 Part 4.
 - Spirally wound.

- Straight seamed.
- Flat oval ductwork - DW 144 Part 5.
 - Spirally wound.
- Straight seamed.

300.060 FLEXIBLE DUCTS:

- Application Ventilation
- Manufacturer and reference TROX
 - Or approved equivalent
- Supply and fasten flexible duct connections as DW 144 Part 7 Section 25. Use flexible duct connections in applications listed in DW 144 paragraph 25.1.
- Material
 - Metal
 - Coated steel.
 - Stainless Steel.
 - Aluminium.
 - Fabric
 - P.V.C/Polyester laminate.
 - Aluminium/Polyester laminate encapsulating high tensile steel wire helix.

300.080 ACCESSORIES - METAL DUCTWORK:

- Application Ventilation
- Flexible Joints
 - Supply and install flexible joints as detailed in DW 144 Part 7 Section 26.
 - Comply with BS 476-24.
 - Position
 - Use flexible joints, as shown on drawings
 - On fan inlet/outlets.
- Access openings
 - Provide access openings in accordance with DW 144 Part 7 Section 20.
 - Provide access for cleaning in accordance with DW 144 Part 7, paragraph 20.8 and
 - Appendix M Table 25 Level 2.
 - Appendix M Table 25 Level 3.
- Provide hangers and supports throughout in accordance with DW 144 Part 6.
- Regulating dampers

Provide regulating dampers in accordance with DW 144 Part 7 Section 21.

 - Locations as shown on drawings
 - Size as shown on drawings.
 - Function
 - Balancing damper.
 - Control damper.
- Supply and install fire dampers in accordance with DW 144 Part 7 section 22.
 - Location as shown on drawings.
 - Size as shown on drawings.

Fusible links
- Fit bird screens of 13mm square mesh wire on all intake and extract louvres to atmosphere. Wire gauge to be not less than 1mm.

300.100 DUCTWORK WORKMANSHIP:

Install ductwork in accordance with DW 144, and DW 154 as appropriate. Ensure that there are no sharp edges or corners on cut edges on ductwork, flanges and supports. Arrange ductwork to

drain any entrained moisture and ensure the lapping of joints minimises moisture leakage.

Connection to builder's work. Comply with DW 144 Part 7 Section 28.

Space supports in accordance with DW 144 Part 6 or DW 154 Part 5 as appropriate.

- Internal cleanliness
 - Provide the level of cleanliness and protection as defined in HVCA document DW/TM2.
 - Basic.
- 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
 - 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 test holes in ductwork system to allow complete testing and balancing of system in accordance with CIBSE Commissioning Code A.
 - Site drill test holes on site in accordance with DW 144 Part 7 Section 20.6.
 - Provide holes in metal ductwork, in accordance with DW 144 Part 7, paragraph 20.7, to accommodate thermostats, humidistats and other control sensors in positions and sizes indicated on drawings.
 - Install sensors and test points in plastics ductwork to suit specialist control and sensing equipment in positions and fixing configurations shown on drawings.
 - Fit sensors, damper motors and other control equipment as indicated on drawings.
 - Provide instrument connections where indicated on drawings.

400.000 PIPELINES AND ANCILLARIES

400.120 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.

400.130 ISOLATION AND REGULATION:

Provide valves, cocks and stop taps for isolation and/or regulation

- where shown on drawings.
- 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.
- at 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.

400.140 SPACING:

Space pipe runs in relation to one another, other services runs and building structure, allow for thermal insulation and ensure adequate space for access to pipe joints, etc.

Minimum clearances to pipe or pipe insulation:-

From	Minimum Clearance (mm)
Wall	25
Ceiling	50
Floor	150
Other pipes	25
Electrical cables, conduit, switchgear, etc	150

400.150 GRADIENTS:

Install pipework with gradients to allow drainage and air release.

Provide a means of venting the pipe system at all high points.

Grade pipework to allow system to be drained.

Provide a means of draining the system at all low points.

400.160 EXPANSION AND CONTRACTION:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes.

Isolate pipes from structure to prevent noise or abrasion due to thermal movement.

400.170 BENDS, SPRINGS AND OFFSETS:

Machine bend and ensure that machine guides and formers are smooth and clean, free from any scores, or other damage. Deformed bends will not be accepted.

400.180 PIPES THROUGH WALLS AND FLOORS:

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves.

400.190 PIPE SLEEVES:

Cut sleeves from material same as pipe one or two sizes larger than pipe. Do not use sleeves as pipe supports. Install sleeves flush with building finish.

400.200 TEMPORARY PLUGS AND CAPS:

Seal all open ends as installation proceeds by metal, plastic or wooden plugs or caps, to prevent ingress of foreign matter.

400.260 PIPE RINGS AND CLIPS:

Select type according to the application and material compatibility.

400.270 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.

400.300 MAINTENANCE AND RENEWAL:

Arrange pipework, valves, drains, air vents etc., for convenient routine maintenance and renewals.

400.310 PROTECTION OF PIPES IN SCREEDS:

- Wrap pipework with two protective tapes prior to laying.
- Sheath pipework with PVC.

400.320 CLEANING:

Remove cement and clean off all pipework and brackets.

500.000 THERMAL INSULATION

500.010 THERMAL INSULATION - MATERIALS:

- Type Fiberglass with aluminium covering
- Application Supply and fresh air

Standards

Comply in general with BS 5970. Description of terms as BS 3533.

Thermal conductivity

Ensure values are in accordance with BS EN 12664, BS EN 12667, BS EN 12939 or BS EN ISO 8990.

Fire rating

Employ materials that comply with BS 476-4, non-combustibility test, or obtain a Class 'O' fire rating to Building Regulations.

When finished, comply with BS 476-7.

Class 1 spread of flame

- Mineral fibre duct insulation
 - Rigid
 - Flexible
 - Lamella
 - Finish
 - Reinforced aluminium foil.
- Adhesives.
 - Comply with the recommendations of clause 8.2 of BS 5970, section 2 for insulation bonding adhesives, lagging adhesives, facing and film attachment adhesives.
 - Protection
 - Polyisobutylene
 - Minimum thickness 0.8mm.
 - Roofing felt
 - Secure in position with galvanized wire netting, of 1mm x 25mm mesh. Finish with two coats of black bituminous paint.
 - Mild steel sheet continuously hot dipped with aluminium-zinc coating to BS EN 10327, applied directly to insulating material.
 - Finish
 - Flat sheet.
 - Ribbed sheet.
 - Aluminium sheeting
 - Apply flat (embossed) or profiled aluminium cladding directly to insulating material, thickness 0.71mm on ductwork.
 - Laminated foil/film
 - Reinforcement
 - Aluminium bands at 300mm centres.
 - Aluminium bands at 450mm centres.
 - 50mm x 19g galvanised wire netting to BS EN 10223.
 - 50mm x 22g galvanised wire netting to BS EN 10223.

500.012 CALCULATION OF INSULATION THICKNESS - BUILDING REGULATIONS

(ENGLAND AND WALES):

Provide insulation of thickness conforming with the values given in the tables below. These

figures are derived from the requirements of the Building Regulations (England and Wales) Part L Approved Documents, and the calculation methods given in BS EN ISO 12241.

500.015 ENVIRONMENTAL THICKNESS ON WARM AIR DUCTWORK:

Temperature difference between air inside ductwork and ambient still air (K)	10	25	50
Heat loss (W/m)	7.2	15.3	26.0
Environmental thickness of mineral wool insulation (mm)	40	50	60
Environmental thickness of phenolic foam (mm)	25	25	40

500.018 ENVIRONMENTAL THICKNESS ON DUCTWORK, BUILDING REGULATIONS:

- The above thicknesses for nitrile rubber insulation relate to Class 0 rated insulation. The thicknesses may vary for other ratings.

500.020 THERMAL INSULATION WORKMANSHIP:

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.

Insulate each unit separately. Do not enclose adjacent units together.

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.

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.

500.040 INSTALLATION OF PROTECTION:

Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.

- Roofing felt
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.
- Aluminium-zinc coated steel
Install aluminium-zinc coated steel protection, in accordance with manufacturer's instructions.
- Aluminium sheeting
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.

600.000 COMMISSIONING

600.010 COMMISSIONING REQUIREMENTS:

- Type A
Application Ventilation
- Clean ductwork before plant is first run, using access openings in ductwork.
- Put system to work and demonstrate that specified duties are attained plus or minus:
 - 10%
- Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the BSRIA Application Guide for air systems to achieve the standards set in the CIBSE Commissioning Codes.
- Carry out checks and procedures as detailed in CIBSE Commissioning Code A, Section A1.
- Set to work and regulate air distribution systems in accordance with CIBSE Commissioning Code A, Section A2.
- Ensure that the control system functions in accordance with the requirements specified in clause 100.030.
- Keep a systematic record of commissioning results.

BS APPENDIX

BS 3533:1981

Glossary of thermal insulation terms

BS 476-24:1987

Fire tests on building materials and structures. Part 24 Method for determination of the fire resistance of ventilation ducts

BS 476-4:1970

Fire tests on building materials and structures. Part 4 Non-combustibility test for materials

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 5970:2001

Code of practice for thermal insulation of pipework and equipment in the temperature range of -100°C to +870°C

BS 7697:1993

Nominal voltages for low voltage public electricity supply systems

BS 848-5:1999

Fans for general purposes. Part 5 Special for mechanical safety (guarding)

BS EN 10327:2004

Continuously hot-dip coated strip and sheet of low carbon steels for cold forming. Technical delivery conditions

BS EN 12664:2001

Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Dry and moist products of medium and low thermal resistance

BS EN 12667:2001

Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

BS EN 12939:2001

Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Thick products of high and medium thermal resistance

BS EN 13779:2007

Ventilation for non-residential buildings. Performance requirements for ventilation and room-conditioning systems

BS EN 15423:2008

Ventilation for buildings. Fire precaution for air distribution systems in buildings

BS EN 60335-2-80:2003

Specification for safety of household and similar electrical appliances. Part 2-80 Particular requirements for fans

BS EN ISO 12241:2008

Thermal insulation for building equipment and industrial installations. Calculation rules

BS EN ISO 5136:2003

Acoustics. Determination of sound power radiated into a duct by fans and other air-moving devices. In-duct method

BS EN ISO 8990:1996

Thermal insulation. Determination of steady-state thermal transmission properties. Calibrated and guarded hot box

BS ISO 13347-1:2004

Industrial fans. Part 1 Determination of fan sound power levels under standardized laboratory conditions. General overview

BS ISO 13347-2:2004

Industrial fans. Part 2 Determination of fan sound power levels under standardized laboratory conditions. Reverberant room method

BS ISO 13347-3:2004

Industrial fans. Part 3 Determination of fan sound power levels under standardized laboratory conditions. Enveloping surface methods

BS ISO 13347-4:2004

Industrial fans. Part 4 Determination of fan sound power levels under standardized laboratory conditions. Sound intensity method

BS ISO 14695:2003

Fans for general purposes. Method of measurement of fan vibration

U39 AIR CONDITIONING - ALL AIR (SELF CONTAINED SPECIFICATION)

100.000 SYSTEM DETAILS

100.010 SYSTEM DESCRIPTION

Variable refrigerant flow (VRF) Airconditioning (indoor and outdoor) units are to be used

100.020 DESIGN PARAMETERS

100.030 CONTROL REQUIREMENTS

100.040 SYSTEM DRAWINGS

The drawings are as listed on the coversheet

- Schedule reference A11-Drawings

200.000 PLANT AND EQUIPMENT - ALL AIR CONDITIONING

200.001 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.

200.010 AIR HANDLING PLANT AND EQUIPMENT SCHEDULES:

- Supply air handling plant as
- Schedule reference Y40-ahus
- Schedule reference Y41-fans
- Schedule reference Y45-Silencers
- Schedule reference Y46-Grilles-diffusers
 - Location

200.050 AIR COOLED CONDENSER:

- Application Outdoor unit
- Manufacturer and reference MITSUBISHI ELECTRIC
 - Or approved equivalent.
- Location
- Duty
 - Cooling capacity(kW)
 - Electrical power input(kW)
 - Electrical supply to BS 7697
 - Single phase.
 - Three phase.
 - Maximum fan speed (r/s)
 - Number of circuits

- Refrigerant
- Sound power level
- Refrigerant pipework
 - Provide and install insulated refrigerant pipework between condensing unit and cooling coil(s).
 - Material
 - Seamless, round tubes to BS EN 12449.
- Seamless, round copper capillary tubes to BS EN 12450.

