Consortium Local Authorities Wales

Mechanical Building Services Specification

This document has been compiled by the Engineering Project Group in association with Marald Engineering Consultants

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MA.01.0 THE C.L.A.W. STANDARD ENGINEERING SPECIFICATION

MA.01.01 The 6th Edition of the C.L.A.W. Standard Mechanical Building Services Engineering Specification shall be read in conjunction with all or any of the sections included in the Specification Summary Sheet.

MA.01.02 The complete Specification of Works to be carried out shall include all forms of tender, forms of contract and contract drawings.

MA.01.03 The aforementioned may be separate or combined together in one or more bundle to comprise the Tender Documents which shall be read as a whole and all items shall be included for in the submitted priced Tender with no exclusions or qualifications.

MA.02.0 DEFINITIONS

MA.02.01 In the Standard Mechanical Building Services Engineering Specification, the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires: -

MA.02.02 "The Employer" shall be as defined on or with the Form of Tender.

MA.02.03 "The Contract Administrator" shall mean the appointed representative defined on or with the Form of Tender.

MA.02.04 "The Contract" shall mean the Form of Contract described on or with the Form of Tender.

MA.02.05 "The Works" shall mean the whole of the Works described in the Specification to be executed by the Mechanical Services Installer.

MA.02.06 "The Specification" shall mean the complete Specification of Works described in Clause MA.01 above.

MA.02.07 "The Main Contractor" shall mean the firm appointed to carry out the whole of the Contract where applicable.

MA.02.08 "The Mechanical Services Installer" shall mean the firm appointed to carry out the whole of the Works described in the complete Specification.

MA.02.09 Where the Form of Tender states that the Mechanical Works shall be carried out under a Sub-Contract with a Main Contractor then the Mechanical Services Installer shall be referred to, and act as, a "Sub-Contractor".

Cont’d
MA.02.10 Where the Form of Tender states that the Mechanical Works shall be carried out under a Direct Contract with the Employer then the Mechanical Services Installer shall also assume the role of the Main Contractor for all purposes described in the Specification.

MA.02.11 Where the Form of Tender states that the Employer's Direct Labour Department or a similar organisation are carrying out the Building Works, then the Mechanical Services Installer whilst directly contracted to the Employer, will act as a "Sub-Contractor" for the purpose of executing the Engineering Works.

MA.03.0 COMMUNICATIONS

MA.03.01 Where the Contract is made between the Mechanical Services Installer and the Main Contractor all written correspondence shall be with and instruction taken from the Main Contractor.

MA.03.02 Where the Contract is made direct between the Mechanical Services Installer and the Employer all written correspondence shall be with, and instructions taken from the Contract Administrator.

MA.04.0 VISITS TO SITE

MA.04.01 Tenderers should visit the site by prior arrangement with the Contract Administrator before completing their tenders, and will be deemed to have satisfied themselves on the full nature of local conditions as regard accessibility, transport and storage of materials, the supply of, and conditions affecting labour and to have obtained all necessary information on all matters affecting the execution of the Works.

MA.04.02 Claims on the grounds of want of knowledge in such respect, will not be admitted.

MA.05.0 INSPECTION OF ARCHITECTURAL/STRUCTURAL DRAWINGS

MA.05.01 Where the Works are part of a building project, Architectural/Structural or other Services drawings will be available for inspection during the tender period at the Contract Administrator's offices within normal working hours. Tenderers will be deemed to have inspected these drawing and included for all matters relating to the execution to the Works.
MA.05.0 INSPECTION OF ARCHITECTURAL/STRUCTURAL DRAWINGS
(Cont’d)

MA.05.02 Claims on the grounds of want of knowledge in such respect will not be admitted.

MA.06.0 LABOUR & SUPERVISION

MA.06.01 The Mechanical Services Installer shall employ experienced and qualified workmen to carry out the Mechanical Works. Such workmen may be assisted by apprentices or labourers, but at all times during the execution of the Mechanical Works, their numbers shall not exceed the number of skilled workmen.

MA.06.02 The Contract Administrator may at any time request proof of the level of qualification and / or competence of any person involved with the Contract on behalf of the Mechanical Services Installer and if not satisfied may request their replacement.

MA.06.03 The Mechanical Services Installer shall employ one representative, whose name shall have been previously communicated in writing to the Contract Administrator by the Main Contractor, to superintend the carrying out of the Mechanical Works on site. The said representative shall be present on the site at all times during working hours and any orders or instructions which the Main Contractor or Contract Administrator may give to the said representative shall be deemed to have been given to the Mechanical Services Installer.

MA.06.04 The Main Contractor or the Contract Administrator shall have the power to request the Mechanical Services Installer to remove from the works any person employed by them who in their opinion is incompetent or misconducts themselves or does not comply with the above paragraphs of this clause. Any person or persons so removed shall not be employed again on the works without the permission of the person who requested their removal.

MA.07.0 IDENTIFICATION

MA.07.01 As the majority of premises to be worked in may be schools or associated buildings the Mechanical Services Installer shall ensure that his operatives have satisfied the provisions of Home Office Circular 86(44) and DES Circular 4/86-Protection of Children: Disclosure of Criminal Background of those with access to children.

Cont’d
MA.07.0 IDENTIFICATION (Cont’d)

MA.07.02 The Mechanical Services Installer shall ensure that all his operatives carry an identification card c/w Photograph

MA.07.03 The Mechanical Services Installer shall, prior to commencement of any work on the premise, report to the responsible person for that premise (e.g. Headteacher, Receptionist, Site Agent) and produce his/her identification card for all operatives intending to carry out work.

MA.07.04 Prior to leaving the premise the Mechanical Services Installer shall report to the responsible person of the intention to leave

MA.08.0 WORKING HOURS

MA.08.01 Work shall be carried out during the normal working hours of the Main Contractor. However, it shall not be carried out outside the hours of 8.00 am to 6 pm, on Mondays to Fridays without the written approval of the Main Contractor and the Contract Administrator.

MA.08.02 No works, which by their nature require inspection prior to and during the course of their execution, shall be carried out outside the specified hours.

MA.09.0 OVERTIME

MA.09.01 Payment of overtime will not be considered unless written authority is given by the Contract Administrator, and only then with the Main Contractor's agreement. Any such overtime must be substantiated with the sheets signed by the Main Contractor and the Contract Administrator as to the numbers of persons employed, their details, and the number of hours worked.

MA.09.02 Should the Mechanical Services Installer wish to employ labour during overtime periods in order to maintain progress of the Works caused by any reason other than by direct act of the Contract Administrator or the Main Contractor, then all costs so incurred shall be deemed to be included in the contract price. All such overtime will still require the written authority of the Contract Administrator and the Main Contractor's agreement.
MA.10.0  PROHIBITION OF TRANSFER OF CONTRACT

MA.10.01 No part of the Mechanical Contract or any interest in it shall be transferred or assigned by the Mechanical Services Installer directly or indirectly to any person or persons whomsoever without the written consent of the Contract Administrator.

MA.11.0  SITE MEETINGS

MA.11.01 Periodical meetings will be held at the site as and when required by the Contract Administrator or the Main Contractor.

MA.11.02 The Mechanical Services Installer shall arrange to have an accredited representative present at each of these meetings.

MA.11.03 The Main Contractor shall have previously communicated the name of the Mechanical Services Installer’s representative in writing to the Contract Administrator.

MA.12.0  SCHEDULE OF RATES

MA.12.01 A Schedule of rates giving details of prices and quantities for each section of the work will be required to accompany the submission of tender.

MA.12.02 This schedule must show the rates of each piece of apparatus, labour rate for erection, rates per unit length (inclusive of labour) for the installation of each size of pipe, valve, ducting etc.

MA.12.03 Each item shall be carried forward and totalled in accordance with the tender analysis sheet.

MA.12.04 The final grand total shall agree with the tender figure.

MA.13.0  VALUATION OF VARIATIONS

MA.13.01 Following the Contract Administrator's or Main Contractor's request for a variation of the Mechanical Work, the Mechanical Services Installer shall submit within seven days to the Main Contractor, for consideration by the Contract Administrator, a written valuation of the variation inclusive of all cost of the proposed work, formulated from the Schedule of Rates, or if the rates are not applicable, an itemised quotation of the cost.

Cont’d
MA.13.0 VALUATION OF VARIATIONS (Cont’d)

MA.13.02 Notwithstanding the Conditions of the Contract, no work shall be commenced upon any variation or cost incurred, unless otherwise authorised by the Contract Administrator, before:

a) The value of the variation has been agreed.
b) The Contract Administrator's written instruction has been issued.
c) The Main Contractor's official order has been received.

MA.14.0 DAYWORKS

MA.14.01 Where authority is given by the Contract Administrator for variations to the work to be executed on a Daywork basis, the definition of the Prime Cost of Dayworks will be as specified on or with the Form of Tender.

MA.14.02 The Mechanical Services Installer shall give notice to the Contract Administrator of the commencement and completion of any works for which it is intended to submit daywork sheets.

MA.14.03 Daywork sheets shall be numbered in sequence and all sheets are to be signed by the Main Contractor and the Contract Administrator. Such signatures are only to be taken as certifying that the time, materials and plant are correct, and shall not be held to justify a claim that the work shall be so charged, or that it cannot be measured and priced according to the terms of the Contract.

MA.14.04 Signed Daywork sheets, giving the fullest particulars of hours worked and names of Craftsmen, Labourers, hourly base rates, description of the work executed, materials and plant used must be forwarded to the Contract Administrator via the Main Contractor not later than the end of the week following that in which the work has been executed.

MA.14.05 Where overtime, authorised for payment by the Contract Administrator, is worked in Dayworks, the percentage addition to the cost of labour shall apply to the Hourly Base Rate only, and premium time shall be paid as net.

MA.15.0 PROVISIONAL & PRIME COST SUMS

MA.15.01 Provisional Sums where stated on or with the Form of Tender, are defined as sums provided for work or for costs which cannot be entirely foreseen at the time of tendering.

Cont’d
MA.15.0  DAYWORKS (Cont’d)

MA.15.02 Prime Cost Sums, where stated on or with the Form of Tender are defined as sums provided for work or services to be executed by a nominated Sub-Contractor, a statutory authority or a public undertaking, or for materials or goods to be obtained from a nominated supplier. Such sums are deemed to be exclusive of any profit required by the Mechanical Services Installer and such profit should be stated separately as a percentage on or with the Form of Tender.

MA.15.03 Provisional and Prime Cost Sums shall only be expended or deducted as directed in writing by the Contract Administrator.

MA.16.0  PAYMENTS

MA.16.01 In the case where the Mechanical Services Installer is a nominated or named Sub-Contractor, payments will be made via the Main Contractor and the appropriate retention and 2½% Main Contractors Discount will be deducted.

MA.16.02 Where the contract is direct between the Mechanical Services Installer and the Employer, payments to the extent of 95% of the value of the works executed shall be paid on the presentation of each interim certificate.

MA.16.03 On the issue of the Certificate of Practical Completion, or the Certificate of Taking Over, 97½% of the Contract Price shall be paid.

MA.16.04 At the discretion of the Contract Administrator, after six months of the Defects Liability Period has elapsed, all retention monies will be released, providing a Certificate of Indemnity is received from the Mechanical Services Installer, indicating that the Employer is indemnified against the cost of remediing any defects, including consequential damage to the building, to fabric and furnishings and the cost of builder’s work associated with the remediing of such defects and consequential damage which shall appear in the latter six months of the twelve months Defects Liability Period of the Contract.
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MB.01.0  CONTRACT DRAWINGS & SPECIFICATION

MB.01.01 The Contract Drawings are intended to show the general arrangements of the various items of the Works as described in the Specification to be supplied and installed under the Contract. They do not necessarily show exact runs or full details of all accessories, fitting etc, required and in some instances are merely diagrammatic.

MB.01.02 However, the Specification and Drawings must be understood to cover everything required to make a first class installation and the Mechanical Services Installer should include for all items necessary for the proper execution of the Works in his Tender.

MB.01.03 Anything shown on the Drawings which is not included in the Specification, or anything herein and not shown on the Drawings shall be deemed to be required as part of the Contract.

MB.01.04 Any anomalies which arise between Drawings or between Drawings and the Specification should be reported to the Contract Administrator before the Tender is submitted. Such discrepancies must be pointed out at the time of tendering and will not be accepted as a basis for extra claims and work during the progress of the installation. All Contract Drawings and the Specification are the property of the Employer, which are to be returned with the Tender.

MB.02.0  WORKING DRAWINGS

MB.02.01 Notwithstanding the provision of the Contract Drawings the Mechanical Services Installer shall be responsible for taking his own particulars and providing at his own expense all necessary working and detail drawings as requested by the Contract Administrator, copies of which must be first submitted for approval before the work is put in hand. Approval of working drawings will not relieve the Mechanical Services Installer of his responsibility to ascertain exact building dimensions and location of other services.

MB.02.02 The working drawings to be prepared for installation purposes in AutoCAD format and shall include:

a) Plantroom and service duct drawings, plans and sections to a minimum scale of 1:20 with service duct sections at 1:10.

b) General layout drawings to a scale of 1:50.

c) General section drawings to a scale of 1:20.

d) Sectional details at 1:5 and 1:10.

Cont’d.
MB.02.0 WORKING DRAWINGS (Cont'd.)

MB.02.02 Cont’d

e) All drawings shall be fully dimensioned, showing plan and section indicating positions and sizes of all pipework and ductwork runs together with all termination equipment e.g. radiators, grilles etc.

f) Where deemed necessary by the Contract Administrator the Mechanical Services Installer shall provide large scale sections through ceiling voids, ducts and service trenches indicating dimensioned co-ordination details of all services.

MB.02.03 To assist the Mechanical Services Installer in the preparation of the working drawings utilising AutoCAD or equivalent, base building outline discs in .dwg or .dxf format will be provided at cost.

MB.02.04 The Mechanical Services Installer shall submit, for approval, a description of the design strategy, all control schematic diagrams and drawings indicating all sensors, actuators, control valves and dampers etc., together with electrical loadings of all supplied equipment and connection information.

MB.02.05 The Mechanical Services Installer will be responsible for taking dimensions from site for all equipment to be specially fabricated such as control panels, ductwork, pipework in plantroom etc. and for preparing his own detailed working drawings from these measurements. Such drawings shall be submitted in electronic format and by triplicate paper copies to the Main Contractor for the Contract Administrator's approval before manufacture is commenced.

MB.02.06 The Contract Administrator's comments on and acceptance of working drawings will not relieve the Mechanical Services Installer of his responsibility for errors and incorrect setting out. The Contract Administrator's approval is to be general and is not intended to serve as a check and does not relieve the Mechanical Services Installer from furnishing the materials and performing the work as required by the Drawings and Specification.

MB.02.07 The Mechanical Services Installer shall be responsible for any discrepancies, errors or omissions in the working drawings and other particulars supplied by him, whether such drawings and particulars have been approved, in principle, by the Contract Administrator or not, provided that such discrepancies, errors or omissions be not due to inaccurate information or particulars furnished in writing to the Services Installer by the Contract Administrator.

Cont’d.
MB.02.0 WORKING DRAWINGS (Cont’d.)

MB.02.08 Following the approval of any working drawing the Mechanical Services Installer shall formally issue in electronic format and two paper copies of the approved drawing to both the Main Contractor and the Contract Administrator.

MB.03.0 SETTING OUT

MB.03.01 The Contract Drawings are for tendering purposes only and are not to be used for setting out. Except where specific dimensions are given, the Mechanical Services Installer will verify all setting out on site and shall make use of all detail, large scale, furniture and internal wall elevation drawings held by the Main Contractor.

MB.03.02 Notwithstanding the submission, approval and issue of Working Drawings, the exact positions of all heating pipe runs, ductwork runs, plant and equipment must be agreed on site with the Contract Administrator before they are set out. Drawings shall not be scaled for this purpose.

MB.03.03 The Mechanical Services Installer shall accurately set out the works and he shall keep them correct in every particular way according to the Drawings and Specification.

MB.03.04 In all instances where other services (gas, hot and cold water, heating, electricity, telecom. TV, etc.) are run in conjunction with and/or parallel to the installations, the setting out of the whole of the services is to be approved by the Contract Administrator before work is commenced on that portion of the installation.

MB.04.0 BUILDERS’ WORK

MB.04.01 The following work shall be deemed to be Builders' Work, which shall be provided by the Main Contractor: -

a) Cutting away through walls, floors and ceilings for passage of conduits etc. and making good after.

b) Concrete plinths for items of plant.

c) Auxiliary timber noggins and the like for supporting heaters and pipework.

d) All underground pipe ducts, trenching etc.

Cont’d.
MB.04.0 BUILDERS’ WORK (Cont’d.)

e) All painting other than that outlined in Clause MB.07 of the Specification.

f) Removal and replacement of other parts of the building fabric as may be necessary.

g) Items of general and special attendance referred to on the Forms of Tender or associated documents.

MB.04.02 The Mechanical Services Installer shall inform the Main Contractor of the location and details of any of the above Builders’ Work required by marking out on site or, if requested, by drawings.

MB.04.03 The Mechanical Services Installer shall be responsible for the accuracy of the Builders’ Work information and shall recompense the Main Contractor for any abortive work carried out due to inaccurate information given by him.

MB.04.04 The Mechanical Services Installer shall be fully responsible for the levels and squareness of surface fixed pipework etc. (especially on tiled surfaces), and to this end shall ensure the accuracy of all works carried out in this connection by the Main Contractor.

MB.04.05 The Mechanical Services Installer shall permit nothing to be done which may injure the stability of the works and no cutting through floors, walls, etc. will be allowed, other than where required by the Drawings, without the sanction of the Contract Administrator.

MB.05.0 FIRE PROTECTION

MB.05.01 When holes are cut through wall or floors to enable pipework, ducting or ducts to pass through, the Main Contractor must make them good with incombustible material. Internal fire barriers in ducts and intumescent fire collars on plastic pipework etc. shall be the responsibility of the Mechanical Services Installer.

MB.06.0 FIXINGS

MB.06.01 The Mechanical Services Installer shall include for all drilling and plugging for the erection of all materials and equipment required by the Specification. This shall include the fixing of metalwork, screws, clips, bolts, brackets, saddles, etc. for the proper support of pipework, ductwork etc.

Cont’d.
MB.06.0 **FIXINGS** (Cont’d.)

MB.06.02 In any building partially or fully occupied by the Employer or other persons, noise and hindrance whilst carrying out any of the above shall be kept to a minimum.

MB.06.03 The Contract Administrator’s and the Main Contractor’s approval shall be obtained as to all methods of fixing proposed before the work is commenced and, in particular, the approval shall be obtained, in writing, before welding, drilling, burning, cutting, cartridge injecting or altering structures or foundations in any way.

MB.06.04 The Mechanical Services Installer shall rectify at his own expense any damage whatsoever caused by negligence on the part of his workmen to decorations, paintwork, building fabric or structure etc.

MB.07.0 **PAINTWORK**

MB.07.01 The Mechanical Services Installer shall be responsible for protecting all mechanical equipment that has been installed from damage, and shall thoroughly clean all equipment before it is handed over. Any damaged paintwork shall be made good in a colour and type of paint to match the original.

MB.07.02 Mild steel or iron brackets or other items to be built in are to be painted before building in. In the case of materials or plant which is delivered to the site already primed, the Mechanical Services Installer shall ensure that the primer is suitable for the type of paint to be subsequently applied, and shall make good any damage to the primer before further coats are applied.

MB.07.03 All items that are to be painted shall have an under-coating and a finishing coat in addition to a primer appropriate to the material being painted, the finishing coat shall be to a colour to be approved by the Contract Administrator.

MB.07.04 All paints, including priming, undercoats and finishing coats shall be of the best quality, and shall be obtained from a manufacturer approved by the Contract Administrator, and are to be used in accordance with the Maker's instructions. Painting shall be done in accordance with the best practices in the Trade, all surfaces to be painted, must be thoroughly prepared, including removal of dust, grease and protective coatings, and in the case of iron and steel, the removal of rust and scale by abrasion, followed by the application of an anti-rust solution to remove pitted rust.
MB.08.0   WORKMANSHP

MB.08.01 Workmanship shall conform to the highest standard of current mechanical installation practice. The Contract Administrator reserves the right to reject any work, which in his opinion does not meet such a standard.

MB.08.02 Rejected work shall be rectified immediately or taken down within two days and corrected as soon as is practically possible.

MB.09.0   MATERIALS

MB.09.01 Unless otherwise specified all material to be used throughout the installation shall be new and shall be of British or EEC manufacture.

MB.09.02 All materials shall be of the best of their particular type and the Mechanical Services Installer may be called upon to submit for approval samples of the various materials intended for use in the execution of the work. All materials are to comply with the appropriate British Standard Specification where such is available.

MB.09.03 Materials, which are specified, to be supplied by a particular Manufacturer shall not be varied without the written approval of the Contract Administrator.

MB.09.04 Notwithstanding any negotiations, which the Contract Administrator may have had with any particular Manufacturer regarding items of equipment, which are specified, the Mechanical Services Installer shall still be responsible for final negotiations to ensure that the equipment is entirely suitable and fully conforms to all requirements.

MB.09.05 The above negotiations will probably have taken place early in the design process and therefore quantities may have changed. It is the Mechanical Services Installer’s responsibility to verify the correct quantities and execute the orders accordingly.

MB.09.06 All catalogue numbers shall be checked to ensure that that number specifies a complete item of equipment etc. Should any number only partially specify an item, this shall be reported before the tender is submitted. The use of specified catalogue, type, make or model numbers without checking as above will not be considered as justification for any additional financial claims and the complete item will be required to be installed as part of the Contract.

Cont’d.
MB.09.0 MATERIALS (Cont’d.)

MB.09.07 The Mechanical Services Installer shall ensure that all materials, which are installed or stored on site, are properly protected. The Contract Administrator reserves the right to reject any materials which are damaged or corroded due to poor storage, installation, or lack of protection, or materials which do not comply with the Specification.

MB.09.08 Rejected materials, whether installed or stored, shall be removed from site within two days and replaced as soon as is practically possible.

MB.09.09 It shall be the Mechanical Services Installer's responsibility to ensure that all materials are ordered and delivered to site in sufficient time so as to enable him to complete his work within the period of contract. No additional claims will be allowed for non-compliance.

MB.10.0 PRODUCTS SPECIFIED BY NAME

MB.10.01 It should be noted that, for tender purposes, the reference to any particular item or product within this specification lays down the parameters required for that product. These parameters will include type and standard of aesthetic finish, applied technology/inter-component compatibility, thermal capabilities, technical suitability and physical dimensions.

MB.10.02 Alternative products may be offered, if full details are submitted in writing, at the submission of any tender for evaluation and approval by the Contract Administrator. Any such alterations shall be detailed in the form of a separate schedule indicating any projected cost savings against any scripted product.