200.080 GRILLES AND DIFFUSERS:

- Application Airconditioning system
- Manufacturer and reference BLAUBERG
 - Or approved equivalent
- As schedule reference Y46-Grilles-diffusers
- As schedule reference
- As indicated on drawings
-

300.000 PLANT AND EQUIPMENT- AIR CONDITIONING UNITS

300.010 AIR CONDITIONING UNIT SCHEDULES:

Supply air conditioning units

- as schedule reference T70- VRF AC units
- as schedule reference
- Location
 - At end of this work section.

300.040 VRF CEILING CONCEALED DUCTED FAN COIL AIRCONDITIONING UNIT:

- Type Ceiling concealed ducted
 - Application
 - Manufacturer and reference MITSUBISHI ELECTRIC
 - Or approved equivalent
- Provide room unit as part of split coil air conditioning system.
- Mounting
 - Concealed horizontal.
 - Duty as schedule reference T70
 - Duty as schedule reference
 - Duty
 - Number off
 - Refrigerant
 - R401A.
 - Refrigerant acceptable under Montreal Convention.
 - Air volume (l/s)
 - Resistance (Pa)
 - Air on condition summer
 - Wet bulb (°C)
 - Dry bulb (°C)
 - RH (%)
 - Air on condition winter
 - Wet bulb (°C)
 - Dry bulb (°C)
 - RH (%)

- Air off condition summer
 - Wet bulb (°C)
 - Dry bulb (°C)
 - RH (%)
- Air off condition winter
 - Wet bulb (°C)
 - Dry bulb (°C)
 - RH (%)
- Cooling load
 - Sensible (kW)
 - Latent (kW)
 - Total (kW)
- Room noise level NR
- Electrical supply to BS 7697
 - Single phase.
 - Three phase.
- Humidification
- Standard
 - BS EN 255-3
 - BS EN 810.
 - BS EN 12693.
 - BS EN 14511-1
 - BS EN 14511-2
 - BS EN 14511-3
 - BS EN 14511-4
 - BS EN 60335-2-40.
- Casing
 - Manufacturer's standard.
- Finish
 - Stoved primer.
 - Manufacturer's standard.
- Access - Provide access to filter, fan and motor.
- Roomside fan
 - Centrifugal with direct coupled motor.
 - Tangential with direct coupled motor.
 - Filter
 - Washable.
- Insulation - Provide thermal and acoustic insulation.
- Controls
 - Display
 - Operating.
 - Program dry function.
 - Defrost/hot start.
 - Filter dirty.
 - Temperature setting.
 - Timer.
 - Air flow.
 - Fault.
 - Auxiliary contacts to wire to external source
 - Normally open contacts.
 - Momentary open contactor.
 - Alarm/fault.

- Temperature setting.
- Start/stop.
- Temperature monitoring.
- Monitor all unit functions.
- Controls type
 - Fixed recessed mounting.
 - Fixed surface mounting.
 - Portable controller
 - Temperature setting.
 - Timer settings (units of 1 hr to 72 hr).
 - Air flow setting.
 - Air flow direction adjustment.
 - Forcibly stop indoor unit by command from external source.
 - Send command to external source.
- Condensate drainage
 - Condensate pump within unit.
- Manufacturer's standard.

300.060 REMOTE AIR COOLED CONDENSING UNIT:

- Type
- Application
- Manufacturer and reference MITSUBISHI ELECTRIC
 - Or approved equivalent

Provide an air cooled condensing unit incorporating hermetic compressor, condenser coil and fan.

Provide compressor complete with crankcase heater, suction and delivery valves, service connections and high and low pressure safety switches.

- Duty
 - Matched to cooling unit.
 - Serve split coil units specified
 - In above clause(s) reference
 - In schedule reference
 - External noise level (dBA)
 - Electrical supply to BS 7697
 - Single phase.
 - Three phase.
- Arrangement
 - One unit serves a single indoor unit.
 - One unit serves multiple indoor units
- Casing

Provide a weatherproof casing constructed from

 - galvanized sheet steel.
 - fibre glass.
 - Finish
 - Manufacturer's standard.
- Condenser location
 - Roof mounted.
 - Wall mounted.
 - Ground level.
 - Indoor
 - With duct connections.
- Refrigerant pipework
 - Seamless, round copper tube to BS EN 12449.

- Seamless, round copper capillary tube to BS EN 12450.
- Pipework insulation
 - Manufacturers standard

400.000 PLANT AND EQUIPMENT GENERAL

400.020 PLANT AND EQUIPMENT WORKMANSHIP:

Install all plant and equipment in accordance with manufacturer's instructions.

500.000 DUCTLINES AND ANCILLARIES

500.010 DUCTWORK FABRICATION:

Prepare fabrication drawings and carry out fabrication of ductwork in accordance with DW 144 and DW 154 as appropriate.

500.020 DUCTWORK DIMENSIONS:

Sizes of ductwork are internal dimensions. Where applicable make allowance for any internal lining.

500.030 INSTALLER SELECTION:

- Use a member of the HVCA specialising in the trade of manufacturing and installing ductwork. Use one of the specialist companies listed below.
- Or approved equivalent.

500.040 DUCTWORK AND FITTINGS:

- Type
- Application
- Design Information - Supply ductwork in accordance with classification in DW 144 Table 1. Ductwork Classification and Air Leakage limits
 - Low pressure - Class A - Positive.
 - Low pressure - Class A - Negative.
- Ductwork air leakage testing
 - Carry out ductwork air leakage testing on high pressure ductwork in accordance with DW 144 as procedures set out in DW 143.
 - Test medium pressure ductwork in accordance with DW 144, A5.
 - Test low pressure ductwork
 - Testing plant items, DW 144, Part 8, A.8.
- Plant connections.
 - Make connection between air handling assembly and ductwork system in accordance with DW 144.
- Flanged connections.
 - Provide bolted flanged joints for connecting ductwork to flanged items of plant, builder's work frames and where removable sections of ductwork are required.

500.050 DUCTWORK TO DW 144:

- Type
- Application
- Material, DW 144 Part 2 - Standards, paragraph 7.
 - Zinc-coated steel.

-
- Protective finishes - DW 144 Part 7 - General, Section 27.
 - Galvanising after manufacture.
 - Metal spraying.
 - Paints
 - Protective requirements for ducts made from mild steel
-
- Construction
 - Rectangular ductwork - DW 144 Part 3.
 - Circular ductwork - DW 144 Part 4.
 - Spirally wound.
 - Straight seamed.
 - Flat oval ductwork - DW 144 Part 5.
 - Spirally wound.
 - Straight seamed.

500.060 FLEXIBLE DUCTS:

- Type
- Application
- Manufacturer and reference
 - Or approved equivalent
- Supply and fasten flexible duct connections as DW 144 Part 7 Section 25. Use flexible duct connections in applications listed in DW 144 paragraph 25.1.
- Material
 - Metal
 - Coated steel.
 - Stainless Steel.
 - Aluminium.
 - Fabric
 - PVC/Polyester laminate.
 - Aluminium/Polyester laminate encapsulating high tensile steel wire helix.

500.080 ACCESSORIES - METAL DUCTWORK:

- Type
- Flexible Joints
 - Application
 - Supply and install flexible joints as detailed in DW 144 Part 7 Section 26.
 - Comply with BS 476-24.
 - Position
 - Use flexible joints, as shown on drawings
 - On fan inlet/outlets.
 - To make connections to air conditioning units.
 - To make connections to air diffusers, grilles and air registers.
- Access openings
 - Provide access openings in accordance with DW 144 Part 7 Section 20.
 - Provide access for cleaning in accordance with DW 144 Part 7, paragraph 20.8 and
 - Appendix M Table 25 Level 2.
 - Appendix M Table 25 Level 3.
- Provide hangers and supports throughout in accordance with DW 144 Part 6.
- Use proprietary system of ductwork supports
- Regulating dampers

Provide regulating dampers in accordance with DW 144 Part 7 Section 21. Locations and size as shown on drawings.

- Function
 - Balancing damper.
 - Control damper.
- Supply and install fire dampers in accordance with DW 144 Part 7 section 22, Locations and size as shown on drawings.
 - Fusible links
 - Supply spare fusible links for fire dampers. Supply links to fuse at (°C)
- Fit bird screens of 13mm square mesh wire on all intake and extract louvres to atmosphere. Wire gauge to be not less than 1mm.

500.100 DUCTWORK WORKMANSHIP:

Install ductwork in accordance with DW 144, and DW 154 as appropriate. Ensure that there are no sharp edges or corners on cut edges on ductwork, flanges and supports. Arrange ductwork to drain any entrained moisture and ensure the lapping of joints minimises moisture leakage.

Connection to builder's work. Comply with DW 144 Part 7 Section 28.

Space supports in accordance with DW 144 Part 6 or DW 154 Part 5 as appropriate.

- Internal cleanliness
 - Provide the level of protection, delivery and installation (PDI) as defined in HVCA document HVCA TR/19, Section 2.
 - Level 1.
 -
- 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
 - 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 test holes in ductwork system to allow complete testing and balancing of system in accordance with CIBSE Commissioning Code A.
 - Site drill test holes on site in accordance with DW 144 Part 7 Section 20.6.
 - Provide holes in metal ductwork, in accordance with DW 144 Part 7, paragraph 20.7, to accommodate thermostats, humidistats and other control sensors in positions and sizes indicated on drawings.
 - Install sensors and test points in plastics ductwork to suit specialist control and sensing equipment in positions and fixing configurations shown on drawings.
 - Fit sensors, damper motors and other control equipment as indicated on drawings.
 - Provide instrument connections where indicated on drawings.

600.000 PIPELINES AND PIPELINES WORKMANSHIP

600.010 REFRIGERANT PIPEWORK:

- Type
- Application
- Manufacturer and reference
- Seamless, round copper tube to BS EN 12449.
- Seamless, round copper capillary tube to BS EN 12450.
- Jointing
 - High temperature solder.

- Manipulative compression (flared).
- Manipulative compression (flared) only at connection to equipment.
- Support
 - Support all pipework and controls cabling throughout their length using cable tray, firmly fixed to the building fabric
 - Perforated cable tray
 - Flanged.
 - Return.
 - Perforations and thickness
 - Manufacturer's standard.
- Fittings
 - Use factory made fittings throughout of same material type, pattern, finish and thickness as tray.
- Finish

600.020 DRAINAGE PIPEWORK:

- Type
- Application
 - Provide condensate drainage pipework from all units to drain
- Copper tube to BS EN 1057
 - Fittings solder.
 - Fittings compression.
 - Provide tees rather than bends to allow cleaning.
- Unplasticised PVC Class C to BS EN 1452, self colour plain ends with solvent welded fittings.
- Unplasticised PVC to BS EN 1452.
- Provide tundish and air break at units.
- Provide trap - depth minimum 1.5 times negative pressure on inlet and 0.5 times negative pressure at discharge.

600.030 REFRIGERANT PIPEWORK INSULATION:

- Type
- Application
 - Ensure the entire length of pipework is insulated for thermal insulation and to avoid contact between copper and galvanising of tray.
- Closed cell nitrile rubber preformed flexible sections
 - CFC free.
 - Fire rating (class)
 - Install un-split wherever possible.
 - Use manufacturer's standard glue for jointing.
 - Ensure vapour barrier is maintained on
 - all pipework.
 - suction pipe only.
- Protection
 - Paint
 - Manufacturer's standard colour.
 - Paint chlorinated rubber colour
 - Colour
 - Wrap fittings and valves with same insulation as pipework.
- Provide aluminium valve boxes.
- Insulation thickness (mm) 15

600.040 REFRIGERANT PIPEWORK INSTALLATION:

Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure.