MB.10.03 Any proposed ‘equal and approved’, alternatives will not be considered after the stage of tender acceptance. The offer and acceptance of any tender will be deemed to have established the full specification of the products included therein and the only parameters for re-consideration thereafter will be due to availability parameters, if notified in writing to the Contract Administrator at least 4 weeks prior to the programmed delivery date.

MB.11.0 TESTING AND COMMISSIONING

MB.11.01 At an early stage of the Project the Mechanical Services Installer shall compile a programme of testing and commissioning of all services contained in the Specification Document.

Cont’d.
MB.11.0 TESTING AND COMMISSIONING (Cont’d.)

MB.11.02 The Mechanical Services Installer shall further provide a method statement supported by risk assessments detailing the procedures for carrying out the on site tests.

MB.11.03 The opportunity shall be afforded to the Contract Administrator, or his appointed representative, to witness all or any tests carried out either on site or at manufacturer’s works, and to facilitate this, the Mechanical Services Installer shall give not less than eight days notice of tests to the Contract Administrator.

MB.11.04 The Mechanical Services Installer shall provide all necessary facilities and equipment to carry out all tests and inspections either on site or at manufacturer’s works.

MB.11.05 An ‘approved’ engineer shall be appointed by the Mechanical Services Installer to supervise the whole of the testing, commissioning, performance testing and instruction of Client’s staff together with all specialised personnel (including manufacturer’s representatives) and all of their activities shall be co-ordinated by him.

MB.11.06 All equipment, material and systems contained in this Specification document shall be tested and if such inspection/test fails, the process shall be repeated until satisfactory results are obtained. All associated costs for repeat tests shall be borne by the Mechanical Services Installer.

MB.11.07 Comprehensive records of all commissioning and testing shall be maintained and shall contain the following information: -

i. Project title

ii. Details and date of test

iii. Instruments used, serial numbers, calibration dates

iv. Signatures of those witnessing test

v. Mechanical Services Installer’s name

vi. Specific location of the item(s) in the Works

MB.11.08 All such documentation shall be included in the O & M manuals.

MB.11.09 Fuel for testing shall be provided by the Mechanical Services Installer.
COMPLETION DETAILS

At the completion and final hand over of the project, the Mechanical Services Installer is required to have carried out the following:

a) fully completed all works detailed in the Specification and shown on the Contract Drawings.

b) fully completed all works relating to Variations to the Contract, for which Contract Administrator’s Instructions have been issued, thus forming part of the Contract.

c) submitted to the Contract Administrator, via the Main Contractor, all duly completed inspection and Completion Certificates.

d) submitted to the Contract Administrator, via the Main Contractor, Record Drawings.

e) submitted to the Contract Administrator, via the Main Contractor, a Maintenance Manual and Job Profile.

All of the above shall be produced in such a format as to allow for ease of inclusion into the Building Log Book.

CLIENT’S OPERATIONAL GUIDE

The Mechanical Services Installer shall liaise with the Contract Administrator to prepare a basic operational guide for the end user client which shall be a non technical information and instruction document.

The document shall be prepared in an easy to read format with simple descriptions of the services contained in the building and giving step-by-step instructions on how to switch on and off the varied controls.

Some of the items to be covered shall be as follows:

1. Heating controls
2. Ventilation controls
3. Intruder alarm controls
4. What to in the event of activation of the fire alarm system e.g. who to contact etc.
5. What action to take in the event of a failure in the electrical supply e.g. who to contact etc.

The guide shall be prepared in draft prior to the instruction sessions presented to the Client’s staff and shall be amended as necessary to reflect any areas of concern voiced by the staff.

Cont’d.
MB.13.0 CLIENT’S OPERATIONAL GUIDE (Cont’d.)

MB.13.05 The guide shall be provided in a durable hard copy and in electronic format.

MB.14.0 INSTRUCTION PERIOD

MB.14.01 After an installation has been completed, tested and handed over to the Employer, and when instructed, the Mechanical Services Installer shall supervise and be completely responsible for the running of the plant detailed in this Specification, for an agreed period during which he shall demonstrate to the persons appointed by the Employer to be in charge, the running conditions, operation of the plant, correct setting and maintenance controls etc. to attain the desired results.

MB.14.02 The Mechanical Services Installer should ensure that the person(s) are familiar with the positions of boilers, calorifiers, water heaters, pumps, etc., and facilities for the isolation of the installation, particularly under emergency conditions. The instructional period may not take place immediately on completion, but when considered desirable by the Contract Administrator.

MB.14.03 The Mechanical Services Installer should ensure that his specialist controls sub-contractor will give ‘hands-on’ training to the appointed Client’s operative(s) including simulating varying conditions.

MB.14.04 Any particular project requirements concerning the instructions shall be detailed elsewhere in the Particular Specification.

MB.15.0 OPERATION & MAINTENANCE MANUALS

MB.15.01 Prior to the issue of the Practical Completion Certificate for Works, comprehensive Operation & Maintenance Manuals finalised in detail and approved shall be provided. It is advised that great importance will be placed upon the quality, accuracy, clarity and completeness of the Operation & Maintenance Manuals and upon their being made available promptly.

MB.15.02 A complete draft copy of the manual must be submitted not less than 8 weeks before the date of Practical Completion. Any amendments necessary in the light of any comments shall be made and the manual re-submitted for the Contract Administrator’s approval.

MB.15.03 Only after the Contract Administrator’s approval are the final copies of the manual to be produced.

Cont'd.
MB.15.04 The finalised copies are to be provided to the Contract Administrator not less than 2 weeks before the date of Practical Completion

MB.15.05 Failure to issue these in time will result in withholding the Practical Completion Certificate, or alternatively the Contract Administrator may produce them and the actual production cost will be contra-charged to the Mechanical Services Installer.

MB.15.06 From time to time, as required by the Contract Administrator throughout the execution of the Works, evidence of adequate and accurate records, in the form of marked-up drawings and record sheets etc., is to be made available to enable the ultimate completeness and accuracy of the Operation & Maintenance Manuals, and these shall be progressively examined by the Contract Administrator as the work on site proceeds.

MB.15.07 All Operation & Maintenance Manuals shall be provided in triplicate together with a CD-ROM containing all documentation, following the issue of one set for approval.

MB.15.08 The Operation & Maintenance Manuals shall be adequate for the following purposes:-

(a) To record clearly the layout of the various sections of the Works as actually installed, and to identify and locate all component parts thereof especially isolation points, controls outstations, distribution boards etc.

(b) To make it possible to comprehend the extent and purposes of the Works and the method of operation thereof.

(c) To set out clearly the extent to which maintenance and servicing is required and how, in detail, it should be executed.

(d) To provide sufficient and readily accessible information properly to facilitate the ordering of spares and replacements.

MB.15.09 The Operation & Maintenance Manuals shall be correlated so that the terminology and the numerical and/or other references used therein are consistent with and similar to those used in the physical identification of component parts of the Works.
MB.15.0 OPERATION & MAINTENANCE MANUALS (Cont'd.)

MB.15.10 Operating and Maintenance Instructions shall be provided and shall comprise the following as applicable (all contained in volumes strongly ring bound in hard covers and suitable for heavy usage over a long period), written to be read in conjunction with the Record Drawings:

(a) A general description of the scope, purpose and manner of working of each system or apparatus forming part of the Works.

(b) A detailed description of the scope, purpose and manner of working of each system of automatic controls and/or monitoring instruments.

(c) A detailed description of the scope, purpose and manner of working of each system of special services.

(d) Data on general design parameters and normal operating conditions (e.g. air volume, voltage, current etc.) based on commissioning tests.

(e) Clear and comprehensive instructions for the switching on, starting up, running and closing down of each such system or apparatus.

(f) Clear and comprehensive instructions for dealing with emergency conditions for each system or apparatus.

(g) Instructions in respect of any precautionary measures from time to time necessary (e.g. against corrosion or freezing).

(h) Instructions in respect of the care of apparatus when subject to seasonal disuse.

(i) Instructions as to the nature, extent and frequency of servicing necessary to properly maintain the Works in good condition and as to the materials to be used for the purpose. This information may be supported in detail, but not replaced by, maintenance instructions provided by the suppliers of particular component apparatus.

(j) The names and addresses of suppliers of all major components of the Works as may be required to obtain spare parts or replacements.

Cont'd.
MB.15.0 **OPERATION & MAINTENANCE MANUALS** (Cont'd.)

MB.15.11 Copies of manufacturers' data shall be supplied with respect to the nature, type and method of operation of individual pieces of equipment, together with their detailed maintenance instructions. Such data, in the form of individual booklets and the like, shall be indexed and cross-referenced to the Operating and Maintenance Instructions and presented suitably protected in box files or folders.

MB.15.12 An asset list of all equipment and services together with all associated technical information pertinent to such services and information shall be included.

MB.15.13 A copy of all Test Certificates, Verification, Inspection and Test Records, Commissioning and Performance Test Records (including, but not limited to, corrosion tests, type tests, start and commissioning tests) for the installations and plant, equipment, valves, etc., used in the installations.

MB.16.0 **RECORD DRAWINGS**

MB.16.01 Prior to the issue of the Practical Completion Certificate for the Works, comprehensive Record Drawings finalised in detail and approved shall be provided. It is advised that great importance will be placed upon the quality, accuracy, clarity and completeness of the Record Drawings and upon their being made available promptly.

MB.16.02 Draft copies of the drawings must be submitted not less than 8 weeks before the date of Practical Completion. Any amendments necessary in the light of any comments shall be made and the drawings re-submitted for the Contract Administrator's approval.

MB.16.03 Only after the Contract Administrator's approval are the final copies of the drawings to be produced.

MB.16.04 The finalised drawings are to be provided to the Contract Administrator not less than 2 weeks before the date of Practical Completion.

MB.16.05 Failure to issue these in time will result in withholding the Practical Completion Certificate, or alternatively the Contract Administrator may produce them and the actual production cost will be contra-charged to the Mechanical Services Installer.

Cont'd.
MB.16.06  From time to time, as required by the Contract Administrator throughout the execution of the Works, evidence that adequate and accurate records in the form of marked-up drawings and record sheets etc., is to made available to enable the ultimate completeness and accuracy of the Record Drawings and these shall be progressively examined by the Contract Administrator as the work on site proceeds.

MB.16.07  All Record Drawings shall be provided in triplicate, following the issue of one set for approval. In the case of drawings and diagrams prepared by the installers, they shall be produced on AutoCAD v 2010, with 3 no CD-ROMs and 3 no sets of paper prints provided.

MB.16.08  Drawings prepared by suppliers of component items shall be in the same form as above, except where they are incorporated in Instruction Manuals when paper is acceptable.

MB.16.09  The Record Drawings shall include the information listed in the following paragraphs, as applicable. All such drawings shall clearly be endorsed RECORD DRAWING near to the title block and shall be drawn to a scale of not less than one hundredth full size, which shall show the following as installed:

(a)  The location, including level if buried, of Public Service connections provided, together with the points of origin and termination, size and materials of pipes and/or other relevant information.

(b)  Location, identity, size and details of all apparatus and control equipment served by, or associated with, each of the various services. The information with respect to size and details may be presented in schedule form subject to the prior agreement of the Contract Administrator.

(c)  The location and identity of each room or space housing plant, machinery or apparatus.

(d)  Main and sub-main pipework, showing origin, route, termination, size and type of each service.

(e)  Details of all services trenches.

(f)  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 interconnections between various systems.

Cont'd.
MB.16.0 RECORD DRAWINGS (Cont'd.)

(g) Details of the principles of application of automatic controls and instrumentation.

(h) Control wiring diagrams, which shall show all equipment supplies as part of the Works.

(i) Manufacturer's drawings and internal wiring diagrams which shall show all special equipment supplied as part of the Works.

MB.17.0 CIBSE LOG BOOK

MB.17.01 The Mechanical Services Installer shall ensure that in addition to clauses MB.15 and MB.16 all the necessary information for the compilation of a log book, as described in CIBSE TM 31, suitable for the property shall be provided in tabulated asset register format to enable completion by the User Client.

MB.17.02 Each item of equipment provided on the project shall be given an unique registered number which shall be printed (not hand written) on self adhesive labels (of size not greater than 75mm x 50 mm) which shall be affixed to the exterior of the item and cross referenced to the equipment asset register.

MB.17.03 The format of the numbering sequence and presentation shall be confirmed by the Contract Administrator prior to the commissioning period when all tabulation shall be checked.

MB.18.0 MAINTENANCE, SERVICING & DEFECTS LIABILITY

MB.18.01 Notwithstanding the conditions of the Contract the Mechanical Services Installer shall be responsible for any defects which may occur, for a period of 12 months from Practical Completion, in the entire mechanical installation detailed in the Specification.

MB.18.02 In order to avoid any misunderstanding of the generic term 'Maintenance Period' the Mechanical Services Installer shall include, separately identified in the tender breakdown, for the first year's maintenance of the total installation to encompass the requirements as laid down in the CLAW maintenance modules which can be downloaded from the CLAW website.

MB.18.03 Following notification of a defect the Mechanical Services Installer shall rectify the item within 24 hours except as may be agreed otherwise with Contract Administrator.
MB.19.0 USE OF MECHANICAL SERVICES PRIOR TO HANDOVER

MB.19.01 It may be essential that the mechanical system is used prior to the practical completion or even before the whole mechanical installation is fully completed.

MB.19.02 In such circumstances the Client may agree, providing that agreement as to the costs etc. can be reached with the Main Contractor and the following requirements are adopted.

1. The Contract Administrator is satisfied that the system is sufficiently advanced.
2. The requirements of the Management of Health and Safety at Work Regulations 1999 are fully carried out.

MB.19.03 The provision of these services is not included in the Sub-Contract, and as such they shall be chargeable to the Main Contractor.

MB.19.04 The defects liability period will commence from the date of practical completion even though the associated electrical services are used previously.

MB.20.0 EMERGENCY CALL OUT

MB.20.01 For the duration of the contract and for the defects period an Emergency Call Out Service must be available 24 hours per day at all times including week-ends and bank holidays.

MB.20.02 The Call Out is to be covered as soon as possible and the operative attending site must be on site within 2 hours of receiving the Emergency Call Out notice.

MB.20.03 If the Mechanical Services Installer is unable to respond to the call out within the time specified, attendance by others operating on a representative basis for the Mechanical Services Installer will be acceptable but the standard and performance of the representative is entirely the responsibility of the Mechanical Services Installer.

MB.20.04 In the event of failure by the Mechanical Services Installer to respond to the call out within the time stipulated, the Client reserves the right to employ and pay others to carry out the work involved and the costs incurred will be deducted by the Client from any monies due to the Mechanical Services Installer under this contract or will be recoverable from the Mechanical Services Installer by the Client as a debt.

Cont'd.
MB.20.0  EMERGENCY CALL OUT (Cont'd.)

MB.20.05  This latter action will in no way invalidate the guarantee inherent in the defects liability period implicit in the terms of the contract.

MB.20.06  The cost to the Mechanical Services Installer of putting the equipment and associated Mechanical Systems into working order will be at the Mechanical Services Installer's expense and at no cost to the Client unless the work involved or the fault attended to is deemed by the Client to be outside the terms of the contract.

MB.20.07  To facilitate the call out procedure the Installer upon placing of an order with him for the contract works will be required to give a Call Out telephone number or numbers where 24 hour contact will be available and the Client will give corresponding 24 hour Call Out contact numbers for the relay of information.

MB.20.08  Included in this Emergency Call Out Procedure is the attendance to any operational fault or breakdown to any temporary plant that may be installed as part of the contract.

MB.21.0  COMPLIANCE WITH REGULATIONS

The whole of the installation carried out under this contract must comply with the following regulations and requirements, together with the latest revisions and amendments, which apply at the time of installation.

a) Building Regulations.
b) Local Authority Bye-Laws, Regulations and Notices.
c) British Standards and European whether applicable in part or whole.
d) Relevant British Standard Codes of Practice.
f) Management of Health and Safety at Work Regulations 1999 (3242).
g) Electrical Equipment (Safety) Regulations 1994 (3260).
h) The local Fire Authorities requirements.

Cont'd.
MB.21.0  COMPLIANCE WITH REGULATIONS (cont’d)

i) The relevant C.I.B.S.E. requirements.

j) The Construction (Design and Management) Regulations 1994 (3140)

k) Work Equipment Regulations 1998 (2306)


m) Workplace (Health Safety and Welfare) Regulations 1992 (3004)

n) Personal Protective Equipment at Work Regulations 1992 (2966)

o) Display Screen Equipment Regulations 1992 (2792)

p) Asbestos Licensing Regulations 1998 (3233)

q) The Control of Asbestos at Work Regulations 2002 (2675)

r) Construction (Head protection) Regulations 1989 (2209)

s) Construction (Health, Safety and Welfare) Regulations 1996 (1592)

t) Control of Lead at Work Regulations 2002 (2676)

u) Control of Substances Hazardous to Health Regulations 2002 (2676)

v) Pollution Prevention and Control Act 1999

w) Waste Management Licensing Regulations 1994 (1056)


y) Reporting of Injuries, Disease and Dangerous Occurrences Regulations 1995 (3163)

MB.22.0  PRESENCE OF ASBESTOS

MB.22.01 The Contractor shall be vigilant with regard to the presence of asbestos and strictly adhere to the Authority’s standing orders with regard to the necessary procedures to be adopted.
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MC.02.0 SAFETY VENT PIPE & COLD FEED & OVERFLOW
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MC.23.0 RETURN HEADERS
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MC.30.0 TESTING & COMMISSIONING
MC.01.0  GENERAL DESCRIPTION

MC.01.01  Unless otherwise indicated in Part MP of the Specification Document, the heating installations shall comprise of an accelerated low pressure system, and temperatures shall be 80.0°C flow with a drop of 10°C for traditional heating systems, and 70.0°C flow with a drop of 20°C for condensing boilers with radiators.

MC.01.02  Space heating requirements shall be in accordance with Part MP of the Specification Document, issued schedules and drawings.

MC.02.0  SAFETY VENT PIPE AND COLD FEED AND OVERFLOW

MC.02.01  Each heating boiler shall have a galvanised safety vent pipe taken from tapping on the boiler or flow header. Each safety vent pipe shall incorporate 3-way cock, T.Port gland cock correctly stamped to suit installation, with galvanised relief pipe taken to near boiler house floor.

MC.02.02  Beyond each 3-way cock, pipes shall be gathered into a common safety vent pipe, which shall be taken over heating tank. The size of single vent shall suit boiler load and the size of the common vent shall suit total connected boiler load all as C.I.B.S.E. Guide, and / or particular specification.

MC.02.03  The cold feed to the system shall be run in copper pipework and fittings, BS EN 1057:2006+A1:2010.

MC.03.0  CIRCULATING PUMPS (FOR HEATING AND HOT WATER SERVICES)

MC.03.01  Supply and fix in the positions shown heating and hot water service pumps of the manufacture, type and duty specified in Part MP of this Specification. All necessary adaptations shall be incorporated to suit pipe diameter.

MC.03.02  Pumps for H.W.S. shall be of all gunmetal construction.

MC.03.03  The pump motors shall be super silent totally enclosed drip-proof and suitable for the electricity supply available and continuous running. Where pumps are not centrally controlled from main boiler control or B.M.S control panel, each pump shall be supplied with push button contactor starter containing overloads and no-volt release (and single phase preventer on 3-phase only) all motors over 3HP shall have star delta or equivalent starter, each duplicate set shall have a 3-position rotary selection switch (centre off).

Cont’d
MC.03.0  CIRCULATING PUMPS (FOR HEATING AND HOT WATER SERVICES)  
(Cont'd)

MC.03.04  Where fullway pumps are fitted a distance piece complete with counter flanges shall be provided to facilitate the provision of a gravity circulation should it be necessary to remove the pump at any time. The distance piece shall be laid on a pair of purpose made brackets. The brackets shall be built into the wall near the pump sets.

MC.03.05  A 100mm diameter dial altitude gauge with flanged back and gunmetal gauges cock and handle shall be connected in copper to the main on each side of the heating and H.W.S. pump sets.

MC.03.06  The gauges shall be mounted side-by-side on appropriate mounting board securely fixed to the wall adjacent.

MC.03.07  This board shall be provided and fixed with C.P. round head screws by the Mechanical Services Installer and be large enough to accommodate the distance thermometers specified for boilers. Each instrument shall have a black on white "Traffolyte" label to identify the service.

MC.03.08  The Mechanical Services Installer must ensure that the wiring to the pump is suitable for the motors and starters provided, and is in accordance with the manufacturer's recommendations and BS 7671: 2008+A1:2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition.

MC.03.09  The pump details are to be stated by the manufacturer on brass labels fixed to pumps. Easily visible label to be fixed to each indicating: - Pump No. 1, Pump No. 2 etc. All pumps to have isolating valves fitted.

MC.04.0  ANTI-VIBRATION MOUNTINGS

MC.04.01  The Mechanical Services Installer is to ensure that vibration and / or noise is not transmitted to the building structure.

MC.04.02  A 50mm anti-vibration pad of cork or proprietary type such as "TECO" pad or similar is to be provided for all concrete bases. Flange connections to pumps are to be made with 25mm rubber damper flanges.

MC.04.03  Where pumps are pipeline mounted vibration isolator brackets are to be fitted incorporating spring mountings and friction damping materials.

Cont'd
MC.04.0 ANTI-VIBRATION MOUNTINGS (Cont'd)

MC.04.04 Both pipeline mounting pumps and bed plate pumps may require flexible bellows pipe connections for noise attenuation and if these are required they will be indicated in the supplementary specification.

MC.05.0 SPARES FOR PUMPS

MC.05.01 The Mechanical Services Installer shall provide one spare set of belts for each pump, which shall be suitably packed and labelled and placed in the respective pump room.

MC.06.0 HOSE PIPE

MC.06.01 The Mechanical Services Installer shall provide in the Boiler Room, one length of 25mm diameter non kink hose with unions and adapters to fit draw-off cocks on all boilers, together with one length of 15mm diameter hose with unions and adapters to fit draw-off cocks on circuits. Supporting brackets for these hoses shall be supplied and fixed in convenient positions in boiler room. The length of 25mm diameter hoses shall be 9 metres and the 15mm diameter 18 metres. The unions and adapters shall be fixed to the hosepipes with jubilee clips.

MC.07.0 PRESSURISATION UNITS

MC.07.01 The unit shall be an air cushion automatic pressurisation unit comprising a small break tank, pressurising pump, high / low pressure switches, pressure reducing valve, pressure gauges and hydraulic accumulator.

MC.07.02 Details of air purgers and automatic air vents and safety valves required will be described and shown on the Contract Drawings and in Part MP of the Specification Document.

MC.07.03 A low water cut-out switch shall be provided and wired in series with the boiler safety controls. The boiler safety controls shall also include a manual reset high limit thermostat.

MC.07.04 Nitrogen pressurisation units when required will be extensively detailed in Part MP of the Specification Document and accompanying drawings.