Ensure all vertical pipes are plumb or follow building line. Provide lifting loops where called for by system manufacturer.

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. Take precautions to prevent the discharge of refrigerant gases to atmosphere.

600.140 VALVE LABELS:

Supply and fit engraved plastic labels to all valves (except isolating and regulating valves on heat emitters). Engrave with

- Description of function.

600.150 PIPEWORK IDENTIFICATION:

Colour code and label to BS 1710.

Apply 300mm wide colour bands to each pipe at intervals of 15 metres maximum.

- Apply 50mm wide colour bands and superimpose a legend identifying circuit and direction of flow.

Apply legends to colour bands by transfers of an approved type.

600.160 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.

600.170 ISOLATION AND REGULATION:

Provide valves, cocks and stop taps for isolation and/or regulation

- where shown on drawings.
- 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.
- at 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.

600.180 SPACING:

Space pipe runs in relation to one another, other services runs and building structure, allow for thermal insulation and ensure adequate space for access to pipe joints, etc.

Minimum clearances to pipe or pipe insulation	
From	Minimum clearance (mm)
Wall	25
Ceiling	50
Floor	150
Other pipes	25
Electrical cables, conduit switchgear, etc	150

600.190 GRADIENTS:

Install pipework with gradients to allow drainage and air release.
Provide a means of venting the pipe system at all high points.
Grade pipework to allow system to be drained. Provide a means of draining the system at all low points.

600.200 EXPANSION AND CONTRACTION:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes.
Isolate pipes from structure to prevent noise or abrasion due to thermal movement.

600.210 BENDS, SPRINGS AND OFFSETS:

Machine bend and ensure that machine guides and formers are smooth and clean, free from any scores, or other damage. Deformed bends will not be accepted.

600.220 PIPES THROUGH WALLS AND FLOORS:

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves.

600.230 PIPE SLEEVES:

Cut sleeves from material same as pipe one or two sizes larger than pipe. Do not use sleeves as pipe supports. Install sleeves flush with building finish.

600.240 TEMPORARY PLUGS AND CAPS:

Seal all open ends as installation proceeds by metal, plastic or wooden plugs or caps, to prevent ingress of foreign matter.

600.300 PIPE RINGS AND CLIPS:

Select type according to the application and material compatibility.

600.310 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.

600.340 MAINTENANCE AND RENEWAL:

Arrange pipework, valves, drains, air vents etc., for convenient routine maintenance and renewals.

600.350 PROTECTION OF PIPES IN SCREEDS:

- Wrap pipework with two protective tapes prior to laying.
- Sheath pipework with PVC.

600.360 CLEANING:

Remove cement and clean off all pipework and brackets.

700.000 THERMAL INSULATION

700.010 DUCTWORK THERMAL INSULATION - MATERIALS:

- Type
- Application
- Thermal Insulation Sub-contractor

Standards

Comply in general with BS 5970. Description of terms as BS 3533.

Thermal conductivity

Ensure values are in accordance with BS EN 12664, BS EN 12667, BS EN 12939 or BS EN ISO 8990.

Fire rating

Employ materials that comply with BS 476-4, non-combustibility test, or obtain a Class 'O' fire rating to Building Regulations.

When finished, comply with BS 476-7

- Class 1 spread of flame.

Temperature of fluid in ducts (°C)

Material

- Mineral fibre duct insulation
 - Rigid
 - Flexible
 - Lamella
 - Finish
 - Reinforced aluminium foil.
- Adhesives.

Comply with the recommendations of clause 8.2 of BS 5970, section 2 for insulation bonding adhesives, lagging adhesives, facing and film attachment adhesives.
- Protection
 - Application
 - Polyisobutylene
 - Minimum thickness 0.8mm.
 - Roofing felt

Secure in position with galvanized wire netting, of 1mm x 25mm mesh. Finish with two coats of black bituminous paint.
 - Mild steel sheet continuously hot dipped with aluminium-zinc coating to BS EN 10327, applied directly to insulating material.
 - Finish
 - Flat sheet.
 - Ribbed sheet.
 - Aluminium sheeting

Apply flat (embossed) or profiled aluminium cladding directly to insulating material, thickness 0.71mm on ductwork.

 - Laminated foil/film
- Reinforcement
 - Application
 - Aluminium bands at 300mm centres.
 - Aluminium bands at 450mm centres.
 - 50mm x 19g galvanised wire netting to BS EN 10223.
 - 50mm x 22g galvanised wire netting to BS EN 10223.

700.020 DUCTWORK THERMAL INSULATION WORKMANSHIP:

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.
 Insulate each unit separately. Do not enclose adjacent units together.
 Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.
 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.

700.030 INSTALLATION OF FOIL FACED 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.
 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.
 Foil faced semi-rigid slab
 Cut slabs so that the top and bottom pieces overlap the sides.
 Where insulation abutts duct support inserts that have integral vapour barriers seal using class 'O' foil tape to continue vapour barrier.

700.040 INSTALLATION OF PROTECTION:

Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.

Roofing felt

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.

Aluminium-zinc coated steel

Install aluminium-zinc coated steel protection, in accordance with manufacturer's instructions.

Aluminium sheeting

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.

700.045 CALCULATION OF INSULATION THICKNESS - BUILDING REGULATIONS (ENGLAND AND WALES):

Provide insulation of thickness conforming with the values given in the tables below. These figures are derived from the requirements of the Building Regulations (England and Wales) Part L Approved Documents, and the calculation methods given in BS EN ISO 12241.

700.050 ENVIRONMENTAL THICKNESS ON WARM AIR DUCTWORK:

Temperature difference between air inside ductwork and ambient still air (K)	10	25	50
Heat loss (W/m ²)	7.2	15.3	26.0
Environmental thickness of mineral wool insulation (mm)	40	50	60
Environmental thickness of phenolic foam (mm)	25	25	40

700.055 ENVIRONMENTAL THICKNESS ON DUCTWORK, BUILDING REGULATIONS:

- The above thicknesses for nitrile rubber insulation relate to Class 0 rated insulation. The thicknesses may vary for other ratings.

700.060 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 25⁰C, relative humidity 80%, dew point temperature 21.3⁰C.

Minimum air temperature inside duct ⁰ C	Thermal conductivity of 0.035 W/mK at a mean temperature of 10 ⁰ C		
	Surface coefficients		
	Low (0.05)	Medium (0.44)	High (0.90)
	Thickness of mineral wool insulation (mm)		
15	25	25	25
10	50	25	25
5	65	40	25
0	90	50	30

700.070 CONDENSATION CONTROL ON CHILLED AIR DUCTWORK - PHENOLIC FOAM:

Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature 25⁰C, relative humidity 80%, dew point temperature 21.3⁰C.

Minimum air temperature inside duct ⁰ C	Thermal conductivity of 0.018 W/mK at a mean temperature of 10 ⁰ C		
	Surface coefficients		
	Low (0.05)	Medium (0.44)	High (0.90)
	Thickness of closed cell phenolic foam (mm)		
15	25	25	25
10	30	25	25
5	40	25	25
0	50	25	25

900.000 COMMISSIONING

900.010 COMMISSIONING REQUIREMENTS:

- Type
- Application
- Clean ductwork before plant is first run, using access openings in ductwork.
- Put system to work and demonstrate that specified duties are attained plus or minus:
 - 10%
- Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the BSRIA Application Guide to achieve the standards set in the CIBSE Commissioning Code.
- Carry out checks and procedures as detailed in CIBSE Commissioning Code A, Section A1.
- Set to work and regulate air distribution systems in accordance with CIBSE Commissioning

Code A, Section A2.

- Ensure that the control system functions in accordance with the requirements specified in clause 100.030.
- Keep a systematic record of commissioning results.

BS APPENDIX

BS 1710:1984

Specification for identification of pipelines and services

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 3533:1981

Glossary of thermal insulation terms

BS 476-24:1987

Fire tests on building materials and structures. Part 24 Method for determination of the fire resistance of ventilation ducts

BS 476-4:1970

Fire tests on building materials and structures. Part 4 Non-combustibility test for materials

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 5141-1:1975

Specification for air heating and cooling coils. Part 1 Method of testing for rating of cooling coils

BS 5970:2001

Code of practice for thermal insulation of pipework and equipment in the temperature range of -100°C to +870°C

BS 7697:1993

Nominal voltages for low voltage public electricity supply 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 10327:2004

Continuously hot-dip coated strip and sheet of low carbon steels for cold forming. Technical delivery conditions

BS EN 1057:2006

Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications

BS EN 1092-1:2007

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

BS EN 12449:1999

Copper and copper alloys. Seamless, round tubes for general purposes

BS EN 12450:1999

Copper and copper alloys. Seamless, round copper capillary tubes

BS EN 12664:2001

Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Dry and moist products of medium and low thermal resistance

BS EN 12667:2001

Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

BS EN 12693:2008

Refrigerating systems and heat pumps. Safety and environmental requirements. Positive displacement refrigerant compressors

BS EN 12939:2001

Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Thick products of high and medium thermal resistance

BS EN 14511-1:2007

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling. Part 1 Terms and definitions

BS EN 14511-2:2007

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling. Part 2 Test conditions

BS EN 14511-3:2007

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling. Part 3 Test methods

BS EN 14511-4:2007

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling. Part 4 Requirements

BS EN 255-3:1997

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors. Heating mode. Part 3 Testing and requirements for marking for sanitary hot water units

BS EN 60335-2-40:2003+A2:2009

Specification for safety of household and similar electrical appliances. Part 2-40 Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

BS EN 60335-2-88:2002

Specification for safety of household and similar electrical appliances. Part 2-88 Particular requirements. Particular requirements for humidifiers intended for use with heating, ventilation, or air-conditioning systems

BS EN 60335-2-98:2003+A2:2008

Specification for safety of household and similar electrical appliances. Part 2-98 Particular requirements for humidifiers

BS EN 779:2002

Particulate air filters for general ventilation. Determination of the filtration performance

BS EN 810:1997

Dehumidifiers with electrically driven compressors. Rating tests, marking, operational requirements and technical data sheet

BS EN ISO 12241:2008

Thermal insulation for building equipment and industrial installations. Calculation rules

BS EN ISO 8990:1996

Thermal insulation. Determination of steady-state thermal transmission properties. Calibrated and guarded hot box

Y10 PIPELINES

Y10.1000 GENERAL

- Supply pipes and fittings as specified in work section
- Location
- As schedule reference

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 for Local Water Authority or Water Research Centre for materials used in water supplies.

Y10.2270A COPPER HALF HARD:

Kitemarked.

Material - Copper.

Standard - BS EN 1057, R250, (Class X).

Dimensions - BS EN 1057 table 3.

Ends - Plain, grooved for mechanical joints.

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.

Y10.2322 CAPILLARY FITTINGS, SHORT, FOR BRAZING TO COPPER TUBING:

Material - Dezincifiable resistant copper alloy.

Standard - BS EN 1254-5

Size range - BS EN 1254-5 - 67mm to 159mm.

Dimensions - BS EN 1254-5, table 2.

Ends - Plain.

Finish - Natural.

Y10.2442 PLASTIC PIPING SYSTEMS TO BS EN 15014:

Standard - BS EN 15014.

Application - Buried and above ground systems for water (not potable) and other fluids under pressure.

Performance characteristics for pipes, fittings and their joints.

Performance characteristics - reaction to fire; external pressure strength; internal pressure strength; dimensional tolerance; tightness (air and water); durability; dangerous substances.

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.

Y10.2491A ORIENTED UNPLASTICISED PVC TO BS ISO 16422:

Material - Unplasticised PVC.

Standard - BS ISO 16422.

Dimensions - BS ISO 16422.

Ends - Plain, socket.

Finish - Blue, grey or cream.

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.

Y10.2510A 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.

Y10.2545A 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 and BS EN 15012.
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.

Y10.2552A 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.

Y10.2553A PIPES AND FITTINGS WITH SMOOTH INTERNAL AND EXTERNAL SURFACE, TYPE A, TO BS EN 13476-2:

PVC-U, PP and PE pipes, type A.
Material - unplasticised poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE).
Standard - BS EN 13476-2.
Dimensions - BS EN 13476-2, Section 7.
Ends - Spigot, Type A1, Type A2, Type B.
Finish - Black, orange-brown, dusty grey.