MC.07.05 All attendant electrical wiring is to be strictly in accordance with BS 7671: 2008+A1:2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition.
MC.08.0  RADIATORS

MC.08.01  The Mechanical Services Installer shall supply and install where indicated on the Contract Drawings, radiators of the manufacture specified which shall comply in all details as laid down in the schedule on heating equipment and complete with airlet plug as incorporated in top return end.

MC.08.02  Each radiator shall be supplied without feet unless specified otherwise on the Contract Drawings. Unless otherwise directed, radiators shall be arranged centrally below windows and fitted so as not to project above a cill.

MC.08.03  Radiators shall be tested at works in accordance with BS EN 442-2:1997 to a hydraulic pressure of 6.89 BAR before despatch. The Mechanical Services Installer shall allow for disconnecting removing and refixing all radiators twice for convenience of other trades.

MC.08.04  Details of type of connection e.g. T.B.O.E., B.B.O.E. will be found on the relevant drawing and / or Part MP of the Specification Document.

MC.08.05  Prior to ordering the specified radiators, the Mechanical Services Installer shall ensure that each individual radiator will fit into the position allocated on the drawings and that changes to building fabric design have not taken place.

MC.09.0  RADIATOR VALVES

MC.09.01  Each radiator shall be complete with two valves. The valve on the flow shall be Hattersley Fig.No.3150 (wheelhead), Crane Fig.No.D880POL or equal and approved and the valve on the return shall be Hattersley Fig.No.3300LS (lockshield), Crane Fig.No.D881POL or equal and approved. The valves shall be polished chrome finish.

MC.09.02  Thermostatic Radiator valves to BS EN 215:2004 shall be fitted in lieu of wheel valve, where required all as indicated elsewhere.

MC.10.0  STEEL RADIATORS

MC.10.01  Radiators to BS EN 442-1:1996 shall be as indicated on the Contract Drawings and in Part MP of the Specification Document and supported on manufacturer's concealed brackets secured permanently to the fabric, in accordance with the manufacturer's instruction.
MC.11.0 STEEL TUBES AND FITTINGS

MC.11.01 All tubes shall be British mild steel medium class quality unless otherwise specified with pipe fittings up to and including 65mm of malleable banded iron.

MC.11.02 All pipework and fittings are to be in accordance with BS EN 10255:2004, BS EN 10226-1:2004, BS EN10226-2:2005, BS 2633:1987, BS 2971:1991, BS 4677:1984 and BS EN 12732:2000. Pipe fittings 80mm and above are to be cast iron flanged or mild steel welded type fitting with flanges fitted for easy disconnection.

MC.11.03 Easy sweep fittings shall be used throughout with the exception of vent, draw-off and thermometer positions where square tees shall be used. In all cases connections shall be of the same size as the pipework connection them. Bushings and longscrew connectors shall not be used.

MC.11.04 On no account will joints be permitted within the thickness of walls or floors. In cases where the application of this rule is impracticable (e.g. with sweep fittings or bends) the Contract Administrator may permit the use of square tees or elbows by special permission, if necessary, on site.

MC.11.05 All pipes shall be screwed in accordance with B.S.S. and shall have sufficient unions or flanges to allow for the disconnection of any pipe without disturbance of the fabric of the building.

MC.11.06 Pipes up to and including 65mm diameter shall have malleable iron unions with brass to iron seats. No connectors will be allowed. Pipes 80mm diameter and above shall have flanged joints and be made with approved expanded jointing rings and jointing compound. Pipes shall be expanded into the flanges after screwing or before welding is required.

MC.11.07 All surplus jointing materials shall be cleaned off at the time the joints are made.

MC.11.08 Non-compliance will involve the Mechanical Services Installer in redecorating costs.

MC.11.09 It is essential that after cutting of pipes the full bore shall be restored by reamer and shall be free from rust, scale and free from other defects and shall be thoroughly cleaned before erection.

Cont’d
MC.11.0 STEEL TUBES AND FITTINGS (Cont’d)

MC.11.10 The tender shall cover for the opening up of completed pipework in three positions and its replacement where so required, for inspection by the Contract Administrator. In the event of the inspection revealing faulty workmanship of material, the Contract Administrator reserves the right to require further openings up of completed pipework at the Mechanical Services Installers expense.

MC.11.11 If further faulty workmanship is found, i.e. pipe burrs, etc., then the Mechanical Services Installer shall dismantle and remove part of whole of the installation and replace all at his own expense.

MC.11.12 All pipes shall be laid with a rise toward the point of venting and fall towards the point of drain. All pipes shall follow the line of walls both vertically and horizontally and where covered shall be spaced sufficiently apart to allow each pipe to be lagged separately and/or to facilitate the fitting of floor or wall plates.

MC.11.13 Where a pipe increases its size for the purpose of providing additional heating surface, the increase shall be made by means of an eccentric reducing socket so fitted to prevent an air lock, on the return side the socket shall be fitted to allow the larger pipe to drain.

MC.11.14 In all cases pipes where exposed in rooms shall be run with a minimum clearance of 100mm between the underside of pipe and finished floor and 40mm clearance between finished walls or piers and back side of pipes.

MC.11.15 All open ends, i.e. for radiator connections, continuation of pipe runs etc., shall have plugs or screwed caps inserts until such time as all open ends are finally connected up.

MC.11.16 Every effort has been made to show the runs of pipework as accurately as possible on the Contract Drawings, yet, if any such runs require any special fittings, sets, fire-bends, pillar-bends, etc., to complete the work to the satisfaction of the Contract Administrator they shall be included whether herein specified and/or shown upon drawings or not.

MC.11.17 All connections to cylinders, tanks, boilers and all other items of plant or equipment shall be made with unions of the appliance for repair or replacement.

MC.11.18 All adaptations to existing services shall be carried out in a neat and approved manner. Where existing materials are to be re-used this shall be indicated in Part MP of the Specification Document and the Contract Drawings.

Cont’d
MC.11.0 STEEL TUBES AND FITTINGS (Cont’d)

MC.11.19 Flanges on flanged pipework, malleable iron unions on steel pipes and straight connections on copper pipes shall be fitted where required for erection, but must not exceed 6 metres and also where their presence would facilitate dismantling, maintenance, etc., also on all pipes immediately under the access covers of ducts or trenches and as directed by the Contract Administrator.

MC.11.20 Where practicable all springs and off-sets shall be made in one piece without the use of fittings.

MC.11.21 Defective joints shall be taken down and re-made. The caulking of defective joints is not allowed.

MC.12.0 COPPER & POLYETHYLENE PIPE & FITTINGS (Above & below ground)


MC.12.02 When used for external underground mains, copper tube shall be fitted in straight lengths only, not exceeding 6 metres, and care shall be taken to ensure that the ends are not distorted prior to fittings being attached.

MC.12.03 All copper pipes in the boiler house shall be flanged on sizes 65mm and greater and including smaller sizes where indicated on the Contract Drawings.

MC.12.04 Copper pipes above ground shall be BS EN 1057:2006+A1:2010 (formerly BS 2871: Part 1 Table X).

MC.12.05 Copper pipes below ground shall be to BS EN 1057:2006+A1:2010 (formerly BS 2871: Part 1 Table Y).

MC.12.06 Generally above ground levels where pipes are visible in rooms, and appearance is of utmost importance, the fittings to be used on light gauge copper tubing shall be Yorkshire capillary type copper fittings and shall be of a single manufacture throughout the installation.

MC.12.07 Fittings shall be made up using the correct Tin / Silver solder and flux with both tube and fitting clean.

Cont’d
MC.12.0 COPPER & POLYETHYLENE PIPE & FITTINGS (Above & below ground)  
(Cont’d)

MC.12.08 Fittings shall be in accordance with BS EN 1254-1:1998 and BS EN 1254-2:1998 and installed as detailed above in the General Clause. 'End feed' copper fittings installed in strict accordance with the manufacturer's recommendations are also acceptable.

MC.12.09 Where plastic pipework is specified (mainly underground). This is to be medium density Polyethylene pipe 12 bar metricated blue to BS EN 1452:1999 and suitably jointed strictly to manufacturer's recommendations.

MC.12.10 All copper pipes and fittings, where buried underground shall be wrapped with two layers of 'Denso' tape after testing. Polythene coated or polythene tape applied after testing will also be acceptable.

MC.12.11 Marker tape for external pipework shall be installed as indicated in Part MP of the Specification Document.

MC.12.12 A tracer wire shall be installed as indicated in Part MP of the Specification Document.

MC.12.13 All external mains shall be laid to minimum depth of 750mm and maximum 1,350mm on graded bed with graded backfill of inert material.

MC.13.0 POSITION OF MAINS IN DUCTS & TRENCHES

MC.13.01 Positions of the mains in ducts and trenches as shown on the Contract Drawings are diagrammatic. The Mechanical Services Installer shall take cognisance of NJUG publications recommending the positioning of utilities apparatus for new installations and allow for the supplying and fixing of all tube, fittings and insulation for crossing ducts as necessary.

MC.14.0 EXPANSION

MC.14.01 Full allowance shall be made for expansion and contraction, the Mechanical Services Installer being responsible for the fixing of the pipes for satisfactory working.

Cont’d
MC.14.0   EXPANSION (Cont’d)

MC.14.02   Where expansion joints are indicated on the drawings, these shall be of the stainless steel bellows type having flanged or screwed ends. Care must be taken when installing these joints that pipework is erected in true alignment and bolt holes on counter flanges lined up correctly with joint flanges.

MC.14.03   Suitable pipe guides must be installed to ensure correct function of these expansion joints. Anchor brackets shall be provided where indicated or required, specially fabricated to suit conditions and to the approval of the Contract Administrator.

MC.15.0   AIR VENTS

MC.15.01   All high points are to be vented adequately. Where automatic air vents are called for these are to be of Winn’s manufacture or equal and approved, incorporating Lockshield shut-off valve and with copper drip pipe carried to discharge outside the building in each case. These drip pipes shall not be connected together.

MC.15.02   In all cases where air vents are taken off, an air bottle shall be formed of the fullbore of the main, surmounted by a cap suitably tapped to take the auto vent or air cock. Where air bottles are fitted at high level, a bleed pipe shall be brought down to a convenient level (generally 1800mm above F.F.L.) in 10mm copper tube, bracketed by means of copper saddle clips with brass screws at 250mm centres and terminating in a 15mm backplate elbow with radiator type air vent.

MC.15.03   All vents and release pipes installed in exposed positions shall be insulated to prevent freezing.

MC.16.0   PIPE SUPPORTS

MC.16.01   Pipes in Boiler Room/Plant Rooms shall be supported on purpose made wrought iron brackets made up to tee iron of flat bar fabricated to the pipe diameter and rigidly fixed to the fabric of the building.

MC.16.02   Flamco (or equal and approved) brackets may be used as directed in Part MP of the Specification Document.

MC.16.03   Pipes in roof spaces / ceiling spaces shall generally be supported from 'Flamco' (or equal and approved) pipe clips.
MC.16.0 PIPE SUPPORTS (Cont'd)

MC.16.04 Pipes where exposed to view within the building shall be supported on split ring brackets with screw-on back plates or build-in tails as required and where installed at low level shall be bracketed alternatively off walls and floors at 1200mm centres.

MC.16.05 In addition pipe supports must also be provided on exposed low level pipework within 150mm either side of any change of direction.

MC.16.07 Pipes in ducts shall be supported on split ring pattern brackets with screw-on back plates or build-in tails as required.

MC.16.08 Reference should be made to the Contract Drawings for guidance on types of acceptable brackets.

MC.16.09 There are various types of proprietary brackets on the market similar in operation to the standard brackets and these generally are acceptable but prior approval must be obtained from the Contract Administrator before use.

MC.16.10 Where intermediate floors are constructed from precast hollow beams the 'support rail' shall be secured by means of galvanized / sheradized steel long screws taken through the centre of these precast hollow beams and attached to galvanised fishplates with locknuts. The fishplate assembly will be covered by the floor screed after the installation has been completed.

MC.16.11 Where intermediate floors are constructed from reinforced concrete slabs, the 'support rail' shall be secured by means of 10mm wedge type anchor bolts fixed into the soffit of the slab with a minimum embedment of 75mm.

MC.16.12 The 'support rail' together with the long screws, drop rods, clips, fixings, etc., shall be supplied and fixed by the Mechanical Services Installer.

MC.16.13 Should any special support steelwork be required, in addition to the items mentioned above, this will be indicated on the relevant design drawing(s).

MC.16.14 The spacing of pipe supports shall not exceed the centres given in the table below:

Cont'd
MC.16.0 PIPE SUPPORTS (Cont'd)

MC.16.14 Cont'd

A - Mild Steel Pipework

<table>
<thead>
<tr>
<th>Size</th>
<th>Uncovered</th>
<th>Insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>2.400 m</td>
<td>2.400 m</td>
</tr>
<tr>
<td>20mm</td>
<td>2.400 m</td>
<td>2.400 m</td>
</tr>
<tr>
<td>25mm</td>
<td>2.500 m</td>
<td>2.400 m</td>
</tr>
<tr>
<td>32mm</td>
<td>3.600 m</td>
<td>3.000 m</td>
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<tr>
<td>40mm</td>
<td>3.600 m</td>
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<tr>
<td>50mm</td>
<td>4.800 m</td>
<td>4.200 m</td>
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<tr>
<td>65mm</td>
<td>4.800 m</td>
<td>4.200 m</td>
</tr>
<tr>
<td>80mm</td>
<td>4.800 m</td>
<td>4.200 m</td>
</tr>
<tr>
<td>100mm</td>
<td>4.800 m</td>
<td>4.400 m</td>
</tr>
<tr>
<td>Over 100mm</td>
<td>6.000 m</td>
<td>5.400 m</td>
</tr>
</tbody>
</table>

B - Copper Pipework

<table>
<thead>
<tr>
<th>Size</th>
<th>Uncovered</th>
<th>Insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>1.200 m</td>
<td>1.200 m</td>
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<tr>
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<td>1.800 m</td>
<td>1.500 m</td>
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<tr>
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<td>35mm</td>
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<td>2.400 m</td>
</tr>
<tr>
<td>54mm</td>
<td>3.000 m</td>
<td>3.000 m</td>
</tr>
<tr>
<td>76mm and over</td>
<td>3.600 m</td>
<td>3.600 m</td>
</tr>
</tbody>
</table>

MC.16.15 Where plastic pipelines incorporate metal valves or other heavy fittings it is essential to support and valves directly rather than allow their weight to be carried by the plastic pipe. For the same reason it is usually advisable to fix pipe supports on either side of flanged connections, especially where metal backing plates are used. Moulded plastic fittings should also be supported.
MC.16.0 PIPE SUPPORTS (Cont’d)

MC.16.16 * Maximum recommended horizontal support distance for Plastic pipes in above ground installation:-

<table>
<thead>
<tr>
<th>Nominal Bore</th>
<th>All Classes 20°C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>0.600 m</td>
</tr>
<tr>
<td>20mm</td>
<td>0.680 m</td>
</tr>
<tr>
<td>25mm</td>
<td>0.762 m</td>
</tr>
<tr>
<td>32mm</td>
<td>0.840 m</td>
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<tr>
<td>40mm</td>
<td>0.9 m</td>
</tr>
<tr>
<td>50mm</td>
<td>1.07 m</td>
</tr>
<tr>
<td>65mm</td>
<td>1.22 m</td>
</tr>
<tr>
<td>80mm</td>
<td>1.37 m</td>
</tr>
<tr>
<td>100mm</td>
<td>1.52 m</td>
</tr>
<tr>
<td>150mm</td>
<td>1.82 m</td>
</tr>
</tbody>
</table>

MC.16.17 * For vertical installation of plastic pipes the above support distances may be doubled.

MC.16.18 NOTE: Where normal ambient or working temperature exceeds 20°C the support distances should be reduced. Continuous support is required where temperatures approach 60°C.

MC.16.19 Sketches of all purpose made brackets not detailed on standard drawings must be submitted to the Contract Administrator and approval must be obtained for the type of supports to be used before the work is put in hand.

MC.17.0 VALVES AND COCKS

MC.17.01 Ball Valves shall be full bore as Hattersley Fig. 113,105,105T et al, or equivalent manufactured by Crane, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.02 Bronze & Ductile Iron Automatic Balancing Valves shall be as Hattersley Fig. 2050 or equivalent manufactured by Crane, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.03 Bronze Check Valves shall be full bore as Oventrop Fig. 10750 or equivalent manufactured by Crane, Hattersley, Pegler or other manufacturer approved by the Contract Administrator.

Cont’d
MC.17.0 VALVES AND COCKS (Cont’d)

MC.17.04 Bronze Commissioning Valves shall be as Hattersley Fig. 1000 series or equivalent manufactured by Crane, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.05 Bronze Gate Valves shall be as Crane Fig. D151 et al or equivalent manufactured by Hattersley, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.06 Bronze Globe Valves shall be as Crane Fig. 71, 72, DM6, DM11, DM10 or equivalent manufactured by Hattersley, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.07 Bronze Y Type Strainers shall be as Crane Fig. D295, D297, D298 or equivalent manufactured by Hattersley, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.08 Butterfly Valves shall be as Crane Fig. F611, 612, 614, 615 or equivalent manufactured by Hattersley, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.09 Cast Iron & Ductile Iron Globe Valves shall be as Hattersley Fig. 731PN16 or equivalent manufactured by Crane, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.10 Cast Iron & Ductile Iron Y Type Strainers shall be as Crane Fig. FM276, FM277, FM278, FM273 or equivalent manufactured by Hattersley, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.11 Cast Iron & Stainless Steel Check Valves shall be as Hattersley Fig. M651 et al or equivalent manufactured by Crane, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.12 Cast Iron & Stainless Steel Commissioning Valves shall be as Hattersley Fig. M737 or equivalent manufactured by Crane, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.13 Cast Iron Lubricated Plug Valves shall be as Hattersley Fig. 200 series or equivalent manufactured by Crane, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.14 Drain Taps and Air Vents shall be as Pegler Fig. 833, 775 or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

Cont’d
MC.17.0 VALVES AND COCKS (Cont’d)

MC.17.15 Ductile Iron & Cast Iron Gate Valves shall be as Crane Fig. FM22 series or equivalent manufactured by Hattersley, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.16 High Performance Butterfly Valves shall be as Crane Fig. F626, F627, F628, F629 or equivalent manufactured by Hattersley, Oventrop, Pegler or other manufacturer approved by the Contract Administrator.

MC.17.17 When using Thermostatic Radiator Valves (TRV’s) each radiator shall be complete with two valves; the valve on the flow shall be Oventrop Fig.No.118 37, 38, 39 with matching lockshield or equivalent manufactured by Crane, Hattersley, Pegler or other manufacturer approved by the Contract Administrator. The valves shall be polished chrome finish.

MC.17.18 When using Manual Radiator Valves each radiator shall be complete with two valves; the valve on the flow shall be Oventrop Fig.No.119 00, 01 with matching lockshield or equivalent manufactured by Crane, Hattersley, Pegler or other manufacturer approved by the Contract Administrator. The valves shall be polished chrome finish.

NOTE: VALVES ARE ALL TO BE OF ONE MANUFACTURE

MC.18.0 VALVE LABELLING

MC.18.01 All valves in Boiler House and each main circuit control valve shall have black on white 'Traffolyte' labels 25mm in diameter securely wired on, stating valve number, also all pumps, fans, boilers, cylinders, etc., shall be numbered.

MC.18.02 The Mechanical Services Installer shall provide and fix a circuit control diagram in accordance with the labelling. This shall be hung in a suitable position in the boiler house, and provided with frame and glass protection.

MC.19.0 SLEEVES

MC.19.01 Where pipes pass through walls, floors, partitions, duct walls, etc., metal sleeve pipes shall be provided of Class 'A' Quality tube 2 no. Min. 'A' size larger, with ends neatly finished off to protrude 6mm beyond the finished face of the wall, etc., so that the pipes may be withdrawn from the sleeve if required.

Cont’d
MC.19.0 SLEEVES (Cont’d)

MC.19.02 These sleeves must be finished off either with an approved plastic or heavy metal floor plate of the set-screw type that can be fixed securely in position. (Sheet metal sleeves will not be acceptable).

MC.19.03 Where pipes pass through suspended ceiling tiles floor/ceiling plates of an approved pattern must be fitted.

ME.19.04 Where pipes pass through Fire Compartment Walls, fire stop precautions shall be required as denoted in Building Regulation B3 Section 11 and BS 476 Part 20:1987.

MC.20.0 UNDERFLOOR HEATING GENERAL

MC.20.01 The specialist installer of the underfloor heating system shall be as indicated in the Section MP of the Specification Document based on flow temperature of 55ºC and return of 45ºC.

MC.20.02 Prior to finalisation of the order to the specialist installer the Mechanical Services Installer shall submit pipework layout drawings to the Main Services Installer and the Contract Administrator to ensure that there have been no changes of building fabric layout from the design stage.

MC.21.0 UNDERFLOOR HEATING MANIFOLD

MC.21.01 The control unit/manifold shall be wall hung no lower than 600mm A.F.F.L. unless otherwise indicated in the Section MP of this Specification. The Mechanical Services Installer shall ensure that there is sufficient space around the manifold to allow ease of later servicing.

MC.21.02 Where the control unit/manifold is housed in an enclosure, it shall be provided with a lockable cover (e.g. using ¼ turn proprietary fixings) and shall be properly labelled.

MC.21.03 If pipework other than polyethylene is used in the system the final 1 metre connection from each loop to the manifold shall be in polyethylene.

MC.21.04 The Mechanical Services Installer shall ensure that there is a bypass valve fitted between the flow and return pipework before the manifold.

MC.21.05 The Mechanical Services Installer shall ensure that there are test points and commissioning valves fitted in the flow and return pipework before the manifold.
MC.22.0 UNDERFLOOR HEATING PIPEWORK INSTALLATION

MC.22.01 The pipework shall be installed in accordance with the specialist installer’s recommendations.

MC.22.02 The Mechanical Services Installer shall ensure that the correct pipe bend radii are maintained and that the pipework is securely fixed to ensure no movement during the laying of the concrete.

MC.22.03 The Mechanical Services Installer shall ensure that all the pipework loops are indelibly labelled and tagged and valves are clearly identity engraved directly they are laid to ensure that problems during commissioning are minimised e.g. loop A flow valve engraved ‘AF’ and return valve engraved ‘AR’.

MC.22.04 The Mechanical Services Installer shall ensure that the loops are accurately recorded and dimensioned on a set of drawings to be issued the Contract Administrator and that the Contract Administrator is afforded the opportunity to verify the veracity of the labelling and the drawing prior to the pipework being covered up.

MC.23.0 RETURN HEADERS

MC.23.01 Where multiple returns are connected into a common return header each separate return shall be provided with isolating valve, thermometer and drain cock.

MC.24.0 UNDERFLOOR HEATING PRESSURE TESTING

MC.24.01 Pressure testing shall be carried out by the specialist installer in accordance with regulations and in the following manner.

MC.24.02 Vent all the air from the system and apply 150% of the normal operating pressure.