Y10.2553B PIPES AND FITTINGS WITH SMOOTH INTERNAL AND PROFILED EXTERNAL SURFACE, TYPE B, TO BS EN 13476-3:

PVC-U, PP and PE pipes, type B.
Material - unplasticised poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE).
Standard - BS EN 13476-3.
Dimensions - BS EN 13476-3, Section 7.
Ends - Solid plain, Type A1, Type A2, Type B.
Finish - Black, orange-brown, dusty grey.

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 and BS EN 15012.
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.

Y10.2730# FULLY PLASTICIZED NYLON TO BS 5409-1:

- Material
 - Fully plasticized nylon polyamide type 11.
 - Fully plasticized nylon polyamide type 12.
- Standard
 - BS 5409-1, light duty grade.
 - BS 5409-1, normal duty grade.
- Dimensions
 - BS 5409-1, table 1.
 - BS 5409-1, table 2.
- Ends - Plain.
- Finish
 - Standard.
 - Stabilized against heat and light degradation.
 - Coloured

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 1092-4.

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 1092-4.

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.

Y10.3050A WELDED JOINTS, WELDING RODS FOR STEEL PIPES:

Gas welding, BS 1453 type A2 or A3; electric arc welding BS 2971.

Y10.3050B WELDED JOINTS, WELDING RODS FOR COPPER PIPES:

Bronze welding BS 1453.

Y10.3060# BRAZED JOINTS:

- Use filler metal alloys to BS EN 1044.
- Use nickel bearing zinc free grades of filler metals to BS EN 1044.

Y10.3070A CAPILLARY JOINTS FOR COPPER:

Use materials as follows

Solder - BS EN ISO 9453.

Flux - Copper pipe - BS EN 29454-1.

Y10.3095B JOINTING MATERIALS FOR PLASTICS PIPES TO BS 7291 - PUSHFIT:

Plastics fittings to BS 7291.

Method of jointing to BS 5955-8

Mechanical joints - Pushfit.

Y10.3095C JOINTING MATERIALS FOR PLASTICS PIPES TO BS 7291 - SOLVENT CEMENT:

Plastics fittings to BS 7291.

Method of jointing to BS 5955-8 - Solvent cement joints.

Y10.3097# JOINTING EQUIPMENT FOR POLYBUTYLENE (PB) PIPES:

Provide the equipment recommended by the manufacturer to carry out the following jointing technique(s) on polybutylene pipes and fittings.

- Compression fittings.
- Socket fusion.
- Electrofusion.

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.

Y10.3170A 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.

Y10.3180A 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:-

Between	and	Clearance (mm)
Pipeline insulated or uninsulated	Wall Finish	25
	Ceiling Finish	50
	Soffit Floor Finish	150
Insulated Pipeline	Adjacent service runs	25
Uninsulated pipeline	Adjacent service runs	50
Adjacent pipelines	Both uninsulated	150
	One uninsulated	75
	Both insulated	25

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.

Y10.4120A 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.

Y10.4150A 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 fitments in pipe runs, so that no undue strain is imposed upon pipes.

Ensure that materials used for supports are compatible with pipeline materials.

Y10.4220 SUPPORT SPACING:

Space supports as tables.

Pipe Bore (mm)	Maximum Support Spacing (M)					
	Steel Pipe		Copper Pipe		Iron Pipe	
Nominal	horizontal	vertical	horizontal	vertical	horizontal	vertical
Up to 15	1.8	2.4	1.2	1.8	-	-
20	2.4	3.0	1.4	2.1	-	-
25	2.4	3.0	1.8	2.4	-	-
32	2.7	3.0	2.4	3.0	-	-
40	3.0	3.6	2.4	3.0	-	-
50	3.0	3.6	2.7	3.0	1.8	1.8
65	3.7	4.6	3.0	3.6	-	-
80	3.7	4.6	3.0	3.6	2.7	2.7
100	3.7	4.6	3.0	3.6	2.7	2.7
125	3.7	5.4	3.0	3.6	-	-
150	4.5	5.4	3.6	4.2	3.7	3.7
200	5.6	6.0	-	-	3.7	3.7
250	5.0	6.0	-	-	4.5	5.4
300	6.1	10.0	-	-	8.0	10.0
350	10.0	12.0	-	-	-	-
400	10.5	12.6	-	-	-	-
450	11.0	13.2	-	-	-	-
500	12.0	14.4	-	-	-	-
600	14.0	16.8	-	-	-	-

For grooved steel and copper pipe, no individual pipe length should be left unsupported.

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 EN 1452.

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.

Y10.5010A 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 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 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.

Arc welding, conforming to 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.

Y10.5070A 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.

Y10.5120 BRAZED JOINTS, STAINLESS STEEL JOINTS:

Preparation - Prepare for brazing in accordance with BS EN 14324.

Making and Sealing - Use flame heat and make in accordance with BS EN 14324. Use nickel bearing zinc free filler metals.

Y10.6010 WELDING GENERAL:

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.

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.

Y10.6050 BRAZED JOINTS, COPPER/COPPER ALLOY PIPES:

Preparation - Prepare for brazing in accordance with BS EN 14324. Use manufactured fittings not subject to dezincification and suitable for application.

Making and Sealing - Use flame heat and make in accordance with BS EN 14324. Use silver brazing filler alloy suitable for application.

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.

Y10.7010 FLANGED JOINTS, CAST IRON/DUCTILE IRON PIPES:

Preparation - Ensure that flange mating faces are parallel, flange peripheries are flush with each other and bolt holes are correctly aligned.

Making and Sealing - Coat both sides of joint ring with jointing compound to BS 6956-5 or BS EN 751-2. Insert joint ring between flange mating faces. Pull up joint with bolts, nuts and washers, ensuring that excess compound does not intrude into the pipe. Leave joint clean.

Y10.7020 CAULKED JOINTS, CAST IRON/SPUN CAST IRON PIPES:

Preparation - Ensure plain ends are cut square.

Making and sealing - Caulk socket with yarn, fill socket with molten lead, allow to cool and caulk home. Ensure bore of pipe is not obstructed.

Y10.7030 FLEXIBLE JOINTS, CAST IRON PIPES:

Preparation - Ensure that cut ends are square. Form groove to manufacturer's detail. Assemble joint in accordance with manufacturer's instructions.

Making and Sealing - Ensure joint ring is suitable for service. Thoroughly lubricate joint ring. Slip ring over pipe end and bring ends together. Slide ring into central position over both pipe ends. Position metal half housings over joint ring and insert bolts and nuts. Tighten bolts to manufacturer's instructions. Check alignment of joint and pipework.

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.

Carry out butt fusion jointing of pipes and fittings in accordance with the procedures given in BS ISO 21307.

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.

Y10.8060 COMPRESSION FITTINGS ON MULTI-LAYER PIPES:

Carry out installation of compression fittings on multi-layer pipe in accordance with manufacturer's recommendations.

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.

Y11.2015A 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.

Y11.2060A PARALLEL SLIDE VALVES TO BS EN 1171:

Ends - Flanged BS EN 1092-2.
Stem - Rising stem.
Valve faces - Stainless steel disc and seat.

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.

Y11.2085A SCREWED END SERVICING VALVES - HANDWHEEL OPERATED:

Materials - copper alloy body.

Ends - Screwed to BS 864 and BS EN 1254-2.

Operation - Handwheel operated.

Y11.2085B COMPRESSION END SERVICING VALVES - HANDWHEEL OPERATED:

Materials - Copper alloy body.

Ends - Compression fittings to BS 864 and BS EN 1254-2.

Operation - Handwheel operated.

Y11.2085C CAPILLARY END SERVICING VALVES - HANDWHEEL OPERATED:

Materials - Copper alloy body.

Ends - Capillary ends to BS 864 and BS EN 1254-1.

Operation - Handwheel operated.

Y11.2085D SCREWED END SERVICING VALVES - LEVER OPERATED:

Materials - Copper alloy body.

Ends - Screwed to BS 864 and BS EN 1254-2.

Operation - Lever operated.

Y11.2085E COMPRESSION END SERVICING VALVES - LEVER OPERATED:

Materials - Copper alloy body.

Ends - Compression fittings to BS 864 and BS EN 1254-2.

Operation - Lever operated.

Y11.2085F CAPILLARY END SERVICING VALVES - LEVER OPERATED:

Materials - Copper alloy body.

Ends - Capillary ends to BS 864 and BS EN 1254-1.

Operation - Lever operated.

Y11.2085G SCREWED END SERVICING VALVES - SCREW DRIVER OPERATED:

Materials - Copper alloy body.

Ends - Screwed to BS 864 and BS EN 1254-2.

Operation - Screw driver operated.

Y11.2085H COMPRESSION END SERVICING VALVES - SCREW DRIVER OPERATED:

Materials - copper alloy body.

Ends - Compression fittings to BS 864 and BS EN 1254-2.

Operation - Screw driver operated.

Y11.2085I CAPILLARY END SERVICING VALVES - SCREW DRIVER OPERATED:

Materials - Copper alloy body.
Ends - Capillary ends to BS 864 and BS EN 1254-1.
Operation - Screw driver operated.

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 BETWEEN MECHANICAL JOINTS:
Construction - Wafer type design, for installation between mechanical joints, body with grooved ends.
Provide lever operated valves with long body neck for lagging clearance.
Seat - Bonded.
Materials - Ductile iron body; stainless steel shaft; electroless nickel coated ductile iron disc; EPDM seat.
Operation - Lever and graduated notch plate.

Y11.2090D GEAR OPERATED BUTTERFLY VALVES BETWEEN MECHANICAL JOINTS:
Construction - Wafer type design, for installation between mechanical joints, body with grooved ends.
Provide gear operated valves with long body neck for lagging clearance.
Seat - Bonded.
Materials - Ductile iron body; stainless steel shaft; electroless nickel coated ductile iron disc; EPDM seat.
Operation - gear operated.

Y11.2110A STOP VALVES - KEY OPERATED SLUICE TYPE A TO BS 5163-1 AND BS 5163-2:
• Flanged to BS EN 1092-2, PN
Valve type - A
Seat - Resilient or metal seated.
Stem seal - Stuffing box and gland; injector packing foil; or toroidal sealing rings (O-rings).
Operation - T key.
Materials - Manufacturer's standard and WRAS approved.
Options - Stem cap.

Y11.2180# REGULATING/FLOW MEASUREMENT VALVES - GLOBE TYPE TO BS EN 13789:
• Performance - BS 7350.
• Pattern
• Straight.
• Oblique or Y.
• Valve face
• Copper alloy faced.
• Nickel alloy faced.

- Stainless steel faced.
- Resilient seated.
- All iron.
- Stem
 - Non-rising stem inside screw.
 - Rising stem outside screw.
- Ends
 - Flanged to BS EN 1092-2 PN
 - Threaded to BS 21 and BS EN 10226-1.
 - Grooved.
- Material
 - Manufacturer's standard.
- Options
 - Body tappings and plug.
 - Body tappings with self-sealing test plugs.
 - Back seat.
 - Locking device.

Y11.2190# REGULATING/FLOW MEASUREMENT VALVES - GLOBE TYPE TO BS 5154:

- Performance to BS 7350.
- Series
 - A.
 - B.
- Pattern
 - Straight.
 - Oblique or Y.
- Ends
 - Threaded to BS 21 and BS EN 10226-1.
 - Flanged to BS EN 1092-3 PN
 - Compression to BS EN 1254-2.
 - Compression to BS EN 1254-3, or BS 864-5.
- Stem
 - Inside screw non-rising stem.
 - Outside screw rising stem.
- Trim material
 - Manufacturer's standard.
 - Suitable for potable water supply.
- Operation
 - Handwheel.
 - Lockshield.
- Options
 - Metallic renewable seat/disk rings.
 - Non-metallic renewable seat/disk rings.
 - Body tappings and drain plug.
 - Body tappings with self-sealing test plugs.

Y11.2200# REGULATING/FLOW MEASUREMENT VALVES - GLOBE TYPE TO BS EN 13709:

- Performance - BS 7350.
- Pattern
 - Straight.
 - Oblique.
- Ends
 - Flanged to BS EN 1092-1, PN

- Butt-weld body ends.
- Operation
 - Handwheel.
- Materials
 - Manufacturer's standard to suit fluid and operating conditions.
- Options
 - Body tappings and plug.
 - Body tappings with valve isolating test points.
 - Back seat.

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 - 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, lever operation.

Y11.2210D GEAR OPERATED REGULATING BUTTERFLY VALVES TO BS EN 593 BETWEEN MECHANICAL JOINTS:

Construction - Installation between mechanical joints with grooved ends.

Provide 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, 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.

Y11.2230A 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 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 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.

Y11.2250# FLOW REGULATOR:

- Arrangement
 - Wafer pattern regulator.
 - Regulator in flanged housing.
 - Y pattern regulator.
 - Combined ball valve and regulator.
 - Combined ball valve and commissioning set.
- Size (mm)
- Material
 - Body
 - Ductile iron
 - Cast iron.
 - Stainless steel.
 - DZR copper alloy.
 - Bronze.
 - Regulator
 - Stainless steel.
 - Nickel plated finish.
- Commissioning set
 - Venturi cartridge.
 - Oriface plate.

Y11.2270E TAMPER PROOF THERMOSTATIC RADIATOR VALVES TO BS EN 215 TABLE A.1:

- Pattern
 - Straight
 - Angle

Material to Annex A.

Pattern - Straight or angle pattern to suit application.

Provide tamper proof TRV's.

Dimensions - Table A.1 series D.

Thermostatic valve type - Integral sensor unless otherwise indicated.

Y11.2270F TAMPER PROOF THERMOSTATIC RADIATOR VALVES TO BS EN 215 TABLE A.2:

- Pattern
 - Straight
 - Angle

Material to Annex A.

Pattern - Straight or angle pattern to suit application.

Provide tamper proof TRV's.

Dimensions - Table A.2 series S.

Thermostatic valve type - Integral sensor unless otherwise indicated.

Y11.2280A FLOAT OPERATED VALVES TO BS 1212-1, COPPER FLOAT:

Piston type float operated valve to BS 1212-1.

Connection - Side or bottom entry to suit application.

Float - Copper to BS 1968.

Y11.2280B FLOAT OPERATED VALVES TO BS 1212-1, PLASTIC FLOAT:

Piston type float operated valve to BS 1212-1.

Connection - Side or bottom entry to suit application.

Float - Plastic to BS 2456.

Y11.2290A THREADED END FLOAT OPERATED VALVES, BALANCED EQUILIBRIUM:

WRAS approved.

Bronze or DZR copper alloy body.

Inlet - Threaded to BS 21 and BS EN 10226-1.

Spindle and head effectively guided and arranged with stops to engage with valve body and prevent over travel. Linkage fulcrum adjustable relative to vertical plane, securely locked to body tapping when set.

Screwed plug from access cover.

Float and lever arm.

Spun copper float, halves brazed or welded together, with centre sleeve connecting to lever arm.

For feed and expansion application use long arm type arranged to close when tank contains 150mm depth.

Y11.2310# THERMOSTATIC CONTROL VALVES:

- Operation
 - Two way.
 - Three way.
 - High limit.
 - High limit with manual reset.
- Material
 - Brass.
 - Copper alloy to BS EN 1982.
 - Cast iron to BS EN 1561 and of tensile strength 140N/mm² or 170N/mm², using separate cast sample test method.
 - Cast steel to BS EN 10222 and BS EN 10213.
- Connections
 - Threaded to BS 21 and BS EN 10226-1.
 - Flanged to BS EN 1092-3 PN
 - Cast Steel, flanged to BS EN 1092-1 PN
 - Cast iron, flanged to BS EN 1092-2 PN
- Ancillaries
 - Position indicator.
 - Locking device.
 - Strainer.
 - Moisture trap.
 - Safety valve.
- Temperature sensor
 - Integral thermostat with an alpha/numeric set-point indicator and locking facility, where indicated.
 - Remote sensor with an alpha/numeric/temperature set-point indicator; integral locking facility, where indicated; and capillary connections between sensor and valve.

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 EN 14451:

Standard - BS EN 14451 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.

Y11.2391A HOSE UNION ANTI-VACUUM TYPE ANTI BACK SYPHONAGE VALVES:

Bronze or DZR copper alloy body assembly with fittings to BS EN ISO 228-1.

Pattern - In line pattern.

Sizes - DN15 to DN25.

WRAS Approval.

Y11.2395A VERIFIABLE BACKFLOW PREVENTER WITH REDUCED PRESSURE ZONE (RPZ) VALVE - GENERAL REQUIREMENTS:

Provide an application to the local water supplier using the WRAS "RPZ Valve Assembly - Application for Installation" form.

Obtain Water Supplier agreement that a Type BA device is a suitable means of backflow protection in the water supply system under consideration.

Test methods and maintenance regimes shall be in accordance with the Water Suppliers requirements and any failure to comply may result in termination of supply or removal of the device. These maintenance requirements must be detailed within the project Operation & Maintenance documentation.

The fitting must be included in the WRAS "Water Fittings and Materials Directory" and satisfy the requirements of the Regulations.

The installer must obtain formal Water Supplier agreement that a Type BA device is a suitable means of backflow protection in the plumbing system under consideration before installation.

Confirm that any Type BA device installed provides protection against back pressure and back siphonage at the point of use from fluids up to and including Category 4 as defined in the Water Supply (Water Fittings) Regulations 1999.

Comply with the stipulations and requirements set out in WRAS Approved Installation Method Document AIM-08-01..

Y11.2395B VERIFIABLE BACKFLOW PREVENTER WITH REDUCED PRESSURE ZONE (RPZ) VALVE - INSTALLATION:

The Type BA device shall not be installed in a place or position which is:

- Liable to flooding

- Above electrical equipment

- Liable to mechanical or other damage

Exposed to freezing - unless measures are taken to prevent the assembly from freezing
Concealed

The assembly shall be:

- Installed horizontally with the relief valve discharging downwards
- Installed with an inline strainer fitted immediately upstream of the device - to prevent fouling of elements of the assembly
- Installed above ground at a height enabling effective inspection and maintenance
- Installed not less than 300mm above ground or floor level or the base of any cabinet to the underside of the exit port of the relief valve
- Installed no more than 1500mm above ground or floor level
- Installed with an air break between the relief outlet port and the top of the allied tundish

Following installation the assembly shall be flushed and disinfected in accordance with BS 6700. Following flushing and prior to commissioning and site test, the assembly shall be checked by the installer to ensure that the relief valve functions correctly - in accordance with the guidelines in WRAS Approved Installation Method Document AIM-08-01.

Y11.2395C VERIFIABLE BACKFLOW PREVENTER WITH REDUCED PRESSURE ZONE (RPZ) VALVE - ON SITE INSPECTION AND TESTING:

Site testing must only be carried out by an accredited tester approved by the Water Supplier.

Testing shall be carried out at intervals not exceeding 12 months.

Test data during the commissioning of the assembly and at subsequent intervals shall be entered on the "RPZ Valve Test Report Form" produced by the WRAS.

The inspections and testing shall be in accordance with WRAS Approved Installation Method Document AIM-08-01.

On completion of site tests, a certificate must be completed by the tester in accordance with WRAS Guidance Note and copies submitted to the water supplier and the person responsible for the device. Copies shall be included in the Operation and Maintenance Manuals, including interval periods for subsequent testing.

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.

Y11.2515A MICROBUBBLE TEMPERATURE DIFFERENTIAL DEAERATORS:

Construction - Vertical mild steel housing incorporating internal spiral wound copper mesh system.

Provide automatic air release mechanism.

Ends - Line size with flanges to BS EN 1092-1, PN 16.

Operating conditions - Maximum temperature 110°C, maximum pressure 10 bar.

Y11.2520A LTHW PRESSURE DIFFERENTIAL DEAERATORS:

Unit - Provide a self circulating unit connected to the system by two 15mm connections at least 500mm apart.

Isolation - Provide valves to isolate the vessel from the main system.

Operating conditions - Maximum temperature 110°C, maximum pressure 10 bar.

Y11.2520B CHILLED WATER PRESSURE DIFFERENTIAL DEAERATORS:

Unit - Provide a self circulating unit connected to the system by two 15mm connections at least 500mm apart. Insulate to prevent condensation.

Isolation - Provide valves to isolate the vessel from the main system.

Operating conditions - Maximum temperature 110°C, maximum pressure 10 bar.

Y11.2521A CENTRIFUGAL AIR SEPARATORS:

Construction - Vertical steel housing with offset inlet and outlet ports to remove bubbles via centrifugal force. Provide automatic air release mechanism.

Ends - Line size with flanges to BS EN 1092-1, PN 16.

Operating conditions - Maximum temperature 110°C, maximum pressure 10 bar.

Y11.2522A GRAVITATION DIRT SEPARATORS:

Construction - Vertical mild steel housing with internal reservoir, sludge pipe, perforation plate and automatic air release mechanism.

Ends - Line size with flanges to BS EN 1092-1, PN 16.

Operating conditions - Maximum temperature 110°C, maximum pressure 10 bar.

Y11.2524A MICROBUBBLE AIR AND DIRT SEPARATORS:

Construction - Vertical steel housing with internal large surface area mechanism to remove microbubbles via coalescence effect. Fitted with dirt drain at its lowest point for removing dirt that sinks, and fitted with a dirt drain valve on the side of the housing for removing dirt that floats on the water.

Provide automatic air release mechanism.

Ends - Line size with flanges to BS EN 1092-1, PN 16.

Operating conditions - Maximum temperature 110°C, maximum pressure 10 bar.

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.

Y11.2670A 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.

Y11.4050# 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.

Y11.4070 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.

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 EN ISO 12241. Use the description of terms as BS 3533.

1030 MATERIALS:

Employ materials that comply with 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.

Y50.1040# 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 EN 12664, BS EN 12667, BS EN 12939 or BS EN ISO 8990.

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 ROCK MINERAL FIBRE PIPE INSULATION:
Standard - BS 3958-4.

Nominal density - 80 kg/m³ to 120 kg/m³.
Thickness - 20mm to 100mm.
Thermal conductivity - Rock Mineral Fibre

Not exceeding 0.038 W/mK at a mean temperature of 50°C.
Finish - Reinforced aluminium foil with at least 25mm overlap.

Y50.2030B CANVAS ROCK 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 - Canvas covered with at least 25mm overlaps.

Y50.2040A FOIL FACED ROCK 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 ROCK 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.

Y50.2060A FOIL FACED ROCK MINERAL FIBRE LAMELLA DUCT INSULATION:

Nominal density - 24-45 kg/m³.
Thickness - 25mm to 80mm.

Thermal conductivity - Not exceeding 0.051 W/mK at a mean temperature of 50°C.
Finish - Reinforced aluminium foil.

Y50.2060B KRAFT PAPER FACED ROCK MINERAL FIBRE LAMELLA DUCT INSULATION:

Nominal density - 24-45 kg/m³.
Thickness - 25mm to 80mm.

Thermal conductivity - Not exceeding 0.051 W/mK at a mean temperature of 50°C.
Finish - Plain Kraft paper.

Y50.2070A GALVANIZED METAL MESH ON MINERAL FIBRE MATTRESSES - ONE FACE:
Standard - BS 3958-3.

Nominal density - 66 - 128 kg/m³.

Thickness - 25mm to 100mm.

Thermal conductivity - Not exceeding 0.038 W/mK at a mean temperature of 50°C.

Mesh - Galvanized. Faced, one side.

Y50.2070B GALVANIZED METAL MESH ON MINERAL FIBRE MATTRESSES - BOTH FACES:

Standard - BS 3958-3.

Nominal density - 66 - 128 kg/m³.

Thickness - 25mm to 100mm.

Thermal conductivity - Not exceeding 0.038 W/mK at a mean temperature of 50°C.