MC.24.03 Maintain this pressure for 30 minutes and visually inspect the joints.

MC.24.04 Rapidly drain off the water to reduce the pressure 50% of the normal operating pressure and close the drain.

MC.24.05 Leave the system for 90 minutes and visually inspect the joints.

MC.24.06 A drop in pressure during this period indicates a leak in the system.

Cont’d
MC.24.0 UNDERFLOOR HEATING PRESSURE TESTING (Cont’d)

MC.24.07 If the pressure exceeds a level of 50% the operating pressure, this indicates that the system is pressure tight.

MC.24.08 Maintain this pressure for 90 minutes and visually inspect the joints.

MC.24.09 A drop in pressure during this period indicates a leak in the system.

MC.25.0 UNDERFLOOR HEATING CONTROLS

MC.25.01 The Mechanical Services Installer and the specialist installer shall ensure that the room stats are correctly sited and match the relevant manifold valve.

MC.25.02 The connections between the room stats and the manifold shall be terminated in a junction box sited adjacent to the heating manifold. The cables shall be individually terminated into connectors mounted on a fixed DIN rail and where loops are to be controlled by a common room stat the connectors shall be ‘jumpered’ to allow for testing.

MC.25.03 The Mechanical Services Installer and the specialist installer shall ensure that the information for each loop is provided on a laminated schedule fixed inside the lid of the junction box.

MC.25.04 The schedule shall denote the loop number, the loop location (i.e. room reference) and flow rate.

MC.25.05 Whenever possible the Mechanical Services Installer shall ensure that the room stats are functionally tested before the pipework is covered.

MC.26.0 UNDERFLOOR HEATING STARTUP

MC.26.01 The Mechanical Services Installer shall ensure that the specialist installer’s recommendations for initial start-up are strictly adhered to, in order to ensure that the floor is correctly dried out.

MC.26.02 Vent all the air from the system and apply 150% of the normal operating pressure.

MC.26.03 Maintain this pressure for 30 minutes and visually inspect the joints.

MC.26.04 Rapidly drain off the water to reduce the pressure 50% of the normal operating pressure and close the drain.

MC.26.05 Leave the system for 90 minutes and visually inspect the joints.
MC.27.0 MAINTENANCE TOOLS

MC.27.01 In addition to the special tools provided by the manufacturer, tools provided by the manufacturer, tools and lubricants as indicated in Part MP of the Specification Document shall be supplied.

MC.28.0 WATER SUPPLY (WATER FITTINGS) REGULATIONS

MC.27.01 The Mechanical Services Installer is to give the Water Regulations Inspector all reasonable access to inspect the installations as it proceeds to ensure that current Water Supply regulations are complied with.

MC.29.0 SYSTEM FLUSHING

MC.29.01 The complete installation is to be treated by the application of ‘Fernox’ chemical agents or equal and approved as advised by the Boiler manufacturer and the Mechanical Services Installer shall submit a schedule of such agents for approval by the Contract Administrator.

MC.29.02 The complete installation is to be flushed out with cold water and a commercial application of cleaning/flushing agent.

MC.29.03 After the application of the flushing agent and the subsequent draining and refilling of the system, in accordance with the manufacturers recommendations, the installation is then to be dosed with protective agent

MC.29.04 The final PH reading for the system water should be between 7.0 and 8.0. Evidence of this reading shall be submitted to the Engineer upon completion of these works.

MC.30.0 TESTING AND COMMISSIONING

MC.30.01 The Mechanical Services Installer is required to supply, install and set to work all the previously specified equipment. All pressure testing and thermal testing techniques shall be carried out in accordance with the C.I.B.S.E. Commissioning Guides. Fuel for this purpose shall be provided by the Mechanical Services Installer.


Cont’d
MC.30.0  TESTING AND COMMISSIONING (Cont’d)

MC.30.03  NOTE: Where alterations and extensions are carried out to existing installations the Installer shall allow in his tender for the filling, dosing and balancing of the new and existing systems after the installation work has been completed.
INDEX TO CLAUSES

MD.01.0    BOILER HOUSE VENTILATION
MD.02.0    CLEAN AIR ACT
MD.03.0    BUILDING REGULATIONS APPROVED DOCUMENT J: 2002
MD.04.0    HEATING BOILERS
MD.05.0    INCLINED FLUES
MD.06.0    MAIN STACKS
MD.07.0    FAN DILUTED FLUES
MD.08.0    FLUE TERMINAL
MD.09.0    GAS BOILERS & BURNERS
MD.10.0    OIL BOILERS & BURNERS
MD.11.0    BIOMASS BOILERS
MD.12.0    FUEL STORAGE BUNKER
MD.13.0    CONDENSING BOILER & FLUE LOCATION
MD.14.00   CONDENSATE DRAIN POINTS
MD.15.0    CONDENSATE DRAIN PIPE INSTALLATION
MD.16.0    OIL STORAGE TANKS
MD.17.0    CONTENTS GAUGE/OIL FLOW METER
MD.18.0    FUEL CUT-OFF VALVE
MD.19.0    FUEL CUT-OFF VALVE RELEASE
MD.20.0    IDENTIFICATION LABELS
MD.21.0    DIPSTICK OR DIP TAPE
MD.22.0    FILTER
MD.23.0    SLUDGE COCK

Cont’d
INDEX TO CLAUSES (Cont’d)

MD.24.0  OIL FILL ALARM
MD.25.0  OIL FILL CABINET
MD.26.0  OIL FILL TERMINAL
MD.27.0  VENT PIPE
MD.28.0  PAINTING
MD.29.0  ELECTRICAL EQUIPMENT
MD.01.0 BOILER HOUSE VENTILATION

MD.01.01 The Mechanical Services Installer shall supply and fit, where indicated on the drawings, fixed louvred metal grilles. The free opening of grilles shall be sized in accordance with the relevant British Standards.

MD.01.02 Free opening has been assessed in BS 6644: 2011 and is given as follows: -

(a) At Low Level: - 1100mm² F.A.I. per 1.0 kW of Boiler output.

(b) At High Level: - 550mm² F.A.I. per 1.0 kW of Boiler output.

NOTE This British Standard covers boilers between 70kW and 1.8MW rated input. Above this rating Ventilation of the Boiler House shall be in accordance with the recommendation of the Gas Board.

MD.02.0 CLEAN AIR ACT

MD.02.01 The Mechanical Services Installer shall ensure that the installation complies with requirements of the Clean Air Act: 1993, and before ordering of equipment and materials he must advise the Contract Administrator of any deviation from these requirements whether specified or not.

MD.03.0 BUILDING REGULATIONS APPROVED DOCUMENT J: 2002

MD.03.01 Compliance with all relevant sections of Building Regulations Approved Document J: 2002 – Combustion appliances and fuel storage systems.

MD.04.0 HEATING BOILERS

MD.04.01 Boilers serving the system shall conform to part L of the Building Regulations.

MD.04.02 The manufacture, rating and firing shall be as detailed on the contract drawings and Part MP of the Specification Document.

MD.04.03 Boiler flue dampers shall be capable of being locked in the open position and shall be provided with a clear external indication of the position in which the damper is set.

MD.04.04 A stop must be provided to prevent the damper from becoming accidentally completely closed.

Cont’d
MD.04.0 HEATING BOILERS (Cont’d)

MD.04.05 Boiler smoke flue outlets shall have hinged gravity closing relief doors, unless otherwise indicated.

MD.04.06 Where packaged boilers are required each boiler shall be fitted with the following mountings: -

1. 1no. National enclosed spring safety valve of size to suit boiler rating with brass padlock and two keys. The valve shall be correctly set for the standing head of the system and shall be complete with light gauge copper discharge pipe taken to within 300mm of the Boiler Room floor and securely fixed at least with two brackets.

2. 1no. 100mm Dial vapour pressure distance thermometer and pocket.

3. The element shall be fixed in the flow main from the boiler and the dial shall be fixed on the control panel or, if a control panel is not specified, on the polished board housing the pump altitude gauge, unless otherwise indicated. The element and thermometer dial shall be complete with all necessary capillary and brackets etc. The capillary shall be long enough to run in a satisfactory manner and bracketed every 300mm. alternatively a 150mm dial thermometer may be fitted if stated in the Contract Drawings or Part MP of the Specification Document.

4. 1no. 100mm HMOW pattern brass-cased altitude gauge, the maximum head to read twice the static head of system calibrated in bars and millibars fitted with second red indicating pointer and ebony-handled gunmetal gauge cock. The gauge shall be fitted on the boiler and shall be provided without a flanged back.


6. 1no. Set of cleaning tools, flue brushes and approved type rack which shall be fixed to a convenient position in the Boiler Room.

7. Cast iron sectional boilers not designed on metal ash pit stands shall be assembled with flat metal strips inserted between the underside of the sections and the brick base, so that irregularities in the brickwork do not obstruct the correct mating of the sections on with another.

8. One set of loose keys required for valves and cocks and fixed in a position approved by the Contract Administrator, is to be provided, all in accordance with applicable standard requirements.
MD.05.0 INCLINED FLUES

MD.05.01 Where specified, the Mechanical Services Installer shall supply and install in the position shown on the contract drawings an inclined steel flue.

MD.05.02 The flue shall be of size indicated and shall be constructed of 6.00mm plates or as shown on drawing. The end of the flue shall be flanged and hinged and provided with removable plate to facilitate cleaning. The plate shall be secured by steel studs with brass wing nuts and have a suitable handle. A manhole and cover secured as above shall be fitted on all changes of direction to facilitate cleaning.

MD.05.03 The smoke boxes shall be supported on shaped angle iron bearers built into the wall and floor of the Boiler Room and the flue shall be similarly supported at intervals of no less than 1200mm throughout its length.

MD.05.04 A 20mm pipe 80mm long shall be welded into side of flue in position agreed by the Contract Administrator on site. This shall be finished with gunmetal cap end.

MD.05.05 Where only one boiler is called for, the smoke pipe shall be Stainless Steel, unless otherwise specified, adequately supported in an approved manner and all joints shall be made with an approved boiler cement. Adequate provision shall be made for internal cleaning.

MD.05.06 In all cases where the smoke pipe enters a main brick stack the joint shall be sleeved and packed with heating resisting rope. The smoke pipe shall finish approximately 15mm within the inside face of the flue.

MD.06.0 MAIN STACKS

MD.06.01 The stack shall be self-supporting and manufactured from not less than 6.00mm M.S. plate of all-welded construction with vertical seams staggered.

MD.06.02 The stack shall be manufactured in 3.00m lengths with angle iron mating flanges, welded toe and heel to the stack for the whole of the circumstance.

MD.06.03 The stack shall be insulated and this will be in the form of internal brickwork or externally applied mineral wool or glass silk blanket, this item being detailed in Part MP of the Specification Document.

MD.06.04 A cleaning door is to be provided positioned facing flue inlets and its size together with detail of bottom construction, which is to include a blanking-off plate below the inlet as detailed on the drawings.

Cont’d
MD.06.0  MAIN STACKS (Cont’d)

MD.06.05 The bottom section shall be either conical in shape or mounted with gusset plates on to a base plate complete with holding-down bolts.

MD.06.06 The external finish of the stack shall be either aluminium-clad riveted or shot-blasted and painted at works with any subsequent damage after erection made good on site.

MD.07.0  FAN DILUTED FLUES

MD.07.01 Shall be used as detailed in Part MP of the Specification Document on gas-fired systems.

MD.07.02 The fan unit will be either a double inlet centrifugal, single inlet centrifugal or bifurcated pattern, complete with vane switch wired in series with the solenoid valve on the boiler control circuit.

MD.07.03 Stand-by motors with changeover switches, if required, will be detailed in Part MP of the Specification Document.

MD.07.04 All attendant wiring shall be in accordance with BS 7671: 2008+A1:2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition.

MD.07.05 The duct system for the flue shall be constructed from 16 s.w.g. for ducts 300mm x 300mm and from 18 s.w.g. for ducts below that size.

MD.07.06 The duct finish is to be galvanised with all edges painted.

MD.07.07 The Mechanical Services Installer shall ascertain that the discharge grille and the fresh air intake have free areas not less than the cross-section area of the flue.

MD.08.0  FLUE TERMINAL

MD.08.01 A flue terminal shall be supplied and fitted to the flue pipe and rigidly supported as indicated on the contract drawings or Part MP of the Specification Document.
MD.09.0 GAS BOILERS & BURNERS

MD.09.01 The Mechanical Services Installer shall supply and install where required fully automatic Gas Boilers having the rated capacity shown on the Contract Drawings, or specified in Part MP of the Specification Document, and shall be installed in accordance with the requirements of the current relevant British Standard Specification.

MD.09.02 Each boiler shall be supplied and fitted with mountings as previously specified and shall be installed to the manufacturer's instructions.

MD.09.03 The type of fully automatic Gas Burner (atmospheric or forced draught) to be supplied and fitted shall be in accordance with the details shown on the Contract Drawings or in Part MP of the Specification Document and shall be sized to obtain the output of the Boiler specified.

MD.09.04 The following ancillary equipment and components shall be supplied and fitted to the Gas Burner.

a. One control thermostat shall be supplied and fixed where shown on the drawing by the Mechanical Services Installer. The control thermostat shall be an Immersion type, the stem of which shall suit the pipework installation.

b. For low Pressure Hot Water Heating Systems the settings of Control Thermostat shall be 40°C to 110°C. For Medium and High Pressure Hot Water Heating Systems the appropriate type of thermostat shall be supplied and if not specified shall be approved and confirmed by the Contract Administrator.

c. 1 no limit thermostat with manual reset which shall be an Immersion type Gas Thermostat or an electric thermostat as specified. For Low Pressure Hot Water Heating Systems settings of Thermostat to cover the range of 40°C to 110°C. For Medium and High Pressure Hot Water Heating Systems the appropriate type of Thermostat to be supplied, and if not specified shall be approved by the Contract Administrator.

d. 1 no electrical isolating switch for each Gas Burner.

e. All Gas Governors, shut-off valves, Test Points, Safety Shut Valves, Flame Failure Device, and Electronic sequencing Controls shall be as manufactured by Landis & Gyr or equal and approved, and necessary components required to ensure that the Burner operates efficiently and safely shall be in accordance with the current relevant British Standard Specification and shall be supplied and installed by the Mechanical Services Installer.

Cont'd.
f. The sequence controls when fitted on Forced or Induced Draught Burners shall provide for pre-purge and post purge after ignition to ensure gases clear from the Boiler. The pre-purge period shall be a minimum of 30 seconds at full combustion air rate, or pro-rata longer periods at lower air rates. The pre-purge air rate shall not be less than 25% of the full combustion air rate.

g. Failure of the air supply during the pre-purge shall result in safety shutdown. Complete restart from the beginning of the pre-purge period upon resumption of the air supply shall be permitted.

h. Gas Safety Shut-Off Valves shall be of the failsafe type so as to close when de-energised or upon mechanical failure.

i. Two safety shut-off valves in series shall be fitted in the gas supply to the main burner when a burner rated in excess of 600 kW input is used.

j. The Flame failure device shall upon flame failure cause safety shutdown and lock out, and there shall be no attempt to re-ignition by spark restoration, automatic re-cycling or other means. A re-start cycle shall only occur after a manual re-set.

k. 3 copies of the Burner Maintenance and Instruction Manual shall be provided for inclusion in the O. & M. Manuals for the Project

MD.09.05 Gas Boiler Installations and materials shall comply with the following, including latest amendments.


MD.09.0  GAS BOILERS & BURNERS (Cont'd.)

MD.09.11 Also in connection with the above, reference is to be made to the following British Gas Publications: -

MD.09.12 IGE/UP/2, IM/21, IGE/TG/3, IGE/TG/4, IM/11

MD.09.13 Each Boiler shall be approved by the Gas Council, comply to the current Gas Council Code of Practice for Automatic Gas Burners and the installation comply with the Gas Safety Regulations 1972 and 1984 plus subsequent amendments.

MD.09.14 Boilers with Gas Burners of 586 kW rating and over shall be installed in accordance with current recommendations of the Gas Council.

MD.09.15 Existing Boilers converted to Gas Firing shall also comply with the relevant requirements of the appropriate current British Standard Code of Practice.

MD.10.0  OIL BOILERS & BURNERS

MD.10.01 The Mechanical Services Installer shall supply and fit, where required, to each Boiler a fully automatic burner suitable for burning the grade of oil specified, all in accordance with the manufacturer’s specification and to the British Standard Specification Nos. 799, Parts 2, 3, 4 and 5, 6, 7 and 8 for Oil Burning Equipment.

MD.10.02 Each oil burner shall be of the Pressure Jet type, unless otherwise specified, and shall be fitted with a jet suitable for burning the grade of oil to obtain the output from the boiler specified.

MD.10.03 The Mechanical Services Installer shall confirm with the Contract Administrator the actual form of control of each Oil Burner to be supplied.

MD.10.04 Boilers shall be provided with mountings specified under Clause MD.03 and each Oil Burner shall be supplied complete with the following items:

(a) Electric Motor suitable for single or three phase Electricity Supply as stated

(b) Oil Pump Unit of adjustable pressure type with pressure regulating valve for ensuring oil reaching the nozzle(s) at the correct pressure atomization.

Cont'd.
OIL BOILERS & BURNERS (Cont'd.)

(c) Chromium plated pressure gauge between pump and nozzle

(d) A suitable oil filter fitted in an accessible position for cleaning purposes

(e) A suitable oil loop fitted adjacent to the burner

(f) A flexible oil pipe at least 600mm long for making the final connection to oil supply pipe

(g) A high tension Transformer for providing an electric spark for automatic ignition

(h) Diffuser combustion head to be fitted to increase combustion efficiency and combustion stability

(i) A suitable oil flow meter shall be fitted to each burner as generally indicated in Part MP of the Specification Document.

(j) Automatic controls as manufactured by Landis & Gyr or equal and approved, with flame failure photoelectric cell, and electronic sequence controls mounted on each burner.

(k) The sequence controls to provide for pre-purge and post-purge after ignition to ensure gases clear from the Boiler.

(l) The Automatic controls shall include a positive safety lockout in case of flame failure from any cause, for preventing wastage of oil.

(m) The photoelectric cell fitted in the burner nozzle casing and focused on the flame, shall stop the Burner, and oil supply instantly in the case of flame failure.

(m) 3 copies of the Oil Burner Maintenance and Instruction Manual shall be provided for inclusion in the O. & M. Manuals for the Project.

The following controls and ancillary equipment shall also be provided.

a. 1no Boiler limit stat with thermal reset for each Boiler, covering the range of 22°C to 95°C.
MD.10.0  OIL BOILERS & BURNERS (Cont'd.)

MD.10.05  Cont'd

b. 1no Controlling Thermostat covering the range of 22°C to 110°C.

MD.10.06  The Mechanical Services Installer shall include in his tender for:-

  a. installation of the burner sets including all necessary refractory brickwork within the Boilers,

  b. carrying out the starting up and commissioning, and testing of Burners.

MD.10.07  The Mechanical Services Installer shall also carry out combustion tests on the Boiler Plant, to be witnessed and accepted by the Contract Administrator. All plant is to be fully re-commissioned at the end of 12 months warranty period.

MD.10.08  Attendance by the Oil Burner Manufacturer at the time of final demonstration and commissioning of the Oil Burning equipment shall be included in the Mechanical Services Installer’s tender. This commissioning shall be carried out in conjunction with the commissioning of the control equipment.

MD.11.0  BIOMASS BOILERS

MD.11.01  The Mechanical Services Installer shall ensure that the boiler and flue are located and installed in accordance with Part MP and the manufacturer's requirements.

MD.12.0  FUEL STORAGE BUNKER

MD.12.01  The Mechanical Services Installer shall ensure that the fuel storage bunker is sited as indicated on the design/working drawings and is of adequate volume as indicated in Part MP, covered, well ventilated and easily accessed for fuel delivery and that all mechanical transference systems are installed in accordance with the manufacturer's requirements.

MD.12.02  The Mechanical Services Installer shall ensure that the fuel storage bunker is adequately drained.

MD.12.03  A means of observation into the bunker shall be provided.

Cont'd.
MD.12.0  FUEL STORAGE BUNKER  (Cont'd.)

MD.12.04  The Mechanical Services Installer shall ensure that the auger fuel delivery to the boiler hopper is installed in a manner so as to enable access for maintenance purposes.

MD.13.0  CONDENSING BOILER & FLUE LOCATION

MD.13.01  The Mechanical Services Installer shall ensure that the boiler and flue are located and installed in accordance with Part MP and the manufacturer's requirements

MD.14.00  CONDENSATE DRAIN POINTS

MD.14.01  During normal operation of the boiler condensate will be formed in the heat exchanger and flue

MD.14.02  Where possible connections should always be made to internal drain points (stack pipe or waste pipe) external termination points are more likely to become blocked by, for example, freezing, leaves or general debris.

MD.15.00  CONDENSATE DRAIN PIPE INSTALLATION

MD.15.01  The Mechanical Services Installer shall ensure that a trap is installed in the pipe; whether it is terminated directly to the outside or before it connects to another waste pipe.

MD.15.02  If the drain pipe is taken directly to a gully or rainwater hopper, a water seal of no less than 38mm is required.

MD.15.03  When connected to another waste pipe the water seal should be at least 75mm, to prevent foul smells entering the occupied space.

MD.15.04  Many boilers include a trap within the boiler to prevent combustion products entering the drain; however, this may not have a sufficient seal depth to meet the building regulations.

MD.15.05  Unless the manufacturer's instructions state otherwise an additional trap of either 38mm or 75mm, depending on the intended connection, will be required with an air break between the traps.

MD.15.06  The length of the condensate pipe should be kept as short as possible. Externally run condensate drainpipes should be limited to 3m to reduce the risk of freezing.

Cont’d
MD.15.0 CONDENSATE DRAIN PIPE INSTALLATION (Cont’d)

MD.15.07 The fall on the condensate pipe shall be at least 2½ degrees away from the boiler, i.e. 45mm/m length.

MD.15.08 The number of bends shall be kept to a minimum. Similarly the number of fittings or joints external to the property needs to be minimised in order to reduce the risk of condensate being trapped.

MD.15.09 The Mechanical Services Installer shall ensure sufficient fixings to prevent sagging. A maximum spacing of 0.5m for horizontal and 1.0m for vertical sections should be adequate.

MD.15.10 The Mechanical Services Installer shall follow the boiler manufacturer’s instructions with regard to pipe sizes. If there are no guidelines then a minimum nominal diameter of 22mm should be used when run internally in a property and a larger diameter is recommended for externally run pipe to reduce the risk of freezing (at least 32mm nominal diameter).

MD.15.11 The Mechanical Services Installer shall ensure the drainpipe material shall be resistant to acid as the condensate is slightly acidic with a pH less than 6. e.g. plastics as used for standard wastewater plumbing systems or cistern overflow pipes (copper and mild steel pipes and fittings shall not be used).

MD.15.12 Many condensing boiler types have a siphon fitted as part of the condensate trap arrangement. This provides intermittent discharge of the condensate which will significantly reduce the risk of condensate freezing where part of the pipework is run externally. If an appliance does not include a siphon then external pipework is best avoided to reduce the risk of freezing. If this is not possible then external pipework should have a minimum nominal diameter of 32mm.

MD.15.13 Where a boiler is sited in basement or a drain point cannot be reached by gravity, a condensate pump can be considered. Pump manufacturers instructions shall always be followed.

MD.16.0 OIL STORAGE TANKS

MD.16.01 The Mechanical Services Installer shall supply and install on supports Oil Storage Tanks of the size and capacity indicated on the contract drawings or, detailed in Part MP of the Specification Document

Cont’d
MD.16.0 OIL STORAGE TANKS (Cont'd.)

MD.16.02 The tanks shall be:-

i. Steel tank to OFS T200 (reference 10)

ii. Polyethylene tank to OFS T100 (reference 11)

iii. Of the prefabricated type, unless otherwise indicated, constructed from black steel plate, and shall be of Welded Construction suitably strengthened to withstand the head specified above the top of the tanks in accordance with B.S. 799-5:1987.

MD.16.03 Each tank shall be provided with a 600mm diameter raised manhole located at the top of the Tank.

MD.16.04 A liquid and vapour proof joint shall be made, between manhole cover and tank surface.

MD.16.05 All connections to the tanks shall be by means of bosses welded on and in accordance with details on the drawing. All pipework used on the Oil Tank Installation shall be as for heating, butt joints shall be welded and sufficient unions or flanges provided for easy disconnection.

MD.16.06 Each tank is to be subjected to a hydraulic pressure test of not less than 1½ times the design pressure and held for a period of one hour. In the event of leakage or plate distortion the defects are to be rectified and the tank retested to the satisfaction of the Contract Administrator. Three copies of the test certificates shall be provided for inclusion in the O. & M. Manuals for the Project.

MD.16.07 Each tank shall be fitted with a brass identification plate engraved with the following details: -

- Gross capacity in litres
- Test pressure at the top of the tank
- Date of test
- Manufacturer’s name
- B.S. number and tank type

MD.16.08 At all changes of direction in the oil supply pipe fittings shall be provided to facilitate rodding, and 6.00mm air cocks provided at high points for venting.

Cont’d
MD.16.0 OIL STORAGE TANKS (Cont'd.)

MD.16.09 The tanks shall be supported on brick, or concrete or steel joists, (the supports to be provided by the Main Contractor). The Mechanical Services Installer shall supply and fix one layer of lead lined damp course on the bearing surface between Tank and support surfaces.

MD.16.10 It will be the responsibility of the Mechanical Services Installer to provide tank support cradles when horizontal cylindrical tanks are used.

MD.16.11 The Mechanical Services Installer shall arrange delivery of oil storage tanks and installation of same in position in chamber before roof or walls are erected.

MD.16.12 Before ordering Oil Storage Tanks, the Mechanical Services Installer shall submit to the Contract Administrator, full working drawings, showing detail of tank construction, positioning and size of connections, and Tank supports, for approval.

MD.16.13 The Mechanical Services Installer shall ensure that the installation complies in all respects with "Above Ground Oil Storage Tanks PPG2" publication issued by the Environmental Agency.

MD.16.14 The Mechanical Services Installer shall arrange for inspection, during the installation, by the User Client’s insurers.

MD.17.0 CONTENTS GAUGE/OIL FLOW METER

MD.17.01 The Mechanical Services Installer shall supply and install an Oil Contents Gauge where indicated on the contract drawings or specified in Part MP of the Specification Document for measuring the quantity of oil in each Storage Tank.

MD.17.02 The Indicator Gauge shall be graduated in litres showing the Oil Tank capacity. The Red line shall be marked on the Gauge indicating "Usable Oil Level" and "Tank Full".

MD.17.03 The Mechanical Services Installer shall supply and install a flow meter on the lines to boilers in the position indicated on the contract drawings or specified in Part MP of the Specification Document.
MD.18.0 FUEL CUT-OFF VALVE

MD.18.01 The Mechanical Services Installer shall supply and install in the oil supply pipe one Weight Operated type Fuel Oil Cut Off Valve complete with fusible link, wire tensioning device and warning labels and all necessary pulleys, brackets and fittings. Plunger Operated Switch to have two pairs of contacts of type to suit the fire alarm system. The normal position of the switch shall be with the plunger extended and the open pair of contacts connected to a Fire Alarm Bell and the closed pair wired to an operating coil in the Main Isolator to the Control Panel or Oil Burners. The alarm bell will be provided under separate contract.

MD.19.0 FUEL CUT-OFF VALVE RELEASE

MD.19.01 The Mechanical Services Installer shall supply and install with fusible linkage near Boiler Exit a fuel cut-off valve release complete as supplied by Messrs British Steam Specialities Ltd, or equal approved enclosed in a cabinet.

MD.20.0 IDENTIFICATION LABELS

MD.20.01 Where a Fire Service Stop Valve is installed on the oil fuel pipe between cut-off dead weight Fire Valve and the Oil Burner, a cast white metal label shall be provided and secured in position by the Mechanical Contractor. The label shall be worded as follows: -

FIRE SERVICE
OIL STOP VALVE

MD.20.02 It's dimensions shall be 300mm x 150mm and finally painted with Post Office Red Letters on a Yellow background.

MD.20.03 A trafolyte label of dimensions 150mm x 150mm having a black lettering on a white background and giving the grade of fuel oil shall be securely attached to the oil fill pipe in such a manner that it can be read easily by the operative supplying the fuel oil. When more than one oil fill pipe is used, on this label shall also be indicated the number of Oil Storage Tank connected to the Oil fill pipe (Tank No. 1, Tank No. 2) etc.
MD.21.0  DIPSTICK OR DIP TAPE

MD.21.01 Where the clear headroom above the Oil Storage Tank is more than the depth of the tank plus 600mm the mechanical contractor shall provide a brass dipstick which is 450mm longer than the depth of the Tank, and graduated in 50 litre divisions, and enumerated at 250 litre divisions. The dip opening shall be provided and fitted with a brass cap.

MD.21.02 Should it be impossible to use a dip stick a Rabone flexible steel dip tape with weight, of length to measure the contents of tank, and complete with appropriate calibration chart to enable measurement to be converted to gallons/litres. This chart shall be mounted in a glazed frame in the Boiler House to be provided by the Mechanical Services Installer.

MD.22.0  FILTER

MD.22.01 The Mechanical Services Installer shall supply and install on main oil flow pipeline from storage tanks a dual filter with removable filter cage suitable for 35/28 sec. oil. A valve to be fitted either side of filter to facilitate removal of filter for cleaning purposes without excessive oil wastage.

MD.23.0  SLUDGE COCK

MD.23.01 The Mechanical Services Installer shall supply and install on each tank a Gate Valve plugged at Sludge outlet, the size of which is indicated on the contract drawings or specified in Part MP of the Specification Document.

MD.24.0  OIL FILL ALARM

MD.24.01 When indicated on the contract drawings or specified in Part MP of the Specification Document, the mechanical contractor shall supply and install in each Oil tank an Oil Level float, with switch connected to an Oil Level warning device.

MD.24.02 The alarm shall comprise a float with level switch, and a visible audible warning device with cancellation and reset switched.

MD.24.03 The float and level switch shall be mounted on top of the Oil Storage Tank.

Cont'd.
MD.24.0 OIL FILL ALARM (Cont'd.)

MD.24.04 To protect the warning device, the mechanical contractor shall install the equipment in the Oil Fill Cabinet when located on an external wall of the building.

MD.24.05 The Mechanical Services Installer shall submit to the Contract Administrator for approval the details of the equipment, and the location of the equipment before commencing the installation work.

MD.25.0 OIL FILL CABINET

MD.25.01 The Mechanical Services Installer shall supply and install an Oil Fill Cabinet when required. The words 'Oil Fill' in 75mm high letters shall be printed on the door in 'Post Office Red'.

MD.26.0 OIL FILL TERMINAL

MD.26.01 The Mechanical Services Installer shall supply and install, mounted in an accessible position, to each oil fill pipe a valve with male B.S.P. thread for hose coupling and gunmetal cap with chain.

MD.26.02 Where called for on the contract drawings or specified in Part MP of the Specification Document, the Mechanical Services Installer shall supply and install under each oil fill point a 450mm x 450mm x 50mm deep mild steel tray painted in a similar manner to the oil storage tanks and filled with sand.

MD.26.03 Where fitted, fixed draw off/feed lines that pass through the bund wall must have the hole fully sealed to maintain the bund integrity.

MD.27.0 VENT PIPE

MD.27.01 At the highest end of each Tank, the Mechanical Services Installer shall supply and install a short piece of pipe externally, fitted with bird guard cage and double bend facing down, or as indicated in Part MP of the Specification Document.

MD.28.0 PAINTING

MD.28.01 Oil tanks manufactured at works shall be delivered to site with one priming coat of paint only. After installation, the tank shall be thoroughly cleaned internally and externally with a wire brush, and painted externally with two coats of best quality bitumastic black paint.
MD.28.0  PAINTING (Cont’d.)

MD.28.02 Tanks welded on site shall be finally finished with one priming coat, and one coat of best bitumastic black paint.

MD.28.03 Before painting commences any parts affected by rusting, etc., shall be thoroughly cleaned with a wire brush.

MD.29.0  ELECTRICAL EQUIPMENT

MD.29.01 All Electrical Equipment (Time switches, Thermostats, Contactors, etc.) supplied, but not fixed, by the Mechanical Services Installer shall be handed to the Electrical Services Installer and a signature must be obtained for receipt of same.

MD.29.02 The Mechanical Services Installer shall be responsible for the final setting of all the controls to the entire satisfaction of the Contract Administrator.
INDEX TO CLAUSES

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ME.03.0 INCOMING MAINS LABELS
ME.04.0 COLD WATER STORAGE TANKS
ME.05.0 COPPER & POLYETHYLENE PIPE & FITTINGS
ME.06.0 ANCHOR POINTS
ME.07.0 POSITION OF MAINS IN DUCTS
ME.08.0 PIPE SUPPORTS
ME.09.0 STOP COCKS
ME.10.0 DRAIN COCKS
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ME.14.0 BALL VALVES
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ME.21.0 CHLORINATION
ME.22.0 TESTING ON COMPLETION
ME.23.0 LEGIONELLA RISK ASSESSMENT
ME.01.0  GENERAL DESCRIPTION

ME.01.01  The cold water main supply shall be installed in accordance with this Specification section, Part MP of the Specification Document and the Contract Drawings.

ME.01.02  The work shall be carried out in accordance with the Water Supply (Water Fittings) Regulations 1999, all appropriate Codes of Practice, Water Authority Byelaws and British Specifications where these apply.

ME.02.0  WATER SUPPLY (WATER FITTINGS) REGULATIONS

ME.02.01  The Mechanical Services Installer is to give the Water Inspector all reasonable access to inspect the installations as it proceeds to ensure that current Water Supply regulations are complied with.

ME.02.02  The whole of the work shall be carried out in accordance with the Water Supply Authority requirements and the installer shall include the cost of the testing, stamping or other charges which the Water Authority may request.

ME.03.0  INCOMING MAINS

ME.03.01  The Mechanical Services Installer shall provide, at all mains water service entries to building(s), 1no - 225mm x 150mm label marked 'Incoming Water Main Stop Cock', fixed adjacent to the main stopcock with 4 No. brass screws. The labels shall be of the red on white 'Traffolyte' type.

ME.03.01  Pipework entries to building shall be as denoted in Regulation 7 of the Water Regulations Guide.

ME.04.0  COLD WATER STORAGE TANK

ME.04.01  The Mechanical Services Installer shall supply, deliver and install a cold water storage tank of the type and capacity indicated on the drawing(s) and Part MP of the Specification Document, with secure cover.

ME.04.02  The tank shall be constructed in accordance with the appropriate British Standard Specification and Water Supply (Water Fittings) Regulations 1999.

ME.04.03  All connections to the tank shall be made by means of screwed bosses or flanges welded on.

Cont'd
ME.04.0  COLD WATER STORAGE TANK (Cont'd.)

ME.04.04  Each tank provided shall comply with BS 4213:2004 and BS EN 13280:2001 and shall be fitted with a drain cock and ball valve suitable for the available water pressure, together with an overflow discharging outside the building. The overflow discharge shall be fitted with a wire guard or hinge flap to prevent the entry of birds, insects, vermin, etc.

ME.04.05  The Mechanical Services Installer’s attention is drawn to the Water Authority’s requirements regarding the relative levels of the overflow and ball valve in order to avoid contamination of the mains water supply.

ME.04.06  Unless otherwise stated, all tank supports and bearers will be supplied and fixed by the Main Contractor.

ME.05.0  COPPER & POLYETHYLENE PIPE & FITTINGS (Above & below ground)

ME.05.01  All copper pipes and fittings shall be in accordance with BS EN 1057:2006 + A1:2010; BS EN 12449:1999; BS EN 12451:1999 and BS EN 1254-1-5:1998 and all amendments.

ME.05.02  When used for external underground mains, copper tube shall be fitted in straight lengths only not exceeding 6 metres and care taken that the ends are not distorted prior to fittings being attached.

ME.05.03  All copper pipes in the boiler house shall be flanged on sizes 65mm and greater and including smaller sizes where indicated on the drawing.

ME.05.04  Copper pipes above ground shall be BS EN 1254 -1- Table X.

ME.05.05  Copper pipes below ground shall be BS EN 1254 -1- Table Y.

ME.05.06  Generally above ground levels where pipes are visible in rooms and appearance is of utmost importance; the fittings to be used on light gauge copper tubing shall be Yorkshire capillary type copper fittings and shall be of a single manufacture throughout the installation.

ME.05.07  Fittings shall be made up using the correct Tin / Silver solder and flux with both tube and fitting clean both before and after soldering.

ME.05.08  Fittings shall be in accordance with BS EN 1254-1: 1998; BS EN 1254-2: 1998, AMD 5097, 1986, AMD 5651, 1987, AMD 7067, 1992 and installed as detailed above in the General Clause. ‘End feed’ copper fittings installed in strict accordance with the manufacturer’s recommendations are also acceptable. All fittings to be Water Board approved and carry the appropriate Kite mark.

Cont’d
ME.05.0  COPPER & POLYETHYLENE PIPE & FITTINGS (Above & below ground) (Cont’d)

ME.05.09 Where plastic pipework is specified (mainly underground). This is to be medium density Polyethylene pipe 12 bar metricated blue, and suitably jointed strictly to manufacturer's recommendations.

ME.05.10 Marker tape for external pipework shall be installed as indicated in Part MP of the Specification Document.

ME.05.11 A tracer wire shall be installed as indicated in Part MP of the Specification Document.

ME.05.12 All pipework and fittings must be in accordance with the Local Water Board requirements and free of all dezincification properties irrespective of specification.

ME.05.13 All copper pipes and fittings, where buried underground to be wrapped with two layers of ‘Denso’ tape after testing. Polythene coated or polythene tape applied after testing will also be acceptable.

ME.05.14 Cold water mains and tank where fitted in ducts, trenches voids or ceiling voids in proximity to heating or domestic hot water services, must be insulated to clauses relating to insulation in order to obviate condensation.

ME.05.15 All cold water pipework must be insulated as indicated in Part MP of the Specification Document and thoroughly protected against possible frost damage.

ME.05.16 All external mains to be laid to minimum depth of 750mm and maximum 1,350mm on graded bed with graded backfill of inert material.

ME.06.0  ANCHOR POINTS

ME.06.01 In all cases of changes of direction or blank ends, etc., on underground mains the Mechanical Services Installer shall allow for anchor blocks to prevent the fitting being dislodged under pressure.

ME.07.0  POSITIONS OF MAINS IN DUCTS

ME.07.01 The positioning and arrangements of pipework in ducts, chases, false ceilings and roof spaces shall be in accordance with the Contract Drawings.
ME.08.0 PIPE SUPPORTS

ME.08.01 The whole of the pipework shall be supported on non-ferrous rings or similar pipe brackets as detailed on the Contract Drawings or as indicated in Part MP of the Specification Document, rigidly fixed to the fabric of the building but allowing the pipework to move under conditions of expansion and contraction. These brackets shall be fitted in accordance with the appropriate drawing and table indicated elsewhere.

ME.08.02 It must be noted that ferrous supports, thimbles or sleeves shall not be in contact with the water supply installation. Where screw-on brackets are required, brass backplate male together with single pipe ring by Yorkshire or approved equal are to be used.

ME.08.03 The spacing of pipe supports shall not exceed the centres given in the table below:

B - Copper Pipework

<table>
<thead>
<tr>
<th>Size</th>
<th>Uncovered</th>
<th>Insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>1.200 m</td>
<td>1.200 m</td>
</tr>
<tr>
<td>22mm</td>
<td>1.800 m</td>
<td>1.500 m</td>
</tr>
<tr>
<td>28mm</td>
<td>2.400 m</td>
<td>1.800 m</td>
</tr>
<tr>
<td>35mm</td>
<td>2.400 m</td>
<td>1.800 m</td>
</tr>
<tr>
<td>42mm</td>
<td>3.000 m</td>
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</tr>
<tr>
<td>54mm</td>
<td>3.000 m</td>
<td>3.000 m</td>
</tr>
<tr>
<td>76mm and over</td>
<td>3.600 m</td>
<td>3.600 m</td>
</tr>
</tbody>
</table>

ME.08.04 Where plastic pipelines incorporate metal valves of other heavy fittings it is essential to support and valves directly rather than allow their weight to be carried by the plastic pipe. For the same reason it is usually advisable to fix pipe supports on either side of flanged connections, especially where metal backing plates are used. Moulded plastic fittings should also be supported.
ME.08.0 PIPE SUPPORTS (Cont'd.)

ME.08.05 Maximum recommended horizontal support distance for Plastic pipes in above ground installation:

<table>
<thead>
<tr>
<th>Nominal Bore</th>
<th>All Classes 20°C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>0.600 m</td>
</tr>
<tr>
<td>20mm</td>
<td>0.680 m</td>
</tr>
<tr>
<td>25mm</td>
<td>0.762 m</td>
</tr>
<tr>
<td>32mm</td>
<td>0.840 m</td>
</tr>
<tr>
<td>40mm</td>
<td>0.9 m</td>
</tr>
<tr>
<td>50mm</td>
<td>1.07 m</td>
</tr>
<tr>
<td>65mm</td>
<td>1.22 m</td>
</tr>
<tr>
<td>80mm</td>
<td>1.37 m</td>
</tr>
</tbody>
</table>

ME.08.06 For vertical installation of plastic pipes the above support distances may by doubled.

ME.08.07 NOTE: Where normal ambient or working temperature exceeds 20°C the support distances should be reduced. Continuous support is required where temperatures approach 60°C.

ME.09.0 VALVES & STOP COCKS

MF.12.01 Valves and Stop Cocks shall be provided in the positions shown on the drawings. Stop Cocks must be provided on all the branches to sanitary fittings etc. Valves to single sinks to be ballofix with screwhead, or Pegler ref: 808 or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

MF.12.02 Where a header is provided to supply a range of sanitary fittings, a stop cock shall be fitted on the branch feeding header.

MF.12.03 All control valves shall be gunmetal fullway gate valves as Crane Fig. No. D159 or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

MF.12.04 All stop cocks on draw off points shall be as Pegler 833 GMLS or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

MF.12.05 Draw-off cocks shall be to BS 2879: 1980 CBS 2879/2 and Kitemarked.

MF.12.06 Where necessary they shall be tested and stamped by the Water Authority at the Mechanical Services Installer's expense.
ME.09.0 VALVES & STOP COCKS (Cont’d.)

ME.09.02 Underground stop cocks shall be Guest & Chrimes, Fig. No. 340 of heavy duty pattern and operable by remote key.

ME.09.03 Where necessary, they shall be tested and stamped by the appropriate Water Authority at the Mechanical Services Installer's expense.

ME.10.0 DRAIN COCKS

ME.10.01 All low points which will not automatically drain through draw off points shall be fitted with screw down drain cocks as Pegler 833 GM or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

ME.11.0 UNIONS

ME.11.01 Sufficient unions must be inserted in the pipework to facilitate the easy disconnection of any section of the pipework without disturbance to the fabric of the building.

ME.12.0 SLEEVES

ME.12.01 Where copper pipes pass through floors, walls, partitions, etc., non ferrous metal sleeves must be provided with ends neatly finished off flush with the surface so that the tubes may be withdrawn without disturbance to the fabric of the building with cover plates, as directed.

ME.12.01 Where pipes pass through Fire Compartment Walls, fire stop precautions shall be required as denoted in Building Regulation B3 Section 11 and BS 476 Part 20:1987.

ME.13.0 DEZINCIFICATION

ME.13.01 All fittings used in conjunction with the hot and cold water services shall be manufactured from a "Non dezincification" alloy.

ME.14.0 BALL VALVES

ME.14.01 All ball valves shall be of the 'Equilibrium' pattern, Fig. No1 329, as manufactured by Hattersley Ltd. or equivalent manufactured by Crane, Pegler, Oventrop, or other manufacturer approved by the Contract Administrator Ball valves shall be to the sizes indicated on design drawing(s).
ME.15.0 CHECK VALVES

ME.15.01 The Mechanical Services Installer should note that to comply with the Water Supply (Water Fittings) Regulations 1999, check valves must be installed in the supply pipe connection serving all Equilibrium Ball Valves.

ME.15.02 The valve shall be installed between the Equilibrium Ball Valve and isolating stop cock and must be fitted strictly in accordance with the manufacturer's instructions.

ME.16.0 TERMINATION POINTS

ME.16.01 The installation shall be connected direct to all outlet points unless stated otherwise on the Contract Drawings.

ME.17.0 URINALS

ME.17.01 All supplies to such appliances to be controlled by means of "Waterguard" or equal approved controller to eliminate excessive use of water consumption.

ME.18.0 'DRINKING WATER' LABELS (MAINS SUPPLY)

ME.18.01 The Mechanical Services Installer shall provide at each drinking water point, 1no 75mm x 50mm label marked 'DRINKING WATER' fixed to wall with 4 No. brass screws. The labels shall be of the black on white 'Traffolyte' type.

ME.19.0 'NOT DRINKING WATER' LABELS (TANK SUPPLY)

ME.19.01 The Mechanical Services Installer shall provide at each tap supplied from the cold water tank service, 1no 75mm x 50mm label marked 'NOT DRINKING WATER' fixed to wall with 4 No. brass screws. The labels shall be of the red on white 'Traffolyte' type.