Mesh - Galvanized. Faced, both sides.

Y50.2070C STAINLESS STEEL MESH ON MINERAL FIBRE MATTRESSES - ONE FACE:

Standard - BS 3958-3.

Nominal density - 66 - 128 kg/m³.

Thickness - 25mm to 100mm.

Thermal conductivity - Not exceeding 0.038 W/mK at a mean temperature of 50°C.

Mesh - Stainless steel. Faced, one side.

Y50.2070D STAINLESS STEEL MESH ON MINERAL FIBRE MATTRESSES - BOTH FACES:

Standard - BS 3958-3.

Nominal density - 66 - 128 kg/m³.

Thickness - 25mm to 100mm.

Thermal conductivity - Not exceeding 0.038 W/mK at a mean temperature of 50°C.

Mesh - Stainless steel. Faced, both sides.

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 - 66 - 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.

Y50.2110A FOIL FACED CLOSED CELL RIGID PHENOLIC FOAM (PF) PREFORMED SECTIONS - CFC AND HCFC FREE:

Standard - BS EN 13166.

Nominal density - 35 - 40 kg/m³.

Temperature range: -180 to +120°C.

Thickness - 15mm to 50mm.

Thermal conductivity - Not exceeding 0.021 W/mK at a mean temperature of 10°C.

Finish - Reinforced aluminium foil.

Y50.2110B CLOSED CELL RIGID PHENOLIC FOAM (PF) PREFORMED SECTIONS - CFC AND HCFC FREE:

Standard - BS EN 13166.

Nominal density - 35 - 40 kg/m³.

Temperature range: -180 to +120°C.

Thickness - 15mm to 50mm.

Thermal conductivity - Not exceeding 0.021 W/mK at a mean temperature of 10°C.

Y50.2120A FOIL FACED CLOSED CELL RIGID LAMINATED PHENOLIC FOAM (PF), DUCT INSULATION SLAB - CFC AND HCFC FREE:

Standard - BS EN 13166.

Nominal density - 40 kg/m³.

Thickness - 20mm to 50mm.

Thermal conductivity - Not exceeding 0.021 W/mK at a mean temperature of 10°C.

Finish - Reinforced aluminium foil.

Y50.2120B CLOSED CELL RIGID LAMINATED PHENOLIC FOAM (PF), DUCT INSULATION SLAB - CFC AND HCFC FREE:

Standard - BS EN 13166.

Nominal density - 40 kg/m³.

Thickness - 20mm to 50mm.

Thermal conductivity - Not exceeding 0.021 W/mK at a mean temperature of 10°C.

Y50.2130A HIGH DENSITY PHENOLIC PIPE AND DUCT SUPPORT FOAM:

- Obtain written confirmation from the manufacturer that the material is CFC and HCFC free.

Standard - BS EN 13166.

Nominal density - 60 kg/m³ to 120 kg/m³.

Temperature range: -180 to +120°C.

Thermal conductivity - Not exceeding 0.040 W/mK at a mean temperature of 50°C.

CFC and HCFC free.

Y50.2140A CLOSED CELL NITRILE RUBBER ELASTOMERIC SHEET AND PREFORMED FLEXIBLE SECTIONS:

Nominal density - 90 - 100 kg/m³.

Temperature range: -40 to +105°C.

Thickness

Sections - 13mm to 25mm for pipe sizes 15mm to 100mm.

Sheets - 6mm to 25mm.

Thermal conductivity - Not exceeding 0.04 W/mK at a mean temperature of 20°C.

Y50.2150 CALCIUM SILICATE PREFORMED SECTION AND SLAB:

Standard - BS 3958-2.

Nominal density - 220 kg/m³.

Temperature range - Up to 800°C.

Thermal conductivity - Not exceeding 0.05 W/mK at a mean temperature of 100°C.

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.

Y50.2180A BITUMEN VAPOUR BARRIER COATINGS:

Cut-back bitumens with cotton canvas or open mesh glass cloth to reinforce coatings.

Y50.2180B VINYL VAPOUR BARRIER COATINGS:

Vinyl emulsions with cotton canvas or open mesh glass cloth to reinforce coatings.

Y50.2180C SOLVENT POLYMER VAPOUR BARRIER COATINGS:

Solvent-based polymers with cotton canvas or open mesh glass cloth to reinforce coatings.

Y50.2180D BITUMEN EMULSION VAPOUR BARRIER COATINGS:

Bitumen emulsions (with or without elastomer latex) with cotton canvas or open mesh glass cloth to reinforce coatings.

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.

Y50.2200B ROOFING FELT PROTECTION:

Secure in position with galvanized wire netting, of 1mm x 25mm mesh. Finish with two coats of black bituminous paint.

Y50.2200C FLAT ALUMINIUM-ZINC COATED STEEL PROTECTION:

Mild steel sheet continuously hot dipped with 185gm aluminium-zinc coating to BS EN 10327, applied directly to insulating material.

0.4mm thick flat sheet.

Y50.2200D RIBBED ALUMINIUM-ZINC COATED STEEL PROTECTION:

Mild steel sheet continuously hot dipped with 185gm aluminium-zinc coating to BS EN 10327, applied directly to insulating material.

0.4mm thick ribbed 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.

Y50.2200G CANVAS PROTECTION:

4.5oz covering for ductwork with two coats of water based co-polymer solution.

Canvas sections for pipework with two coats of water based co-polymer solution.

Y50.2200H CANVAS PROTECTION WITH ALUMINIUM BANDS:

4.5oz covering for ductwork with two coats of water based co-polymer solution, with aluminium bands.

Canvas sections for pipework with two coats of water based co-polymer solution, with aluminium bands.

Y50.2210A ALUMINIUM BANDS REINFORCEMENT:

Aluminium bands at 300mm centres.

Y50.2210B ALUMINIUM BANDS REINFORCEMENT:

Aluminium bands at 450mm centres.

Y50.2220A VALVE AND FLANGE INSULATION - ALUMINIUM CASING:

Install insulation on flanges and valves.

Use a protected metal split casing fabricated from 0.91mm aluminium sheet fitted with spring clip fasteners, filled with insulating material with same thermal performance as insulation on adjoining pipe.

Y50.2220B VALVE AND FLANGE INSULATION - ALUMINIUM-ZINC COATED STEEL CASING:

Install insulation on flanges and valves.

Use a protected metal split casing fabricated from 0.7mm aluminium-zinc coated steel sheet fitted with spring clip fasteners, filled with insulating material with same thermal performance as insulation on adjoining pipe.

Y50.2220C CLOSED CELL VALVE AND FLANGE INSULATION - COLD APPLICATIONS:

Install insulation on flanges and valves.

Enclose cold piping valve bodies and flanges with closed cell insulating material to maintain vapour barrier.

Y50.2220D VALVE AND FLANGE INSULATION - COLD APPLICATIONS:

Install insulation on flanges and valves.

Enclose cold piping valve bodies and flanges with insulating material to maintain vapour barrier.

Y50.2230A ALUMINIUM PROTECTION FOR HEAT EXCHANGERS AND OTHER VESSELS:

Finish with 0.9mm thick aluminium ribbed or embossed sheeting, with lapped, riveted and sealed joints, laps to shed water. Seal all joints at manholes and stools. Fit cut-outs with purpose made over-plates or collars.

Y50.2230B ALUMINIUM PROTECTION FOR HEAT EXCHANGERS AND OTHER VESSELS - WITH CHEST AND ACCESS COVERS:

Finish with 0.9mm thick aluminium ribbed or embossed sheeting, with lapped, riveted and sealed joints, laps to shed water. Seal all joints at manholes and stools. Fit cut outs with purpose made over-plates or collars.

Enclose chests and access covers in removable covers lined with high density flexible material. Remove manufacturer's name plate and refix on cladding.

Y50.2240A MINERAL FIBRE INSULATION FOR BOILER FLUES WITH ALUMINIUM CASING:

Use bonded mineral fibre preformed sections secured with aluminium bands direct to flue. Use multi-layers and stagger joints for thicknesses in excess of 65mm. Finish with 0.9mm thick aluminium ribbed or embossed sheeting.

Y50.2280 PUMPS AND OTHER IRREGULAR SHAPES:

Where access is required to pumps and other irregular shapes submit proposals for materials and methods of applying a demountable finish, for approval.

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 EN ISO 12241.

Y50.2286 CALCULATION OF INSULATION THICKNESS - BUILDING REGULATIONS (ENGLAND AND WALES):

Provide insulation of thickness conforming with the requirements of the Building Regulations (England and Wales) Part L Approved Documents, and the calculation methods given in BS EN ISO 12241.

Y50.2286 CALCULATION OF INSULATION THICKNESS - BUILDING REGULATIONS (ENGLAND AND WALES):

Provide insulation of thickness conforming with the requirements of the Building Regulations (England and Wales) Part L Approved Documents, 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.

Outside diameter of steel pipe (mm)	Thickness of mineral wool (mm)
17	30
21	30
27	30
34	35
42	35
48	35
60	40
76	40
89	40
114	45
140	45
168	45
219	50
273	50
Above 273 & flat surfaces	50

- 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.

Y50.2300 NON-DOMESTIC HOT WATER SERVICE AREAS - PHENOLIC FOAM:

Environmental insulation thickness for non-domestic hot water service areas to control heat loss, aged K-value.

Outside diameter of steel pipe (mm)	Thickness of phenolic foam (mm)
17	15
21	15
27	15
34	20
42	20
48	20

60	25
76	25
89	25
114	25
140	30
168	30
219	30
273	35
Above 273 & flat surfaces	35

- 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 - ROCK MINERAL WOOL:
Environmental insulation thickness for non-domestic heating installations to control heat loss.

Outside diameter of steel pipe (mm)	Temperature of contents °C		
	75	100	150
	Thickness of mineral wool insulation (mm)		
17	30	35	60
21	30	40	60
27	35	40	60
34	35	45	70
42	35	45	70
48	40	50	70
60	40	50	70
76	40	50	80
89	40	60	80
114	45	60	80
140	45	60	80
168	45	60	90
219	50	60	90
273	50	60	90
Flat surfaces	50	70	90

- Use this table for insulation thickness of copper pipework of the nearest equivalent outside diameter.

Y50.2320 NON-DOMESTIC HEATING INSTALLATIONS - PHENOLIC FOAM:
Environmental insulation thickness for non-domestic heating installations to control heat loss, aged K-value.

Outside diameter of steel pipe (mm)	Temperature of contents °C	
	75	100
	Thickness of phenolic foam insulation (mm)	
17	15	20
21	15	20
27	20	20
34	20	25
42	20	25
48	20	25
60	25	30
76	25	30
89	25	30
114	25	35
140	30	35
168	30	35
219	30	40
273	30	40
Flat surfaces	35	45

- Use this table for insulation thickness of copper pipework of the nearest equivalent outside diameter.

Y50.2330 DOMESTIC CENTRAL HEATING AND HOT WATER SYSTEMS - ROCK MINERAL WOOL:

Environmental insulation thickness for domestic central heating installations and hot water systems in potentially unheated areas to control heat loss.

Outside diameter of copper pipe (mm)	Thickness of rock mineral wool insulation for water at 60 °C for hot water with ambient still air temperature of -1 °C (mm)	Thickness of rock mineral wool insulation for water at 75 °C for central heating with ambient still air temperature of -1 °C (mm)
10	23	24
12	24	25
15	26	29
22	40	40
28	40	45
35	40	45
42	45	45
54	45	45
Cylinders	50	60

Y50.2350 CHILLED AND COLD WATER SUPPLIES TO PREVENT CONDENSATION - ROCK 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 25⁰C and a relative humidity of 80%.

Outside diameter of steel pipe (mm)	Temperature of contents ⁰ C		
	10	5	0
Thickness of mineral wool insulation (mm)			
17	20	20	20
21	20	20	20
27	20	20	20
33	20	20	20
42	20	20	20
48	20	20	20
60	20	20	20
76	25	25	25
89	25	25	25
102	20	20	20
114	25	25	25
140	25	25	25
168	25	25	25
219	25	25	25
245	25	25	25
273	25	25	25
324	25	25	25
356	30	30	30
406	35	35	35
456	35	35	35
508	35	35	35
610	35	35	35
Flat surfaces	25	30	40

- 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.