ME.20.0 TEMPERATURE GAUGE PROVISION

ME.20.01 To assist in meeting the requirements of the HSE Code of Practice Document L8 Legionnaires' Disease: The control of legionella bacteria in water systems the Mechanical Services Installer shall provide, where indicated on the Contract drawings, pipe pockets for the later addition of temperature gauges.
ME.21.0 CHLORINATION

ME.21.01 In accordance with BS 6700:2006 + A1:2009, BS EN 806-4:2010, when the installation is completed it shall be thoroughly flushed out and then filled with chlorinated water at an initial concentration of 50 mg/l (50 ppm) for a contact period of one hour will be made at selected points including terminal points and wash out positions. If the free residual chlorine measured at the end of the contact period is less than 30 mg/l (30 ppm) the disinfection process shall be repeated. The tests must show at least 0.2 parts per million of residual chlorine. On successful completion of this test, the main must be well flushed out with clean water and left filled.

ME.21.02 Results of analysis of water samples for hot and cold water systems shall be forwarded to Contract Administrator prior to practical completion.

ME.21.03 The Mechanical Services Installer is at liberty to have this work carried out by the Water Authority but its costs must be included in the tender and a Certificate that it has been done must be supplied.

ME.22.0 TESTING ON COMPLETION

ME.22.01 On completion of the installation, and before the issue of the Certificate of Practical Completion the Mechanical Services Installer shall carry out time and temperature draw off tests in accordance the requirements of the HSE Code of Practice Document L8 Legionnaires’ Disease

ME.23.0 LEGIONELLA RISK ASSESSMENT

ME.23.01 Prior to the handover of the completed installation, the Mechanical Services Installer shall arrange for a legionella risk assessment to be carried out in accordance with the requirements of C.L.A.W. document MM48 and HSE document L8 and all highlighted defects remedied.
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MF.03.0  THERMOSTATIC MIXING VALVES & ASSOCIATED EQUIPMENT
MF.04.0  SHOWER SPRAYS
MF.05.0  TUBES & FITTINGS (PRIMARY CIRCULATION)
MF.06.0  TUBES & FITTINGS (SECONDARY CIRCULATION)
MF.07.0  POSITIONS OF MAINS IN DUCTS ETC
MF.08.0  TERMINATION POINTS & BUCKET TAPS
MF.09.0  PIPE SUPPORTS
MF.10.0  EXPANSION
MF.11.0  AIR VENTS
MF.12.0  VALVES & STOP COCKS
MF.13.0  DEZINCIFICATION
MF.14.0  WATER SUPPLY (WATER FITTINGS) REGULATIONS
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MF.18.0  UNIONS
MF.19.0  SLEEVES
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MF.23.0 PRIMARY CIRCULATORY PUMPS
MF.24.0 SECONDARY CIRCULATORY PUMPS
MF.25.0 TEMPERATURE GAUGE PROVISION
MF.26.0 CHLORINATION
MF.27.0 TESTING ON COMPLETION
MF.28.0 LEGIONELLA RISK ASSESSMENT
C.L.A.W. MECHANICAL SPECIFICATION PART MF HOT WATER SUPPLY SERVICES
MARCH 2012 ISSUE

MF.01.0 GENERAL DESCRIPTION

MF.01.01 The hot water supply systems shall be installed in accordance with this Specification section, Part MP of the Specification Document, and the Contract Drawings enclosed with this document.

MF.01.02 The work shall be carried out in accordance with the Water Supply (Water Fittings) Regulations 1999, all appropriate Codes of Practice, Water Authority Byelaws and British Specifications where these apply.

MF.02.0 DIRECT FIRED HOT WATER HEATERS

MF.02.01 The Mechanical Services Installer shall supply, deliver and install Natural Gas Fired Water heaters, as shown on the Drawings, and detailed in Part MP of the Specification Document.

MF.02.02 The Manufacturer's Model Number, size and duty will be indicated in Part MP of the Specification Document.

MF.02.03 All units shall have the connections and accessories as shown on the Contract Drawings and detailed in Part MP of the Specification Document.

MF.02.04 Where an unvented system is specified it shall comply with the Water Supply (Water Fittings) Regulations 1999 and all details included in Part MP of the Specification Document.

MF.02.05 All units shall be operable from a controlled electrical supply and have local isolation afforded by plug and socket arrangement. All electrical associated works shall comply with BS7671:2008+A1:2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition.

MF.03.0 THERMOSTATIC MIXING VALVES & ASSOCIATED EQUIPMENT

MF.03.01 The Mechanical Services Installer shall supply, deliver and install thermostatic mixing valves and associated equipment in accordance with Part MP of the Specification Document and design drawing(s).

Cont'd.
MF.03.02 Mixed water outlet temperatures from thermostatic mixing valves shall be set by the installer in accordance with the following table:

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Location</th>
<th>Draw-off Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basin (Standard)</td>
<td>Staff W.C.’s</td>
<td>42°C (108°F)</td>
</tr>
<tr>
<td>Basin (Spray)</td>
<td>Inmates/Pupils W.C.’s</td>
<td>42°C (108°F)</td>
</tr>
<tr>
<td>Cleaners Sink</td>
<td>Cleaners Stores</td>
<td>60°C (140°F)</td>
</tr>
<tr>
<td>Slop Hopper/Sluice</td>
<td>Sluice Room/Toilets</td>
<td>60°C (140°F)</td>
</tr>
<tr>
<td>Sink Unit (Primary)</td>
<td>Classrooms</td>
<td>42°C (108°F)</td>
</tr>
<tr>
<td>Sink Unit (Comp)</td>
<td>Classrooms/Toilets</td>
<td>60°C (140°F)</td>
</tr>
<tr>
<td>Bucket Tap</td>
<td>Toilets/Kitchens</td>
<td>60°C (140°F)</td>
</tr>
<tr>
<td>Foot Baths</td>
<td>Swimming Pools</td>
<td>42°C (108°F)</td>
</tr>
<tr>
<td>Baths</td>
<td>Bathrooms</td>
<td>42°C (108°F)</td>
</tr>
</tbody>
</table>

Homes for Children, Handicapped Adults & Elderly People

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Location</th>
<th>Draw-off Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinks</td>
<td>Kitchen &amp; staff area</td>
<td>60°C (140°F)</td>
</tr>
<tr>
<td>Basins</td>
<td>Bedrooms</td>
<td>42°C (108°F)</td>
</tr>
<tr>
<td>Baths</td>
<td>Residential areas</td>
<td>43°C (110°F)</td>
</tr>
<tr>
<td>Showers</td>
<td>Residential areas</td>
<td>43°C (110°F)</td>
</tr>
</tbody>
</table>

MF.03.03 The valves shall have chromium plated finish and be complete with non-return valves and strainers on the hot and cold inlet connections when required.

MF.03.04 Mixing valves shall have lockable temperature controls and shall be provided with loose keys, which shall be handed to the Contract Administrator upon contract completion.

MF.03.05 The mixing valves and associated equipment shall be securely fixed to the fabric of the building and care must be taken to fix them in such a manner that they do not constitute a danger to the occupants.

MF.03.06 Mixing valves must be type TMV 3 conforming to NHS Model Engineering Specification DO8, unaffected by fluctuations in water pressure and shall 'fail safe' if the cold water supply fails as

MF.03.06 Mixing valve as Messrs Oventrop model Brawa-Mix 97” Fail Safe Pattern (For under bath/basin installation) including integral check valves and strainers, size 15mm & 22mm Messrs Oventrop Fig No. 130 03 or equal and approved.
MF.04.0 SHOWER SPRAYS

MF.04.01 The Mechanical Services Installer shall supply, deliver and install in the positions shown on the drawings, chromium plated vandal resistant shower fittings with timed controlled unit to comply with BS 6340-4:1984 as manufactured by Messrs. Caradon Mira or equal/approved. All units shall be complete with automatic drain valve to eliminate residual water.

MF.04.02 The position and heights of the shower heads shall be as shown below:

**Spray Height**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Height from Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior and Infants</td>
<td>1.3m</td>
</tr>
<tr>
<td>Women &amp; Senior Girls</td>
<td>1.6m</td>
</tr>
<tr>
<td>Men &amp; Senior Boys</td>
<td>1.8m</td>
</tr>
</tbody>
</table>

MF.04.03 These fittings to be manufactured as stated in Part MP of the Specification Document.

MF.05.0 TUBES & FITTINGS (PRIMARY CIRCULATION)

MF.05.01 All tubes shall be British mild steel medium class quality unless otherwise specified with pipe fittings up to 65mm of malleable banded iron.

MF.05.02 All pipework and fittings are to be in accordance with the appropriate British Standards. Pipe fittings 80mm and above are to be cast iron flanged or mild steel welded type fitting with flanges fitted for easy disconnection.

MF.05.03 Easy sweep fittings shall be used throughout with the exception of vent, draw-off and thermometer positions where square tees shall be used. In all cases connections shall be of the same size as the pipework connection them. Bushings and longscrew connectors shall not be used.

MF.05.04 On no account will joints be permitted within the thickness of walls or floors. In cases where the application of this rule is impracticable (e.g. with sweep fittings or bends) the Contract Administrator may permit the use of square tees or elbows by special permission, if necessary, on site.

MF.05.05 All pipes shall be screwed in accordance with the relevant B.S. and shall have sufficient unions or flanges to allow for the disconnection of any pipe without disturbance of the fabric of the building.

Cont'd.
MF.05 TUBES & FITTINGS (PRIMARY CIRCULATION) (Cont'd.)

MF.05.06 Pipes up to and including 65mm diameter shall have malleable iron pattern unions with brass to iron seats. No connectors will be allowed. Pipes 80mm diameter and above shall have flanged joints and be made with approved expanded jointing rings and jointing compound. Pipes shall be expanded into the flanges after screwing or before welding is required.

MF.05.07 All surplus jointing materials shall be cleaned off at the time the joints are made.

MF.05.08 Non-compliance will involve the Mechanical Services Installer in redecorating costs.

MF.05.09 It is essential that after cutting of pipes the full bore shall be restored by reaming and shall be free from rust, scale and free from other defects and shall be thoroughly cleaned before erection.

MF.05.10 The tender shall cover for the opening up of completed pipework in three positions and its replacement where so required, for inspection by the Contract Administrator. In the event of the inspection revealing faulty workmanship of material, the Contract Administrator reserves the right to require further openings up of completed pipework at the Mechanical Services Installers expense.

MF.05.11 If further faulty workmanship is found, i.e. pipe burrs, etc., then the Mechanical Services Installer shall dismantle and remove part of whole of the installation and replace all at his own expense.

MF.05.12 All pipes shall be laid with a rise toward the point of venting and fall towards the point of drain. All pipes shall follow the line of walls both vertically and horizontally and where covered shall be spaced sufficiently apart to allow each pipe to be insulated separately and/or to facilitate the fitting of floor or wall plates.

MF.05.13 Where a pipe increases its size, the increase shall be made by means of an eccentric reducing socket so fitted to prevent an air lock, on the return side the socket shall be fitted to allow the larger pipe to drain.

MF.05.14 In all cases pipes, where exposed in rooms, shall be run with a minimum clearance of 100mm between the underside of pipe and finished floor and 40mm clearance between finished walls or piers and back side of pipes.

Cont’d
MF.05.0  TUBES & FITTINGS (PRIMARY CIRCULATION)  (Cont’d)

MF.05.15  All open ends, i.e. for continuation of pipe runs etc., shall have plugs or screwed caps inserts until such time as all open ends are finally connected up.

MF.05.16  Every effort has been made to show the runs of pipework as accurately as possible on the drawings. If any such runs require any special fittings, sets, fire-bends, pillar-bends, etc., to complete the work to the satisfaction of the Contract Administrator, they shall be included whether specified herein and/or shown upon drawings or not.

MF.05.17  All connections to cylinders, tanks, boilers and all other items of plant or equipment shall be made with unions on the appliance for repair or replacement.

MF.05.18  All adaptations to existing services are to be carried out in a neat and approved manner. Where existing materials are to be re-used this shall be detailed in Part MP of the Specification Document Specification and drawings.

MF.05.19  Flanges on flanged pipework, malleable iron unions on steel pipes and straight connections on copper pipes shall be fitted where required for erection, but must not exceed 6 metres and also where their presence would facilitate dismantling, maintenance, etc., also on all pipes immediately under the access covers of ducts or trenches and as directed by the Contract Administrator.

MF.05.20  Where practicable all off-sets are to be made in one piece without the use of fittings.

MF.05.21  Defective joints shall be removed and re-made. The caulking of defective joints is not allowed.

MF.06.0  TUBES & FITTINGS (SECONDARY CIRCULATION)

MF.06.01  All pipework shall be fabricated from solid drawn phosphorous arsenical copper tubes complying in all respects with BS EN 1254 -1- Table X as manufactured by Yorkshire Limited or equal approved.

MF.06.02  Fittings and other materials shall comply with the Water Supply (Water Fittings) Regulations 1999 as listed in the water fittings and material directory.

Cont’d
MF.06.0 TUBES & FITTINGS (SECONDARY CIRCULATION) (Cont’d)

MF.06.03 All fittings shall be of Yorkshire capillary type with integral rings of tin, silver solder to equal approved, conforming to BS EN 1254-1-5: 1998 and in accordance with the Heating Service Specification in respect of Venting, Draining and the use of Sweep & Square Fittings, unions, etc.

MF.06.04 End feed fittings may be used but in all cases the solder used in both capillary or end feed fittings must be LEAD FREE to BS EN ISO 9453:2006 Grade 96S.

MF.06.05 All copper pipes in the boiler house shall be flanged on sizes 65mm and above and including smaller sizes where indicated on the design drawing(s).

MF.06.06 All cuts shall be reamed to restore the full bore of the tube and the Contract Administrator shall reserve the right to have any joints disconnected for the purpose of checking that the full bore has been restored.

MF.06.07 All pipework shall follow the lines of walls both vertically and horizontally and shall be spaced sufficiently far apart to allow for lagging separately (where necessary).

MF.06.08 Joints must be wiped clean of surplus solder and flux to avoid discolouring and heat resistant mats must be used to prevent damage to the fabric of the building, decorations and woodwork, etc.

MF.06.09 All fittings must be resistant to dezincification.

MF.06.10 All 90° bends are to be formed using fittings with the exception of bends in cupboards, ceiling spaces etc., which may be pulled and bends in floor ducts or trenches, which must be formed without joints.

MF.06.11 Multiple droppers to fitments and appliances where exposed to view shall be kept as close together as bracket fixing will allow.

MF.06.12 All the above fittings to be used with tin / silver solder only. The use of all aggressive type soldering fluxes where the label or instructions state that they are based on chlorides and / or self cleaning is NOT permitted.

MF.06.13 All draw-off points shall be taken off the top of the circulation system to assist in venting.
MF.07.0 POSITIONS OF MAINS IN DUCTS & TRENCHES

MF.07.01 Positions of the mains in ducts and trenches as shown on drawings are diagrammatic. The Mechanical Services Installer shall take cognisance of NJUG publications recommending the positioning of utilities apparatus for new installations and allow for the supplying and fixing of all tube, fittings and insulation for crossing ducts as necessary.

MF.08.0 TERMINATION POINTS & BUCKET TAPS

MF.08.01 All hot water connections to taps and equipment shall be connected direct by the Mechanical Services Installer. All taps with the exception of bucket taps will be supplied as directed in Part MP of the Specification Document.

MF.08.02 Bucket Taps shall be provided by the Mechanical Services Installer. These shall be of the chromium plated bibcock type complete with chromium plated back plate elbow and loose key. All bucket taps shall be mounted at 610mm A. F.F.L. unless otherwise shown on design drawing(s).

MF.09.0 PIPE SUPPORTS

MF.09.01 The whole of the pipework shall be supported on non-ferrous rings or similar pipe brackets as detailed on the Contract Drawings or as indicated in Part MP of the Specification Document, rigidly fixed to the fabric of the building but allowing the pipework to move under conditions of expansion and contraction. These brackets shall be fitted in accordance with the appropriate drawing and table indicated elsewhere.

MF.09.02 It must be noted that ferrous supports, thimbles or sleeves shall not be in contact with the water supply installation. Where screw-on brackets are required, brass backplate male together with single pipe ring by Yorkshire or approved equal are to be used.
MF.09.0 PIPE SUPPORTS (Cont'd.)

MF.09.03 The spacing of pipe supports shall not exceed the centres given in the table below:

**B - Copper Pipework**

<table>
<thead>
<tr>
<th>Size</th>
<th>Uncovered</th>
<th>Insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>1.200 m</td>
<td>1.200 m</td>
</tr>
<tr>
<td>22mm</td>
<td>1.800 m</td>
<td>1.500 m</td>
</tr>
<tr>
<td>28mm</td>
<td>2.400 m</td>
<td>1.800 m</td>
</tr>
<tr>
<td>35mm</td>
<td>2.400 m</td>
<td>1.800 m</td>
</tr>
<tr>
<td>42mm</td>
<td>3.000 m</td>
<td>2.400 m</td>
</tr>
<tr>
<td>54mm</td>
<td>3.000 m</td>
<td>3.000 m</td>
</tr>
<tr>
<td>76mm and over</td>
<td>3.600 m</td>
<td>3.600 m</td>
</tr>
</tbody>
</table>

MF.09.04 Where plastic pipelines incorporate metal valves of other heavy fittings it is essential to support and valves directly rather than allow their weight to be carried by the plastic pipe. For the same reason it is usually advisable to fix pipe supports on either side of flanged connections, especially where metal backing plates are used. Moulded plastic fittings should also be supported.

MF.09.05 Maximum recommended horizontal support distance for Plastic pipes in above ground installation:-

<table>
<thead>
<tr>
<th>Nominal Bore</th>
<th>All Classes 20°C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>0.600 m</td>
</tr>
<tr>
<td>20mm</td>
<td>0.680 m</td>
</tr>
<tr>
<td>25mm</td>
<td>0.762 m</td>
</tr>
<tr>
<td>32mm</td>
<td>0.840 m</td>
</tr>
<tr>
<td>40mm</td>
<td>0.9 m</td>
</tr>
<tr>
<td>50mm</td>
<td>1.07 m</td>
</tr>
<tr>
<td>65mm</td>
<td>1.22 m</td>
</tr>
<tr>
<td>80mm</td>
<td>1.37 m</td>
</tr>
</tbody>
</table>

MF.09.06 For vertical installation of plastic pipes the above support distances may by doubled.

MF.09.07 NOTE: Where normal ambient or working temperature exceeds 20°C the support distances should be reduced. Continuous support is required where temperatures approach 60°C.
MF.10.0 EXPANSION

MF.10.01 The Mechanical Services Installer shall make full allowance for expansion and contraction, the Mechanical Services Installer being responsible for the fixing of the pipes for satisfactory working.

MF.10.02 Where expansion joints are indicated on the drawings, these shall be of the stainless steel bellows type having flanged or screwed ends. Care must be taken when installing these joints that pipework is erected in true alignment and bolt holes on counter flanges lined up correctly with joint flanges.

MF.10.03 Suitable pipe guides must be installed to ensure correct function of these expansion joints. Anchor brackets shall be provided where indicated or required, specially fabricated to suit conditions and to the approval of the Contract Administrator.

MF.11.0 AIR VENTS

MF.11.01 All Distribution Pipework shall be installed so that the rise/fall of the pipework provides natural venting of the system when a "draw-off" occurs.

MF.12.0 VALVES & STOP COCKS

MF.12.01 Valves and Stop Cocks shall be provided in the positions shown on the drawings. Stop Cocks must be provided on all the branches to sanitary fittings etc. Valves to single sinks to be ballofix with screwhead, or Pegler ref: 808 or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

MF.12.02 Where a header is provided to supply a range of sanitary fittings, a stop cock shall be fitted on the branch feeding header.

MF.12.03 All control valves shall be gunmetal fullway gate valves as Crane Fig. No. D159 or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

MF.12.04 All stop cocks on draw off points shall be as Pegler 833 GMLS or equivalent manufactured by Crane, Hattersley, Oventrop, or other manufacturer approved by the Contract Administrator.

Cont’d
MF.12.0 VALVES & STOP COCKS (Cont’d)

MF.12.05 Draw-off cocks shall be to BS 2879: 1980 CBS 2879/2 and Kitemarked.

MF.12.06 Where necessary they shall be tested and stamped by the Water Authority at the Mechanical Services Installer's expense.

MF.13.0 DEZINCIFICATION

MF.13.01 All fittings used in conjunction with the hot and cold water services shall be manufactured from a "Non dezincification" alloy.

MF.14.0 WATER SUPPLY (WATER FITTINGS) REGULATIONS

MF.14.01 The Mechanical Services Installer shall give the Water Inspector all reasonable access to inspect the installations as it proceeds to ensure that current Water Supply regulations are complied with.

MF.14.02 The whole of the work shall be carried out in accordance with the Water Supply Authority requirements and the installer shall include the cost of the testing, stamping or other charges which the Water Authority may request.

MF.15.0 FEED TANKS

MF.15.01 The Mechanical Services Installer shall supply, deliver and install galvanised / or plastic feed tanks in the positions shown on the Contract Drawings and to the capacity detailed in Part MP of the Specification Document.


MF.15.03 All connections to the tank with the exception of vents shall be made by means of screwed bosses or flanges welded on.

MF.15.04 Each tank shall be fitted with a drain cock and ball valve suitable for the available water pressure to conform to BS1212 parts 1, 2 and 3:1990 and BS1212 part 4:1991, together with an overflow discharging outside the building. The overflow discharge shall be fitted with a wire guard or hinge flap to prevent the entry of birds, insects, vermin, etc.

Cont’d
MF.15.0 FEED TANKS (Cont'd)

MF.15.05 The Mechanical Services Installers attention is drawn to the Water Authority's requirements regarding the relative levels of the overflow and ball valve in order to avoid contamination of the mains water supply.

MF.15.06 Unless otherwise stated, all tank supports and bearers will be supplied and fixed by the Main Contractor.

MF.16.0 FLUE PIPES FROM DIRECT WATER HEATERS

MF.16.01 All flue pipes shall be installed in accordance with Part MD of the Specification Document.

MF.17.0 COMBUSTION EQUIPMENT FOR DIRECT WATER HEATERS

MF.17.01 All combustion equipment shall be in accordance with Part MD of the Specification Document.

MF.18.0 UNIONS

MF.18.01 Sufficient unions must be inserted in the pipework to facilitate the easy disconnection of any section of the pipework without disturbance to the fabric of the building.

MF.19.0 SLEEVES

MF.19.01 Where copper pipes pass through floors, walls, partitions, etc., non ferrous metal sleeves must be provided with ends neatly finished off flush with the surface so that the tubes may be withdrawn without disturbance to the fabric of the building with cover plates, as directed.

MF.12.01 Where pipes pass through Fire Compartment Walls, fire stop precautions shall be required as denoted in Building Regulation B3 Section 11 and BS 476-20:1987.

MF.20.0 DRAINAGE OF LOW POINTS

MF.20.01 All low points on the system which will not drain automatically through taps or ball valves shall be fitted with screw-down draw-off cocks to BS 2879 1980 Type 1 in such a manner the whole system can be drained if required.
MF.21.0 ELECTRIC WATER HEATERS

MF.21.01 These will be indicated on the drawings and Part MP of the Specification Document.