Y50.2360 CHILLED AND COLD WATER SUPPLIES TO PREVENT CONDENSATION - PHENOLIC FOAM, HIGH EMISSIVITY:

Minimum insulation thickness for chilled and cold water supplies to prevent condensation on a high emissivity outer surface (0.6) with an ambient temperature of 25⁰C and a relative humidity of 80%.

Outside diameter of steel pipe (mm)	Temperature of contents ⁰ C		
	10	5	0
Thickness of phenolic foam insulation (mm)			
17	15	15	15
21	15	15	15
27	15	15	15
33	15	15	15
42	15	15	15
48	15	15	15
60	15	15	15
76	15	15	15
89	15	15	15
102	15	15	20
114	20	20	20
140	20	20	20
168	20	20	20
219	25	25	25
245	25	25	25
273	25	25	25
324	25	25	25
356	25	25	25
406	25	25	25
456	25	25	25
508	25	25	25
610	25	25	25
Flat surfaces	25	25	25

- 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 - ROCK 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 25⁰C and a relative humidity of 80%.

Outside diameter of steel	Temperature of contents ⁰ C
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pipe (mm)	Thickness of rock mineral wool insulation (mm)		
	10	5	0
17	20	25	30
21	20	25	30
27	20	30	35
34	20	30	35
42	25	30	40
48	25	35	40
60	25	35	45
76	30	35	45
89	30	40	50
102	30	40	50
114	30	40	50
140	30	45	60
168	35	45	60
219	35	50	60
245	35	50	70
273	40	50	70
324	40	60	70
356	40	60	70
406	40	60	80
456	45	60	80
508	45	60	80
610	45	70	80
Flat surfaces	50	70	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.

Y50.2380 CHILLED AND COLD WATER SUPPLIES TO PREVENT CONDENSATION - PHENOLIC FOAM, 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 25⁰C and a relative humidity of 80%.

Outside diameter of steel pipe (mm)	Temperature of contents ⁰ C		
	10	5	0
	Thickness of phenolic foam insulation (mm)		
17	15	20	20
21	15	20	20

27	15	20	25
33	15	20	25
42	15	20	25
48	15	25	30
60	20	25	25
76	20	25	30
89	20	25	35
102	20	25	35
114	20	30	35
140	20	30	40
168	25	30	40
219	25	35	40
245	25	35	40
273	25	35	45
324	25	35	45
356	25	35	50
406	25	35	50
456	25	35	50
508	30	40	50
610	30	40	55
Flat surfaces	30	40	55

- 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 - ROCK MINERAL WOOL:

Environmental insulation thickness for chilled water supplies to control heat gain.

Outside diameter of steel pipe (mm)	Temperature of contents °C	
	5	0
Thickness of rock mineral wool insulation (mm)		
17	25	30
21	25	30
27	30	35
34	30	35
42	30	40
48	35	40
60	35	45
76	35	45
89	40	50
114	40	50

168	45	60
219	50	60
273	50	70
508	60	80
Flat surfaces	70	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.

Y50.2400 CHILLED WATER SERVICES - PHENOLIC FOAM:

Environmental insulation thickness for chilled water supplies to control heat gain.

Outside diameter of steel pipe (mm)	Temperature of contents °C	
	5	0
	Thickness of phenolic foam insulation (mm)	
17	15	15
21	15	15
27	15	15
34	15	20
42	20	20
48	20	20
60	20	25
76	25	25
89	25	30
114	25	35
140	30	35
168	30	40
219	35	40
273	35	45
Flat surfaces	40	50

- 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.

Y50.2410 CHILLED AND MAINS COLD WATER SUPPLIES - CLOSED CELL NITRILE RUBBER:

Outside diameter of steel pipe (mm)	Thickness of closed cell nitrile rubber (mm)
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15	19
20	19
25	25
32	25
40	25
50	25
54	32
60	32

Y50.2470 CONDENSATION CONTROL ON CHILLED AIR DUCTWORK - PHENOLIC FOAM:
 Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature 25⁰C, relative humidity 80%, dew point temperature 21.3⁰C.

Minimum air temperature inside duct ⁰ C	Thermal conductivity of 0.021 W/mK at a mean temperature of 10 ⁰ C Surface coefficients		
	Low (0.05)	Medium (0.44)	High (0.90)
	Thickness of phenolic foam insulation (mm)		
15	25	25	25
10	30	25	25
5	40	25	25
0	50	25	25

Y50.2475 CONDENSATION CONTROL ON CHILLED AIR DUCTWORK - CLOSED CELL PVC NITRILE FOAM:
 Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature 25⁰C, relative humidity 80%, dew point temperature 21.3⁰C.

Minimum air temperature inside duct. ⁰ C	Thermal conductivity of 0.036 W/mK at a mean temperature of 10 ⁰ C. Surface coefficients	
	(0.7)	(0.9)
	Thickness of PVC Nitrile foam insulation (mm)	
	10	8
10	16	12
5	19	16
0	25	25

Y50.2490# THICKNESS OF INSULATION TO BS 5422:
 Supply minimum thickness of insulation for services in accordance with BS 5422.

- Inhibit freezing
 - Table 22, Minimum insulation thickness to protect steel pipes against freezing under selected industrial process conditions.
 - Table 23, Minimum insulation thickness required to give protection against freezing under specified commercial and institutional conditions.
 - Table 24, Minimum insulation thickness to protect against freezing for domestic cold water systems (12hr).
 - Table 25, Minimum insulation thickness to protect against freezing for domestic cold water systems (8hr).
- Control condensation
 - Table 2, Minimum insulation thickness for refrigeration applications to prevent condensation on a high emissivity outer surface (0.90 with an ambient temperature of +20⁰ C and a relative humidity of 70%.
 - Table 3, Minimum insulation thickness for refrigeration applications to prevent condensation on a low emissivity outer surface (0.05) with an ambient temperature of +20⁰ C and a relative humidity of 70%.
 - Table 4, Minimum insulation thickness for refrigeration applications to prevent condensation on a high emissivity outer surface (0.90) with an ambient temperature of +25⁰C and a relative humidity of 80%.
 - Table 5, Minimum insulation thickness for refrigeration applications to prevent condensation on a low emissivity outer surface (0.05) with an ambient temperature of +25⁰ C and a relative humidity of 80%.
 - Table 7, Minimum insulation thickness for chilled and cold water supplies to prevent condensation on a high emissivity outer surface (0.90) with an ambient temperature of +25⁰ C and a relative humidity of 80%.
 - Table 8, 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 +25⁰ C and a relative humidity of 80%.
 - Table 10, Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature +25⁰ C, relative humidity of 80%, dewpoint temperature 21.3⁰ C.
- Protect personnel
 - Table 16, Insulation thickness for personnel protection from a non-metallic surface with a surface emissivity of 0.90 and design cold face temperature of 59⁰ C.
 - Table 17, Insulation thickness for personnel protection from a metallic surface with a surface emissivity of 0.05 and design cold face temperature of 50⁰ C.
 - Table 18, Insulation thickness for personnel protection from a non-metallic surface with a surface emissivity of 0.90 and design cold face temperature of 50⁰ C.
- Control processes
- Conserve energy
 - Cost saving (economic)
 - Carbon saving (environmental)
 - Table 6, Environmental thickness for refrigeration applications to control heat gain.
 - Table 9, Environmental thickness for chilled water supplies to control heat gain.
 - Table 11, Environmental thickness on ductwork carrying warm air.
 - Table 12, Environmental thickness for non-domestic heating installations to control heat loss.
 - Table 13, Environmental thickness for non-domestic hot water service areas to control heat loss.
 - Table 14, Environmental thickness for domestic heating installations and hot water systems in potentially unheated areas to control heat loss.

- Table 15, Environmental insulation thickness for process pipework and equipment to control heat loss.

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.

Y50.3030 INSTALLATION OF FOIL FACED PHENOLIC FOAM 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.

Y50.3040 INSTALLATION OF INSULATION WITH CANVAS FINISH ON PIPEWORK:

Ensure joints are close butted together and secure overlaps with adhesive and smooth out.

Insulate fittings to same standard as adjacent pipework and use mitred segments where necessary, secure with adhesive using a minimum of 50mm wide canvas to cut mitred joints.

Apply two coats of class 'O' polymer solution.

Y50.3050 INSTALLATION OF CLOSED CELL NITRILE RUBBER INSULATION ON PIPEWORK:

Install closed cell nitrile rubber in accordance with manufacturer's recommendations.

Check installation procedure when closed cell nitrile rubber is to be installed on stainless steel pipework.

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 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.

Y50.3150 INSTALLATION OF CANVAS PROTECTION:

Cover the whole with 4.5oz (minimum) canvas with at least 50mm overlaps. Seal joints. Give two coats of class 'O' polymer solution. Fit aluminium bands where indicated.

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.

Y50.3190 INSTALLATION OF RIGID PVC PROTECTION:

Apply rigid PVC sheet and pre-formed fittings directly to insulation with an overlap of at least 40mm on longitudinal and circumferential joints. Secure longitudinal laps with plastic rivets at 150mm centres.

Ensure rigid PVC is not installed in contact with heat sources.

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.

Y50.3210 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.

Y50.3230A 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.

Y50.3230B INSTALLATION WHERE CLOSED CELL INSULATION IS CARRIED THROUGH PIPELINE SUPPORT:

For load bearing insulation, carry through insulation and finish.
For non-load bearing insulation on hot pipework up to 120oC, close butt to a high density phenolic or polyisocyanurate pipe support.
For non-load bearing insulation on cold pipework, close butt to high density phenolic foam pipe supports.
Ensure the vapour barrier is maintained.

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.

Y50.Rock mineral fibre.

Y51 TESTING AND COMMISSIONING

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.

Y51.2030# PRESSURE TESTING - UNDERGROUND PIPEWORK:

- Test to a gauge pressure not less than twice the operating pressure for 1 hour.
- Test to a gauge pressure twice the operating pressure or 7 bar, whichever is the greater, for 4 hours.
- Test

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.

Y51.2050 PRESSURE TESTING - FIRE RISERS:

Test hydraulically to a pressure of 10 bar (gauge) measured at the top outlet to maintain pressure for not less than 15 minutes. Demonstrate to Fire Brigade when tests are satisfactory. Carry out flow tests after satisfactory pressure testing.

Y51.2055A PRESSURE TESTING - REFRIGERANT PIPEWORK, STRENGTH PRESSURE TEST:

Test refrigerant pipework using the strength test procedure as detailed in Clause R6.4 of the CIBSE Commissioning Code R: 2002.

Y51.2055B PRESSURE TESTING - REFRIGERANT PIPEWORK, LEAK TEST:

Test refrigerant pipework using the leak test procedure as detailed in Clause R6.5 of the CIBSE Commissioning Code R: 2002.

Y51.2055C PRESSURE TESTING - REFRIGERANT PIPEWORK, DEEP VACUUM TEST:

Test refrigerant pipework using the deep vacuum test method as detailed in Clause R6.6 of the CIBSE Commissioning Code R: 2002.

Y51.2065 PRESSURE TESTING - OIL PIPEWORK TO BS 5410:

Test oil pipework in accordance with BS 5410-2, Section 39.

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.

Y51.3020 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 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.

Y51.3040B COMMISSIONING VAV 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.

For regulation of Variable Air Volume Systems follow routine in BSRIA Application Guide 1/91 The Commissioning of VAV Systems.

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.

Y51.3060 COMMISSIONING REFRIGERATING SYSTEMS:

Follow the procedures given for use and handling of refrigerants, pressure and leak testing, evacuation and dehydration, charging and lubrication of refrigerating systems in CIBSE Commissioning Code R and manufacturer's instructions.

Pre-commissioning:

Carry out the procedures for pre-commissioning detailed in CIBSE Commissioning Code R, Section R5.

Combined pressure and leak testing:

Carry out the procedures for combined pressure and leak testing, including refrigerant charging, detailed in CIBSE Commissioning Code R, Section R6.