MF.22.0 ELECTRICAL IMMERSION HEATERS

MF.22.01 These will be indicated on the drawings and Part MP of the Specification Document.

MF.23.0 PRIMARY CIRCULATING PUMPS

MF.23.01 The Mechanical Services Installer shall supply and install, in the positions shown, hot water service pumps of the manufacture, type and duty specified in the Part MP of the Specification Document. All necessary adaptations shall be incorporated to suit pipe diameter.

MF.23.02 The pumps shall be of all gunmetal construction.

MF.23.03 The pump motors shall be super silent totally enclosed drip-proof and suitable for the available electricity supply, and continuous running. Each pump shall be supplied with push button contactor starter containing overloads and no-volt release (and single phase preventer on 3-phase only) all motors over 3HP shall have star delta or equivalent starter, each duplicate set shall have a 3-position rotary selection switch (centre off).

MF.23.04 Where fullway pumps are fitted, a distance piece complete with counter flanges shall be provided to facilitate the provision of gravity circulation should it be necessary to remove the pump at any time. The distance piece shall be laid on a pair of purpose made brackets. The brackets shall be wall mounted near the pump sets.

MF.23.05 A 100mm diameter dial altitude gauge with flanged back and gunmetal gauges cock and handle shall be connected in copper to the main on each side of the H.W.S. pump sets.

MF.23.06 The gauges shall be mounted on the control panel, or if a control panel is not specified, side-by-side on appropriate mounting board securely fixed to the wall.

Cont’d
MF.23.0 PRIMARY CIRCULATING PUMPS (Cont'd)

MF.23.07 This mounting board shall be provided by the Mechanical Services Installer and securely fixed to the wall by means of brass screws. The board shall have black on white "Traffolyte" labels to identify the service.

MF.23.08 The Mechanical Services Installer must ensure that the wiring to the pump is suitable for the motors and starters provided, and is in accordance with the manufacturer's recommendations and BS7671:2008+A1:2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition.

MF.23.09 The pump details shall be stated by the manufacturer on brass labels fixed to pumps. An easily visible label shall be fixed to each indicating: - Pump No. 1, Pump No. 2 etc. All pumps shall have isolating valves fitted.

MF.24.0 SECONDARY CIRCULATING PUMPS

MF.24.01 The Mechanical Services Installer shall supply and install secondary circulating pumps in accordance with Part MP of the Specification Document Specification and design drawing(s) constructed of stainless steel or other suitable Water Authority approved material.

MF.24.02 Individual pumps or pump sets shall be complete with isolating wheel valves and non-return valves. The non-return valves shall be fitted between the outlet of pump and isolating valve.

MF.24.03 Individual pumps or pump sets shall be supplied with 2 no. 100mm dia. dial altitude gauges (suitably graduated), each complete with flanged back and isolating cock, connected in copper to the main on each side of the Individual pump or pump set.

MF.24.04 The gauges shall be mounted side-by-side on a mounting board, securely fixed to the wall by means of brass screws. This board shall be provided by the Mechanical Services Installer and have a black on white "Traffolyte" label to identify the service.

MF.24.05 The individual pumps, of a pump set, shall have a black on white "Traffolyte" label indicating Pump No. 1 or Pump No. 2. These labels shall be screw fixed
MF.25.0 TEMPERATURE GAUGE PROVISION

MF.25.01 To assist in meeting the requirements of the HSE Code of Practice Document L8 Legionnaires’ Disease: The control of legionella bacteria in water systems the Mechanical Services Installer shall provide, where indicated on the Contract drawings, pipe pockets for the later addition of temperature gauges.

MF.26.0 CHLORINATION

MF.26.01 In accordance with BS 6700:2006 + A1:2009, BS EN 806-4:2010, when the installation is completed it shall be thoroughly flushed out and then filled with chlorinated water at an initial concentration of 50 mg/l (50 ppm) for a contact period of one hour will be made at selected points including terminal points and wash out positions. If the free residual chlorine measured at the end of the contact period is less than 30 mg/l (30 ppm) the disinfection process shall be repeated. The tests must show at least 0.2 parts per million of residual chlorine. On successful completion of this test, the main must be well flushed out with clean water and left filled.

MF.26.02 Results of analysis of water samples for hot and cold water systems shall be forwarded to Contract Administrator prior to practical completion.

MF.26.03 The Mechanical Services Installer is at liberty to have this work carried out by the Water Authority but its costs must be included in the tender and a Certificate that it has been done must be supplied.

MF.27.0 TESTING ON COMPLETION

MF.27.01 On completion of the installation, and before the issue of the Certificate of Practical Completion the Mechanical Services Installer shall carry out time and temperature draw off tests in accordance the requirements of the HSE Code of Practice Document L8 Legionnaires’ Disease.

MF.28.0 LEGIONELLA RISK ASSESSMENT

MF.28.01 Prior to the handover of the completed installation, the Mechanical Services Installer shall arrange for a legionella risk assessment to be carried out in accordance with the requirements of C.L.A.W. document MM48 and HSE document L8 and all highlighted defects remedied.
INDEX TO CLAUSES

MG.01.0   GENERAL DESCRIPTION
MG.02.0   POSITION OF MAINS IN DUCTS
MG.03.0   TUBES & FITTINGS EXTERNALLY (UNDERGROUND)
MG.04.0   TUBES & FITTINGS INTERNAL (ABOVE GROUND)
MG.05.0   TUBES & FITTINGS PIPE CONSTRUCTION
MG.06.0   TUBES & FITTINGS CORROSION PROTECTION
MG.07.0   TUBES & FITTINGS TRACER WIRE
MG.08.0   PIPE SUPPORTS
MG.09.0   SLEEVES
MG.10.0   GAS GOVERNORS & BOOSTERS
MG.11.0   GAS COCKS
MG.12.0   GAS WATER HEATERS
MG.13.0   GAS KITCHEN EQUIPMENT
MG.14.0   TESTS
MG.15.0   GAS SAFETY LINE DIAGRAM
MG.16.0   GAS REGULATIONS
MG.17.0   MAIN GAS SAFETY UNIT
**MG.01.0** GENERAL DESCRIPTION

MG.01.01 The network provider shall run the incoming main from a point outside the site boundary into the building at points as indicated on the drawings, connecting to and installing all gas meters, gas cocks, pressure regulating equipment, and by-pass for emergency use, including filter and drainage points immediately adjacent to incoming connections.

MG.01.02 The work concerning the Mechanical Services Installer shall comprise the supply and fixing of a valve or cock on the outlet side of the meter along with a pressure testing nipple, and of all the internal gas services within the building, and the handling into position from the site stores and erecting of all gas kitchen equipment and all other gas appliances in the building as indicated on the Contract drawings and connecting each item to the gas mains. All the equipment will be supplied under a separate contract. A list of equipment is given on the Contract Drawings or will be supplied on request.

**MG.02.0** POSITION OF MAINS IN DUCTS

MG.02.01 Positions of the mains in ducts and trenches as shown on drawings are diagrammatic. The Mechanical Services Installer shall take cognisance of NJUG publications recommending the positioning of utilities apparatus for new installations and allow for the supplying and fixing of all tube, fittings and insulation for crossing ducts as necessary.

**MG.03.0** TUBES & FITTINGS EXTERNALLY (UNDERGROUND)

MG.03.01 All polyethylene pipes and fittings should be obtained from Messrs Stewart and Lloyds Plastics or Messrs Wavin Plastics Limited or other approved and agreed supplier.

MG.03.02 Polyethylene pipe should conform to BS EN 1555-1:2010, BS EN 1555-2:2010, BS EN 1555-3:2010, BS EN 1555-4:2011, BS EN 1555-5:2010 Gas Industry Standard GIS/PL2, SDR11 specification for polyethylene (PE) pipes and fittings for natural gas and manufactured gas, Parts I, II and III. Fusion jointing will be carried out using tools complying with Part II.

MG.03.03 All materials should also comply with Gas Industry Standard GIS/PS/PL3 Part I - Specification for fittings and joints - steel to polyethylene and Part II - Pipes sized 75mm to 180mm.
MG.04.0  TUBES & FITTINGS INTERNAL (ABOVE GROUND)

MG.04.01 For steel supplies using welded joints, materials should be in accordance with BS EN 10216-1:2002, BS EN 10217-1:2002, AP 15L Grade B.

MG.04.02 For steel supplies using screwed joints, materials should be steel tubes (heavy) in accordance with BS EN 10255:2004 with screwed taper threads to BS EN 10226-1:2004.

MG.04.03 In all cases the materials used shall comply with the Institution of Gas Engineers and Managers Publications IGE/TD3 and IGE/TD4.

MG.04.04 Pipe construction shall be carried out in accordance with the Institution of Gas Engineers and Managers Publications IGE/TD3 and IGE/TD4.

MG.05.0  TUBES & FITTINGS PIPE CONSTRUCTION

MG.05.01 The Polyethylene system of heat fusion welded pipe shall only be assembled and installed by trained operatives.

MG.05.02 The Polyethylene main shall start and finish one metre from the building Meter House, the first and last sections of the underground system being in steel pipework.

MG.05.03 The pipework shall not be installed under the foundations, or base or footings of a load bearing wall of any building.

MG.05.04 When any part of these mains passes through a solid structure it shall be protected by a sleeve of internal diameter at least 25mm greater than the outside diameter of the pipe passing through it, of the same material and with both ends sealed with non setting mastic except where end terminates to exterior of building.

MG.06.0  TUBES & FITTINGS CORROSION PROTECTION

MG.06.01 All steel pipework, after fabrication, shall be cleaned with a wire brush in an electric drill to remove all rust, weld splatter and dirt. Internal pipework shall be painted with yellow ochre paint (to BS 1710 -08 C 35) and all pipework exposed to ground conditions, shall be protected by:

MG.06.02 One coat Servi Rap SD Primer or Denso Prima Type 'D'

MG.06.03 All flange joints and gaps to be fitted with Servi Rap mounting putty or Densyl Mastic strips

MG.06.04 and then wrapped with 100mm wide tape with a 55% overlap of Servi Rap R610 wrap cold applied or Densopol 60 tape.
MG.07.0 TUBES & FITTINGS TRACER WIRE

MG.07.01 The Mechanical Services Installer shall lay, with the Polyethylene main and in the stone duct, a 2.5mm² earth coloured single copper cable to be terminated both ends. Also a yellow tape with the works "Warning Gas Main Below" is to be laid 300mm below surface.

MG.08.0 PIPE SUPPORTS

MG.08.01 Pipes in Boiler Room/Plant Rooms shall be supported on purpose made wrought iron brackets made up to tee iron of flat bar fabricated to the pipe diameter and rigidly fixed to the fabric of the building.

MG.08.02 Flamco (or equal and approved) brackets may be used as directed in Part MP of the Specification Document.

MG.08.03 Pipes where exposed to view within the building shall be supported on split ring brackets with screw-on back plates or build-in tails as required and where installed at low level shall be bracketed alternatively off walls and floors at 1200mm centres.

MG.08.04 In addition pipe supports must also be provided on exposed low level pipework within 150mm either side of any change of direction.

MG.08.05 Pipes in ducts shall be supported on split ring pattern brackets with screw-on back plates or build-in tails as required.

MG.08.06 Reference should be made to the contract drawings for guidance on types of acceptable brackets.

MG.08.07 There are various types of proprietary brackets on the market similar in operation to the standard brackets and these generally are acceptable but prior approval must be obtained from the Contract Administrator before use.

MG.08.08 Where intermediate floors are constructed from precast hollow beams the 'support rail' shall be secured by means of galvanised / sheradized steel long screws taken through the centre of these precast hollow beams and attached to galvanised fishplates with locknuts. The fishplate assembly will be covered by the floor screed after the installation has been completed.

MG.08.09 Where intermediate floors are constructed from reinforced concrete slabs, the 'support rail' shall be secured by means of 10mm wedge type anchor bolts fixed into the soffit of the slab with a minimum embedment of 75mm.

Cont’d
MG.08.0 PIPE SUPPORTS (Cont’d)

MG.08.10 The 'support rail' together with the long screws, drop rods, clips, fixings, etc., shall be supplied and fixed by the Mechanical Services Installer.

MG.08.11 Should any special support steelwork be required, in addition to the items mentioned above, this will be indicated on the relevant design drawing(s).

MG.08.12 The spacing of pipe supports shall not exceed the centres given in the table below:

A - Mild Steel Pipework

<table>
<thead>
<tr>
<th>Size</th>
<th>Uncovered</th>
<th>Insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>2.400 m</td>
<td>2.400 m</td>
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<tr>
<td>20mm</td>
<td>2.400 m</td>
<td>2.400 m</td>
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<tr>
<td>25mm</td>
<td>2.500 m</td>
<td>2.400 m</td>
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<tr>
<td>32mm</td>
<td>3.600 m</td>
<td>3.000 m</td>
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<tr>
<td>40mm</td>
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<tr>
<td>50mm</td>
<td>4.800 m</td>
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<td>65mm</td>
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<td>4.200 m</td>
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<tr>
<td>80mm</td>
<td>4.800 m</td>
<td>4.200 m</td>
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<tr>
<td>100mm</td>
<td>4.800 m</td>
<td>4.400 m</td>
</tr>
<tr>
<td>Over 100mm</td>
<td>6.000 m</td>
<td>5.400 m</td>
</tr>
</tbody>
</table>

B - Copper Pipework

<table>
<thead>
<tr>
<th>Size</th>
<th>Uncovered</th>
<th>Insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>1.200 m</td>
<td>1.200 m</td>
</tr>
<tr>
<td>22mm</td>
<td>1.800 m</td>
<td>1.500 m</td>
</tr>
<tr>
<td>28mm</td>
<td>2.400 m</td>
<td>1.800 m</td>
</tr>
<tr>
<td>35mm</td>
<td>2.400 m</td>
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<tr>
<td>42mm</td>
<td>3.000 m</td>
<td>2.400 m</td>
</tr>
<tr>
<td>54mm</td>
<td>3.000 m</td>
<td>3.000 m</td>
</tr>
<tr>
<td>76mm and over</td>
<td>3.600 m</td>
<td>3.600 m</td>
</tr>
</tbody>
</table>

MG.08.13 Where plastic pipelines incorporate metal valves of other heavy fittings it is essential to support and valves directly rather than allow their weight to be carried by the plastic pipe. For the same reason it is usually advisable to fix pipe supports on either side of flanged connections, especially where metal backing plates are used. Moulded plastic fittings should also be supported.

MG.08.14 * Maximum recommended horizontal support distance for Plastic pipes in above ground installation:-

Cont’d
### PIPE SUPPORTS (Cont’d)

<table>
<thead>
<tr>
<th>Nominal Bore</th>
<th>All Classes 20°C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>0.600 m</td>
</tr>
<tr>
<td>20mm</td>
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</tr>
<tr>
<td>25mm</td>
<td>0.762 m</td>
</tr>
<tr>
<td>32mm</td>
<td>0.840 m</td>
</tr>
<tr>
<td>40mm</td>
<td>0.9 m</td>
</tr>
<tr>
<td>50mm</td>
<td>1.07 m</td>
</tr>
<tr>
<td>65mm</td>
<td>1.22 m</td>
</tr>
<tr>
<td>80mm</td>
<td>1.37 m</td>
</tr>
<tr>
<td>100mm</td>
<td>1.52 m</td>
</tr>
<tr>
<td>150mm</td>
<td>1.82 m</td>
</tr>
</tbody>
</table>

MG.08.15 * For vertical installation of plastic pipes the above support distances may by doubled.

MG.08.16 **NOTE**: Where normal ambient or working temperature exceeds 20°C the support distances should be reduced. Continuous support is required where temperatures approach 60°C.

MG.08.17 Sketches of all purpose made brackets not detailed on standard drawings must be submitted to the Contract Administrator and approval must be obtained for the type of supports to be used before the work is put in hand.

### SLEEVES

MG.09.01 Where pipes pass through walls, floors, partitions, duct walls, etc., sleeves of the same material of the pipework and with both ends sealed, with ends neatly finished off to protrude 6mm beyond the finished face of the wall, etc., so that the pipes may be withdrawn from the sleeve if required.

MG.09.02 These sleeves must be finished off either with an approved plastic or heavy metal floor plate of the set-screw type that can be fixed securely in position. (Sheet metal sleeves will not be acceptable).

MG.09.03 Where pipes pass through suspended ceiling tiles floor/ceiling plates of an approved pattern must be fitted.
MG.10.0 GAS GOVERNORS & BOOSTERS

MG.10.01 The Mechanical Services Installer shall supply and fix Governors or pressure boosters where indicated, these should be as detailed in the Part MP of the Specification Document.

MG.10.02 A gas governor is to be fitted in the connection to each item of kitchen equipment.

MG.10.03 NOTE: Pressure Boosters should comply with the Institution of Gas Engineers and Managers Publication IGE/UP/2.

MG.11.0 GAS COCKS

MG.11.01 Gas cocks in meter housing(s), Boilerhouse(s), ducts, roof spaces, ceiling spaces and concealed locations together will all emergency shut-off cocks shall be of cast iron pattern as manufactured by Newman Hender Ltd., or Crane Ltd. Gas cocks of size 65mm and above shall be of the 201M or 600 pattern with flanged ends drilled B.S.T. ‘D’ or ‘E’. Gas cocks of size 50mm and below shall be of the 200M or D191 pattern with screwed ends B.S.P.T.

MG.11.02 Gas cocks installed to control individual fittings or ranges of fittings shall be of the ball valve pattern with captive lever handles and screwed ends B.S.P.T. type D.195 as manufactured by Crane (Valves) Limited.

MG.11.03 All gas cocks shall be fitted with a device to stop the plug in the full or open position.

MG.11.04 Where gas cocks are fitted in vertical pipework they shall be fitted in such a manner that isolation of the section they control is effected by moving the wrench handle downwards. This is particularly important where a gas cock is used for emergency gas shut-off purposes.

MG.11.05 Each size of gas cock shall be provided with a suitable operating wrench. The wrench provided for emergency shut-off cocks shall be permanently fixed.

MG.11.06 The Mechanical Services Installer shall provide, adjacent to all emergency gas shut-off, a 200mm x 75mm label with the works "EMERGENCY GAS SHUT-OFF VALVE" in 15mm red letters on a white background. The label shall be securely fixed by means of 4 no. brass screws.

Cont’d
MG.11.0 GAS COCKS (Cont'd)

MG.11.07 The Mechanical Services Installer shall provide at all gas main entries to buildings, ONE - 225mm x 150mm label marked 'INCOMING GAS MAIN VALVE', fixed adjacent to the gas valve with 4 no. brass screws. The labels shall be of the red on white 'Traffolyte' type.

MG.11.08 The Mechanical Services Installer shall ensure that emergency gas shut-off cocks and exposed pipework connections are securely bracketed by vandal-proof build-in brackets.

MG.12.0 GAS WATER HEATERS

MG.12.01 Provide and fix gas water heaters of the type specified, complete with fume pipes, supports, roofing plate, weather apron and terminal or vent tile as necessary.

MG.12.02 Where the fume pipe passes through walls, intermediate floor ceilings, or roofs a 3mm thick mild steel sleeve giving 15mm clearance all round shall be provided for the builder to fix in the required position. After installation of the fume pipe the space between the pipe and the sleeve shall be packed with appropriate fire stopping material.

MG.13.0 GAS KITCHEN EQUIPMENT

MG.13.01 All gas fired kitchen equipment is to be installed in accordance with BS 6173:2009 and in particular the gas supply shall be interlinked with the kitchen ventilation.

MG.13.02 The Mechanical Services Installer should supply and fix, in a position approved by the Contract Administrator, a warning notice as follows:

"IMPORTANT FOR YOUR SAFETY, DO NOT OPERATE ANY COOKING APPLIANCES WITHOUT THE MECHANICAL VENTILATION SYSTEM IN FULL OPERATION"

MG.14.0 TESTS

MG.14.01 Upon completion, the whole of the gas installation shall be pneumatically tested in accordance with the general requirements of the Gas Regulations covering purging, testing and commissioning procedures.
MG.15.0 GAS SAFETY LINE DIAGRAM

MG.15.01 A schematic circuit control diagram shall be provided by the Mechanical Services Installer and fixed in a position approved by the Contract Administrator.

MG.15.02 The diagram shall indicate the position, function, size and reference number of all valves and pipework together with all pressure test points, purge points, electrical bonding and all emergency controls.

MG.15.03 The diagram shall be not less than A4, durable, non-fading and rigidly mounted with an unbreakable washable finish frame.

MG.16.0 GAS REGULATIONS

MG.16.01 The installations are to be installed in accordance with The Gas Safety (Installation and Use) Regulations 1998 L56 3rd edition 2011. It should be noted that these regulations call for a gas line diagram to be mounted in meter kiosk and building entrance.

MG.16.02 Other Regulations which the system must comply with are as follows:-

   a) Institution of Gas Engineers and Managers Publications IGE/UP/2
   b) Institution of Gas Engineers and Managers Publications IGE/TD/3
      - Main laying
   c) Institution of Gas Engineers and Managers Publications IGE/TD/4
      - Gas Services
   d) BS 6644:2011.

MG.16.03 Together with The Gas Safety (Installation and Use) Regulations 1998 cognisance should be made of the Approved Code of Practice and Guidance L56

MG.17.0 MAIN GAS SAFETY UNIT

MG.17.01 Supply and fix where indicated Automatic Gas Main Emergency shut off units, which will ensure that gas cannot enter an unsafe or leaking section of the Installation.

MG.17.02 This unit is to be obtained from Flamefast (UK) Ltd, Unit2, Labec Street, Swinton, Manchester M27 8SE or equal and approved.

MG.17.03 These units are to be fitted in lieu of the Anti-Back Pressure Valves specified elsewhere.
INDEX TO CLAUSES

MH.01.0  GENERAL DESCRIPTION
MH.02.0  FIRST AID REELS
MH.03.0  FIRE HYDRANTS
MH.04.0  DRY RISERS
MH.05.0  FOAM INLET SYSTEMS
MH.06.0  CO₂ EXTINGUISHERS
MH.07.0  FOAM EXTINGUISHERS
MH.08.0  WATER (GAS PRESSURE) EXTINGUISHERS
MH.09.0  FIRE BLANKETS
MH.10.0  MAINTENANCE SCHEDULE
MH.11.0  SPRINKLER SYSTEMS
MH.01.0  GENERAL DESCRIPTION

MH.01.01 The Mechanical Services Installer shall supply, deliver and install in the positions indicated on the Contract drawings all the first aid fire fighting equipment consisting of hydrants, hose reels and extinguishers, etc. The work shall include the necessary connections from the cold water mains service to the hydrants and hose reels including control valves. The work shall be completed to the satisfaction of the Contract Administrator and Chief Fire Officer.

MH.01.02 All first aid fire fighting equipment shall be to the latest British Standard incorporating all amendments, and shall comply with the relevant Loss Prevention Council's Standards.