Setting to work and adjusting

Carry out the procedures for setting to work and adjusting detailed in CIBSE Commissioning Code R7.

Absorption Systems.

Carry out the procedures for Preliminary Checks, Testing and Charging, and Setting to Work and adjusting detailed in CIBSE Commissioning Code R, Section R10.

Apparatus and Instruments

Use Apparatus and Instruments detailed in CIBSE Commissioning Code R, Section R8. Apply tolerances defined in Section R8.6.

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.

Y51.3090A 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.

Y51.4010 SYSTEM PERFORMANCE TESTING:

Demonstrate the performance of installations including single, standby, multi-duty plants and systems, and of plants specified for future use.

Y51.4015 TESTING OF RESIDENTIAL VENTILATION SYSTEMS:

Demonstrate the performance of residential ventilation systems through performance testing and installation checks in accordance with BS EN 14134.

Y51.4020A ENVIRONMENTAL TESTS, ARTIFICIAL LOADS:

Carry out environmental testing to prove the performance of the systems.

Apply artificial loads or provide test arrangements to simulate the full range of operating conditions and duties.

Y51.4020B ENVIRONMENTAL TESTS, AMBIENT AIR QUALITY

Carry out environmental testing to prove the performance of the systems.

Carry out ambient air quality tests in accordance with BS EN 13528-1, BS EN 13528-2 and BS EN 13528-3.

Y51.4030 RECORDERS:

- Seven day space temperature recorders
 - Number
 - For (weeks)
- Relative humidity recorders
 - Number
 - For (weeks)

Provide and maintain on free loan portable seven day space temperature and relative humidity recorders, as indicated, together with adequate charts.

Y52 VIBRATION ISOLATION MOUNTINGS

Y52.1000 GENERAL

1010 DESIGN INTENT:

Supply equipment indicated to ensure that vibration from equipment is not transmitted to building, other supporting structure, pipework or ductwork.

1020 SPRING ANTI VIBRATION MOUNTINGS:

Select spring mounts with an overload capacity of 50%, for metal springs the outside diameter should be at least 75% of operating height. Permanently identify individual mounts with their load capacity.

1030 SPRING HANGERS:

Provide spring hangers that allow the lower hanger rod to move laterally at least 15°.

1040

Where indicated, provide lockable levelling device.

Y52.1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Y52.2010A SYNTHETIC MATERIAL CONFIGURED MAT MOUNTINGS:

Provide configured mat mountings manufactured from neoprene or composite fibre/synthetic rubber.

Where mats are stacked, bond 1mm steel sheet thickness between each pad without filling voids.

Y52.2010B NATURAL RUBBER CONFIGURED MAT MOUNTINGS:

Provide configured mat mountings manufactured from natural rubber.

Where mats are stacked, bond 1mm steel sheet thickness between each pad without filling voids.

Y52.2010C HIGH TEMPERATURE CONFIGURED MAT MOUNTINGS:

Provide configured mat mountings manufactured from high temperature synthetic rubber.

Where mats are stacked, bond 1mm steel sheet thickness between each pad without filling voids.

Y52.2010D RESILIENT MAT MOUNTINGS:

Provide a minimum of 20mm resilient mat and sheet of 1.6 mm steel for incorporation in cast in situ base.

Y52.2010E PAD MOUNTINGS:

Provide pad mountings manufactured from composite synthetic rubber.

Y52.2020A SYNTHETIC RUBBER TURRET COMPRESSION MOUNTINGS:

- **1040 LOCKING FACILITY:**

Where indicated, provide lockable levelling device.

Provide turret compression mountings fabricated from synthetic rubber between two steel plates. Protect the metal from corrosion by painting and fix friction pads to top and bottom. Provide bolt holes to allow fixing.

Y52.2020B NEOPRENE TURRET COMPRESSION MOUNTINGS:

- **1040 LOCKING FACILITY:**

Where indicated, provide lockable levelling device.

Provide turret compression mountings fabricated from neoprene between two steel plates. Protect the metal from corrosion by painting and fix friction pads to top and bottom. Provide bolt holes to allow fixing.

Y52.2030 SPRING COMPRESSION MOUNTINGS:

- **1040 LOCKING FACILITY:**

Where indicated, provide lockable levelling device.
Provide spring compression mountings comprising high strength low stress helical spring capped with steel pressure plate, on resilient base pad, mounted on pre-drilled base for bolting down, and enclosed with cap. Protect metal from corrosion.

Y52.2040 CAPTIVE SPRING MOUNTINGS:

Provide captive spring mountings comprising high strength low stress helical spring designed to achieve horizontal and vertical snubbing.
Mount spring on pre-drilled base plate for bolting down and protect against corrosion. Supply complete with levelling screw.

Y52.2050A SYNTHETIC RUBBER HANGERS, TURRET COMPRESSION:

- 1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Provide turret compression hangers fabricated from synthetic rubber incorporated with hanger box.

Construct hanger box from steel (minimum thickness 1.6mm) complete with hole for suspension rod and enlarged lower hole for drop rod to equipment.

Y52.2050B NEOPRENE HANGERS, TURRET COMPRESSION:

- 1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Provide turret compression hangers fabricated from neoprene incorporated within hanger box.

Construct hanger box from steel (minimum thickness 1.6mm) complete with hole for suspension rod and enlarged lower hole for drop rod to equipment.

Y52.2060 SPRING COMPRESSION HANGERS:

- 1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Provide spring compression hangers comprising high strength low stress helical spring capped with steel pressure plate, on resilient base pad, mounted within hanger box.

Construct hanger box from steel (minimum thickness 1.6mm) complete with hole for suspension rod and enlarged lower hole for drop rod to equipment.

Y52.2070A SYNTHETIC RUBBER HANGERS, COMBINED TURRET/SPRING COMPRESSION:

- 1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Provide turret/spring compression hangers with turret fabricated from synthetic rubber and high strength low stress helical spring capped with steel pressure plate, on resilient base pad, incorporated within hanger box.

Construct hanger box from steel (minimum thickness 1.6mm) complete with hole for suspension rod and enlarged lower hole for drop rod to equipment.

Y52.2070B NEOPRENE HANGERS, COMBINED TURRET/SPRING COMPRESSION:

- 1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Provide turret/spring compression hangers with turret fabricated from neoprene and high strength low stress helical spring capped with steel pressure plate, on resilient base pad, incorporated within hanger box.

Construct hanger box from steel (minimum thickness 1.6mm) complete with hole for suspension rod and enlarged lower hole for drop rod to equipment.

Y52.2080 HORIZONTALLY RESTRAINED SPRING MOUNTINGS:

Provide horizontally restrained spring mountings comprising high strength low stress helical spring capped with steel pressure plate, on resilient base pad, mounted within hanger box.

Construct hanger box from steel (minimum thickness 1.6mm) complete with holes for installing across connection. In addition supply synthetic rubber or neoprene snubber as a horizontal buffer.

Y52.2090# INERTIA BASES:

Construction

- Provide purpose built inertia bases constructed using welded steel frame formwork containing concrete reinforced with 12mm minimum diameter bars at 100mm maximum centres, 35mm above the bottom of the base; and mounted on spring compression mountings.
- Provide purpose built inertia bases constructed using welded steel frame mounted on spring compression mountings.

Y52.2090A CONCRETE/STEEL FORMWORK INERTIA BASES:

- 1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Provide purpose built inertia bases constructed using welded steel frame formwork containing concrete reinforced with 12mm minimum diameter bars at 100mm maximum centres, 35mm above the bottom of the base; and mounted on spring compression mountings.

Y52.2090B WELDED STEEL FRAME INERTIA BASES:

- 1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

Provide purpose built inertia bases constructed using welded steel frame mounted on spring compression mountings.

Y52.2100 VIBRATION ISOLATION HOSES:

Provide flexible hose couplings for connecting pipework comprising nylon fabric or steel mesh carcass with waterproof cover and internal lining of material to suit fluid conveyed, temperatures and pressures indicated.

Y52.2110A NATURAL CORKWOOD PIPEWORK NOISE VIBRATION ISOLATION:

Incorporate within pipework support ring purpose made isolators manufactured from natural corkwood of density 160 kg/cubic metre, impregnated with fungicide, individually bound with steel strip not more than half depth of isolator.

Y52.2110B RECONSTITUTED CORKWOOD PIPEWORK NOISE VIBRATION ISOLATION:

Incorporate within pipework support ring purpose made isolators manufactured from resin bonded reconstituted soft corkwood granules, of density 100 kg/cubic metres.

Y52.2110C RUBBER MATTING PIPEWORK NOISE VIBRATION ISOLATION:

Incorporate within pipework support ring purpose made isolators manufactured from rubber matting.

Y52.2120A SPONGE FOAM PIPE WALL AND RISER SEALS:

Provide pipe sleeves, minimum length 300mm, with minimum 25mm dense sponge foam lining bonded internally.

Y52.2120B MINERAL FIBRE PACKING PIPE WALL AND RISER SEALS:

Provide pipe sleeves, minimum length 300mm, with minimum 52mm mineral fibre packing lining bonded internally.

Y52.3040 HORIZONTALLY RESTRAINED SPRING MOUNTINGS:

Ensure snubbers for limiting excessive movement are installed out of contact during normal operation.

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.

1045 PERFORMANCE AND DURABILITY:

Ensure durability of identification for safety purposes is to BS ISO 17398.

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.

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.

Y90.2080 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.

Y90.3050 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 or, as appropriate, 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.

Y90.3100# NON-PENETRATIVE SUPPORT SYSTEMS FOR ROOF MOUNTED EQUIPMENT:

Provide manufacturer's information on recommended support systems.

- Obtain the necessary approvals to use non-penetrative support systems as follows:
 - Ensure that the roof surface is compatible with non-penetrative supports
 - Ensure that necessary approval is given by
 - The Structural Engineer
 - The Architect
- Mounting positions
- Roof loading parameters
 - Wind Loadings
 - Point Loads
 - Pressures
- Components
 - Support leg type
 - Support frame type
- Maintenance
 - Ensure that future maintenance access to roof finish is provided under support system.

Y91 PAINTING AND ANTI-CORROSION TREATMENTS

Y91.1000 GENERAL:

Y91.2010A PAINT MATERIALS:

Use the following materials as appropriate

Solvent borne priming paint to BS 7956 for bare woodwork.

Red Oxide priming paint for bare iron and steelwork.

Zinc Chromate priming paint for bare ferrous and non-ferrous metals.

Calcium Plumbate priming paint to BS 3698 for galvanized steel or composite wood/metal components.

Undercoating paint for previously primed or painted surfaces before the application of finishing coats.

Gloss finishing paint for previously primed or painted/undercoated surfaces.

Epoxy resin paint for specialist coatings requiring resistance to acids, alkalis, oils, solvents, abrasion or high humidity.

Aluminium paint to BS 388 for structural steelwork, storage vessels, heated metallic surfaces and similar applications where moisture and heat resistant properties are required.

Cold galvanizing paint for making good damage to previously galvanized surfaces and protection to galvanized materials modified during installation.

Zinc-rich metallic to BS 4652 for bare iron and steelwork where electrical conductivity has to be assured.

Black tar-based paint to BS 1070 for moisture resistant protection to metal surfaces where decorating appearance is not important.

Bitumen based coatings for cold application to BS 3416 protection to iron and steel, particularly pipelines and fittings for use in contact with potable water.

Bitumen based coatings for cold application to BS 6949 not to be used in contact with potable water.

Y91.2020 PAINT QUALITY:

Ensure paints used are of quality and type to suit application and that:-

primers have good adhesion, covering power, rust-inhibiting and grain filling properties.

gloss finishing paints are of machine finish grade having high adhesion and high resistance to solvents, mineral oils, cutting oils, detergents, chipping and impact damage.

Tender Summary

Section

U39 AIR CONDITIONING - ALL AIR (SELF CONTAINED SPECIFICATION)

U19 VENTILATION (SELF CONTAINED SPECIFICATION)

As Fitted Drawings

Operating and Maintenance Manuals

Maintenance During Defects Liability Period

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