MH.02.0  FIRST AID REELS

MH.02.01 The Mechanical Services Installer shall supply, deliver and install in the positions indicated on the Contract drawings, first aid hose reels of the type specified on the drawings or in Part MP of the Specification Document. The hose reels shall be in accordance with BS EN 671-1:2001 and installed in accordance with BS 5306-1, 2006.

MH.02.02 The reels shall be constructed from pressed steel plates and drums with brass machined waterways and bearings. They shall be complete with malleable brackets and be fixed to the building structure using proprietary fixing methods.

MH.02.03 Each reel shall be complete with a control valve and 6.3mm chrome plated or plastic nozzle with a twist grip control. All hose reels shall be finished in red cellulose with chrome fittings and shall be complete with the specified length of 20mm non-kink seamless rubber hose.

MH.02.04 Unless otherwise stated they shall be fitted at a height of 1200mm from finished floor level to centre of reel.

MH.03.0  FIRE HYDRANTS

MH.03.01 The Mechanical Services Installer shall supply, deliver and install in the positions indicated on the contract drawings standard ground fire hydrants constructed of cast iron with gunmetal working parts and having round thread outlets.
MH.03.0 FIRE HYDRANTS (Cont’d)

MH.03.02 They shall be installed complete with self-draining hydrant boxes, covers and marker posts and plates. All fire hydrants shall be constructed in accordance with BS 750:2006 and be installed in accordance with BS 5306-1, 2006.

MH.03.03 Fire hydrant signs shall be in accordance with BS 3251:1976 and of the type specified on the Contract drawings or in Part MP of the Specification Document.

MH.04.0 DRY RISERS

MH.01.01 The Mechanical Services Installer shall supply, deliver and install all dry risers as indicated on the contract drawings. They shall be constructed of 125mm mild steel tubes with flanged joints and fitted with the following fittings:

a) 1 no Gunmetal dry riser hydrant valve with 65mm instantaneous female hose connection and blank cap fitted at a height of 1100mm above finished floor level on each floor as shown on the drawing, and in accordance with BS 5041-2:1987 and AMD 5776:1988.

b) 1 no Dry riser pump-in breaching with flanged outlet and having two 65mm instantaneous male inlets fitted with control valves and integral back valves and 25mm drain valves.

c) 1 no Dry riser steel inlet box to suit the above breaching and having a hinged wired glass door, complete with locking device with 2 keys and marked “F.S. Dry Riser Inlet”, dimensions of box 610mm x 457mm x 365mm deep. The dry riser boxes are to be in accordance with B.S. 5041-4:1975, AMD 5503:1987, and of the type specified in Part MP of the Specification Document or on the Contract drawings. This valve shall be fixed on top of the main riser to release the air during initial filling when the dry riser is in use and shall be constructed of cast iron with gunmetal ball and seat.

d) The dry risers shall be constructed of heavy quality mild steel tube with welded joints and sufficient flanged joints to facilitate erection and disconnection.

e) They shall be constructed and tested to a pressure of 17 bar for 30 minutes without leakage.
MH.05.0  FOAM INLET SYSTEMS

MH.05.01 Where indicated on the contract drawings, the Mechanical Services Installer shall provide fixed foam inlet systems, in accordance with BS 5306-1:2006, for use by the local fire service.

MH.05.02 The pipework to these systems shall be as specified for the heating system but change of direction shall be made with long radius bends turning through the minimum angle. Fittings shall be reduced to a minimum and no right angle bends will be allowed unless specific permission is given in writing from the Contract Administrator.

MH.05.03 All pipework shall be 80mm bore complete with the foam spreaders adaptor sleeves and inlet boxes. The foam spreaders, adaptor sleeves and inlet boxes shall be of the type specified in Part MP of the Specification Document or on the Contract drawings.

MH.05.04 The inlet boxes shall be constructed of sheet steel with wire glass doors fitted with lock and two keys. The glass door shall be marked in 75mm high red letters "FOAM INLET". The horizontal centre line of the inlet box shall be at a height of 900mm above the finished ground level. The foam inlet boxes shall be in accordance with BS 5041-5:1974 and AMD 5505:1987.

MH.06.0  CO₂EXTINGUISHERS

MH.06.01 The Mechanical Services Installer shall supply, deliver and install in the positions indicated on the drawings CO₂ fire extinguishers of a capacity and type stated in Part MP of the Specification Document or on the Contract drawings.

MH.06.02 The extinguishers shall be of the trigger release type painted red and manufactured in accordance with BS EN 3-7:2004+A1:2007. A zone of colour of up to 5% of the external area, positioned immediately above or within the section used to provide the operating instructions, may be used to identify the type of extinguisher. This zone should be positioned so that it is visible through a horizontal arc of 180° when the extinguisher is correctly mounted. The colour-coding should follow the recommendations of BS 7863:2009.

MH.06.03 The extinguishers shall be installed on brackets supplied by the manufacturer with the top of the extinguisher approximately 850 above finished floor level. Care must be taken to ensure that the brackets are rigidly fixed to the fabric of the building using proprietary fixing methods.
MH.07.0 FOAM EXTINGUISHERS

MH.07.01 The Mechanical Services Installer shall supply, deliver and install in the positions indicated on the drawings foam fire extinguishers of a capacity and type stated in Part MP of the Specification Document or on the Contract drawings. They shall be painted red and be of the turn-over type with lug cap and handle-hold under the base constructed in accordance with BS EN 3-7:2004+A1:2007. A zone of colour of up to 5% of the external area, positioned immediately above or within the section used to provide the operating instructions, may be used to identify the type of extinguisher. This zone should be positioned so that it is visible through a horizontal arc of 180° when the extinguisher is correctly mounted. The colour-coding should follow the recommendations of BS 7863:2009.

MH.07.02 The extinguishers shall be installed on brackets supplied by the manufacturer with the top of the extinguisher approximately 750mm above finished floor level. Care must be taken to ensure that the brackets are rigidly fixed to the fabric of the building using proprietary fixing methods.

MH.08.0 WATER (GAS PRESSURE) EXTINGUISHERS

MH.08.01 The Mechanical Services Installer shall supply, deliver and install in the positions indicated on the drawings Water (Gas Pressure) Type fire extinguishers of a capacity and type stated in Part MP of the Specification Document or on the Contract drawings. They shall be painted red and manufactured in accordance with BS 5423, Part 3 and BS EN 3:1996. A zone of colour of up to 5% of the external area, positioned immediately above or within the section used to provide the operating instructions, may be used to identify the type of extinguisher. This zone should be positioned so that it is visible through a horizontal arc of 180° when the extinguisher is correctly mounted. The colour-coding should follow the recommendations of BS 7863:2009.

MH.08.02 The extinguishers shall be installed on brackets supplied by the manufacturer with top of the extinguisher approximately 750mm above finished floor level. Care must be taken to ensure that the brackets are rigidly fixed to the fabric of the building using proprietary fixing methods.

MH.09.0 FIRE BLANKETS

MH.09.01 The Mechanical Services Installer shall supply, deliver and install in the positions indicated on the drawings fire blankets of the type stated in Part MP of the Specification Document or on the Contract drawings to BS 7944:1999 and BS EN 1869:1997.
MH.10.0  MAINTENANCE SCHEDULE

MH.10.01 On completion of the installation the Mechanical Services Installer shall hand over the Contract Administrator, under cover of signature, a log book containing individual maintenance check sheets (in plastic pockets) for each of the extinguishers installed complete with details of the extinguisher, location and date of installation.

MH.10.02 In addition to the check sheets the log book shall contain a drawing of the premises reduced to A4 or ‘pull-out’ A3 indicating the position of all extinguishers together with the recommended maintenance regime.

MH.11.0  SPRINKLER SYSTEMS

MH.11.01 All sprinkler systems shall be installed under a separate contract by specialist firms but the Mechanical Services Installer will be required to provide the necessary 150mm water connections as shown on the Contract drawing.

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MI.41.0 REFRIGERATION PLANT
MI.42.0 TESTING AND COMMISSIONING
MI.01.0  GENERAL DESCRIPTION

MI.01.01 This section relates to the manufacture, delivery, erection, commissioning, and testing of mechanical ventilating/air conditioning systems in buildings including, where required, air heating, cooling, humidification, dehumidification and filtration.

MI.01.02 This section defines the standards of equipment and work normally required, the individual project detail will be as indicated on the contract drawings and part MP of the Specification Document.

MI.02.0  STANDARDS

MI.02.01 The systems must conform to the following standards and codes of practice:

i. HVCA DW/144 Specification for Sheet Metal Ductwork including Appendix M revision 2002.

MI.03.0  FANS GENERAL

MI.03.01 Fans shall be capable of giving the specified performance when tested in accordance with BS.848-9:2007 and as detailed in part MP of the Specification Document.

MI.03.02 Each fan is to be complete with a plate fixed to the casing showing the maker's name, fan duty serial number and electricity supply.

MI.03.03 The specification requirements for motors and starters shall be as indicated under centrifugal fans.

MI.03.04 Where guards for Drive and Couplings are to be provided with the fans as necessary to comply with Statutory Regulations, and where the fans are operated under open inlet or outlet conditions mesh guards are to be fitted.

Cont’d
MI.03.0  **FANS GENERAL** (Cont’d)

MI.03.05  Special requirements for fans used in a corrosive atmosphere e.g. fume cupboard extraction, will be indicated in part MP of the Specification Document.

MI.03.06  Connections to suction and delivery of all fans and elsewhere as required shall have best quality heavy air tight canvas/neoprene connections secured between angle iron flanges.

MI.03.06  It is the Mechanical Services Installer's responsibility to check the available voltages before ordering any electrical equipment.

MI.04.0  **CENTRIFUGAL FANS**

MI.04.01  The Mechanical Services Installer shall supply and install where indicated in part MP of the Specification Document radial bladed centrifugal fans of the type, duty and manufacture specified.

MI.04.02  Fan casings shall be constructed so that impellers can be easily withdrawn after installation. Outlets shall be flanged and inlets flanged or spigotted as indicated. A drain and plug shall be fitted to the fan casing at its lowest point.

MI.04.03  Impellers shall be keyed to a substantial mild steel shaft and both statically and dynamically balanced at maker's works.

MI.04.04  Fan bearings shall be sleeve type oil lubricated, but ball or roller type will be acceptable if the noise level is satisfactory.

MI.04.05  Each fan is to be complete with a motor rated for continuous running and have Class ‘A’ insulation throughout.

MI.04.06  To control the motors push button starters shall be provided with overload protection on each phase and no-volt release.

MI.04.07  This starter type to be used on motors up to 3hp. Motors of larger capacity will have special starter requirements

MI.05.0  **AXIAL FLOW FANS**

MI.05.01  The Mechanical Services Installer shall supply and install where indicated on the drawing(s) Axial flow fans of the type, duty and manufacture as indicated in part MP of the Specification Document.

Cont’d
MI.05.0 AXIAL FLOW FANS (Cont’d)

MI.05.02 Generally Axial flow fans shall have integral casings with the motors arranged for direct drive built into the unit.

MI.05.03 The casings shall be constructed with flanges, to enable the unit to be easily removed without disturbing adjacent ductwork. Access doors shall be provided for motor inspection and external greasing and oiling points.

MI.05.04 If guide vanes are fitted as part of an axial flow fan the vanes are to be of true aerofoil section as are the fan blades themselves.

MI.06.0 PROPELLER FANS

MI.06.01 The Mechanical Services Installer shall supply and install, where indicated on the Contract Drawings, Propeller type fans of the type, duty and manufacture as indicated in part MP of the Specification Document.

MI.06.02 Propeller fans shall have the impeller integrally constructed with the driving motor.

MI.06.03 They may be ring mounted, or diaphragm mounted in a casing as indicated in part MP of the Specification Document. Where they are mounted in a casing, the casing shall be longer than the length of the fan and motor. The casing shall have flanged ends and shall incorporate an inspection door.

MI.07.0 MECHANICAL ROOF EXTRACT UNITS

MI.07.01 The Mechanical Services Installer shall supply and install where indicated in part MP of the Specification Document extract fans of the type, duty and manufacture specified.

MI.07.02 The fans used in roof extract units shall meet the appropriate requirements of the preceding clauses relating to all fans types.

MI.07.03 Cowls and bases shall be of weather proof material as indicated on contract drawings or in part MP of the Specification Document. Cases shall be formed so as to ensure weatherproof fitting to the building structure. Adequate access to motor and lubricating points with appropriate means of electrical isolation shall be provided by means of hinged cowls or otherwise as appropriate.
MI.08.0  DOMESTIC TYPE FANS

MI.08.01  The Mechanical Services Installer shall supply and install domestic type extract fans of the manufacture and type as indicated in part MP of the Specification Document.

MI.08.02  Automatic shutters shall be provided and each fan unit shall be complete with the proprietary control unit supplied by the fan manufacturer.

MI.08.03  Fans shall be supplied suitable for 230 volts single phase, 50Hz AC electricity supply unless otherwise stated.

MI.09.0  BIFURCATED FANS

MI.09.01  The Mechanical Services Installer shall supply and install where indicated on contract drawings or in part MP of the Specification Document, bifurcated fans of the manufacture and type indicated.

MI.09.02  These fans must be capable of handling air at temperatures as indicated in the part MP of the Specification Document and shall be suitably treated if dealing with moisture laden air, smoke or airborne dust.

MI.09.03  The motors shall be of the totally enclosed squirrel cage induction type, with Class 'F' insulation.

MI.10.0  FUME HANDLING FANS

MI.10.01  The Mechanical Services Installer shall supply and install where indicated on contract drawings or in part MP of the Specification Document, fume handling fans of the type, duty and manufacture specified.

MI.10.02  The fans and casings will be treated as indicated and the motors shall be as for Bifurcated fans but with Class 'E' insulation.

MI.10.03  Neoprene duct connectors shall be used where necessary.

MI.11.0  KITCHEN VENTILATION

MI.11.01  The Mechanical Services Installer shall supply and install where indicated on contract drawings or in part MP of the Specification Document a kitchen canopy to the leading dimensions and materials as specified with due consideration to DW171

Cont’d
MI.11.0 KITCHEN VENTILATION (Cont’d)

MI.11.02 The Mechanical Services Installer shall supply and install where indicated on contract drawings or in part MP of the Specification Document, extract canopies constructed as indicated therein. The Mechanical Services Installer shall forward to the Contract Administrator a detailed drawing of the canopies for approval before manufacture.

MI.11.03 All canopies shall have watertight drainage channels formed around entire bottom edge with drain plug. All canopies shall be fire resisting complying with BS.476-24:1987.

MI.11.04 Grease eliminators shall be as indicated in part MP of the Specification Document, and be of corrugated plates or crimped wire mesh type and be entirely of metal, all ferrous metal shall be protected against corrosion. Where grease eliminators are fitted in kitchen canopies the assembly shall include a drip tray and the element shall be secured in the frame by quick release clips.

MI.11.05 The outmost surface of exposed ductwork or insulation in kitchen shall not be less than 80mm away from walls and ceilings to permit access for cleaning.

MI.11.06 Every precaution shall be taken to ensure that water or grease shall not leak from ducts serving kitchen areas.

MI.12.0 AIR FILTERS

MI.12.01 Where indicated on contract drawings or in part MP of the Specification Document, the Mechanical Services Installer shall supply and install filters of the type and duty specified. They shall be complete with holding frames sufficiently robust to ensure that no distortion occurs in operation. All filters whether unit type or not shall have edge seals and shall remain effective on renewal of filter media.

MI.12.02 One complete set of filter elements shall be provided in each plant room for the particular type of unit specified at the end of the Defects Liability Period.

Cont’d
### MI.12.0 AIR FILTERS (Cont’d)

<table>
<thead>
<tr>
<th>FILTER TYPE</th>
<th>EFFICIENCY TEST RATING</th>
<th>MAXIMUM VELOCITY (M/S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry replaceable media type</td>
<td>Not less than 95%</td>
<td>2.0</td>
</tr>
<tr>
<td>Test Dust No.2</td>
<td>BS EN 779:2002</td>
<td></td>
</tr>
<tr>
<td>Throw-away type</td>
<td>Not less than 90%</td>
<td>2.25</td>
</tr>
<tr>
<td>Test Dust No. 2</td>
<td>BS EN 779:2002</td>
<td></td>
</tr>
<tr>
<td>Open cell plastic type</td>
<td>&quot;</td>
<td>2.25</td>
</tr>
<tr>
<td>Viscous unit type</td>
<td>&quot;</td>
<td>2.25</td>
</tr>
<tr>
<td>Automatic viscous type</td>
<td>&quot;</td>
<td>2.5</td>
</tr>
<tr>
<td>Automatic fabric roll type</td>
<td>Not less than 95%</td>
<td>2.5</td>
</tr>
<tr>
<td>Test Dust No. 2</td>
<td>BS EN 779:2002</td>
<td></td>
</tr>
<tr>
<td>Absolute filters</td>
<td>Not more than 5%</td>
<td>2.5</td>
</tr>
<tr>
<td>penetration either</td>
<td></td>
<td>BS EN 779:2002</td>
</tr>
<tr>
<td>(methylene Blue)</td>
<td></td>
<td>or BS3928:1969</td>
</tr>
<tr>
<td>(sodium Flame)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrostatic type</td>
<td>Not less than 90%</td>
<td>2.5</td>
</tr>
<tr>
<td>Test Dust No. 2</td>
<td>BS EN 779:2002</td>
<td></td>
</tr>
<tr>
<td>(methylene blue)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MI.12.06 Generally filter types will fall into one of four categories as follows:-

a) **Viscous** either of the panel or moving curtain type. The moving curtain shall have an electric motor for turning the filter roll. This filter type shall be contained within a substantial steel casing having adequate cleaning and inspection doors.

b) **Fabric** either of the panel cell in a frame arranged for easy withdrawal for cleaning or moving curtain type with operation and construction as above.

Cont’d
MI.12.0 AIR FILTERS (Cont’d)

MI.12.06 Cont’d.

c) **Glassfibre** of the plant cell type with cells contained within a steel framing having an access door for easy replacement. Metal wood filters will not be accepted.

d) **Electrostatic** the filter shall include a baffle or mesh to ensure even air flow, an ioniser section, a collecting section, frames to hold the mains section and capable for being built into a filter bank, and automatic washing plant.

**Note.** Where the motor and/or gearbox is mounted in the air stream the electrical insulation and/or lubricants shall be suitable for the temperature range experienced.

MI.13.0 FIRE PRECAUTIONS

MI.13.01 Flameproof filter medium built into sheet metal ducting - the ducting shall not be less than 1.6mm thick for at least 1.8m upstream and 1.8m downstream of the filter; the immediate frames or cases of the filter elements shall be of material complying with BS 476-7:1997, Class 1

MI.13.02 Viscous type filters shall have a flash point of not less than 180°C.

MI.14.0 ACTIVATED CARBON TYPE FILTERS

MI.14.01 The cell casing shall be of steel protected against corrosion. The internal arrangement shall include a corrosion proof framework or supports to ensure an equal disposition of individual panels across the cell and thorough sealing between panel and mechanical protection to the front and rear of the panels.

MI.14.02 The carbon shall be of uniform thickness in the panels, and for each 0.5m³/s capacity, 20 kg of carbon shall be provided. The resistance to air flow must not exceed 125W/m².

MI.15.0 FILTER CONDITION INDICATORS

MI.15.01 Unless otherwise stated in part MP of the Specification Document, filters shall be fitted with manometers suitably calibrated in N/m², and having flexible tubes for attaching to test points on each side of the filter. The position on the gauge at which filters are to be cleaned or changed is to be indelibly marked.
MI.16.0  AIR HEATERS GENERAL

MI.16.01 All plenum heater batteries, air conditioning pre-heat and re-heat batteries, shall be capable of the specified output when supplied with the primary heating medium at the condition indicated in part MP of the Specification Document.

MI.16.02 The battery casings shall be of galvanised sheet steel not less than 1.2mm thick with angle framing at each end drilled ready to receive the counter flanges on the connecting ductwork.

MI.16.03 Heaters shall be independently supported so that their weight is not transmitted to ductwork and so that they can be removed without disturbing adjacent ductwork. Inspection doors shall be provided on both the upstream and the downstream sides of the heater.

MI.17.0  AIR HEATERS HOT WATER AND STEAM TYPES

MI.17.01 The heater battery shall be one of the following types:-

1. Copper tubes with non-ferrous fins, fitted into copper or bronze headers.

2. Copper tubes with non-ferrous fins, fitted into steel or cast iron headers.

3. Mild steel tubes with mild steel fins, fitted into steel headers, the whole protected against corrosion.

4. Aluminium tubes with tinned copper fins, fitted into aluminium steel headers.

5. Copper tubes and fins all tinned fitted into copper/bronze headers.

MI.17.02 For types (1) and (2) above the copper tubes shall comply with BS EN 1254-1:1998 Table X and the secondary extended heating surface shall be of either aluminium or copper. The secondary heating surface shall in all cases be bonded to the primary heating tubes.

MI.17.03 Where anti-frost heaters are fitted in fresh air intakes they shall be low resistance plain unfinished tube heaters.

Cont’d
MI.17.0 AIR HEATERS HOT WATER AND STEAM TYPES (Cont’d)

MI.17.04 The flow and return connections and headers shall be arranged to ensure an equal flow of water or steam through all tubes. Connection up to and including 65mm bore for pressure up to 350KN/m² shall be screwed or flanged: connection 75mm diameter and above and for all sizes where the heating media pressures are above 350 KN/m² shall be flanged.

MI.17.05 Provision shall be made for expansion of the tubes, for effective venting of the heater battery and connections, and for drainage of the heater battery. Isolating valves shall be provided on inlet and outlet connections, arranged so as to facilitate removal of the heater battery.

MI.17.06 Special provision shall be made to form an air tight seal around the battery and be arranged with suitable quick release fixings to facilitate withdrawal of battery.

MI.17.07 Each battery shall be pressure tested at works to 1½ times the working pressure or to 700 KN/m² whichever is the greater and certification is to be provided to that effect.

MI.17.08 The resistance to air flow of the heater shall not exceed 62 N/m² and the face velocity shall not exceed 4 m/s.

MI.18. AIR HEATERS ELECTRIC TYPE

MI.18.01 Electric air heaters shall consist of a number of heating elements of the enclosed type mounted in a sheet steel casing. The elements shall be so installed that they can be removed for cleaning or installed that they can be removed for cleaning or renewal without dismantling ductwork.

MI.18.02 The surface temperature of the elements shall not exceed 150°C. A high temperature limit device with hand reset button shall be incorporated.

MI.18.03 The control of the electric air heaters, except for remote boosters, shall be interlocked with the fan motor starters so that the heaters cannot operate unless the fan is running. Electric air heaters which are installed as boosters in branch ducts, remote from the fans, shall have an air flow control of the vane or pressure type which shall isolate the heating elements from the electricity supply in the event of failure of air flow.

MI.18.04 All heater and heater sections of more than 3 KW loading shall be balanced over three phases and the complete heater bank shall be arranged for balanced operation on a 3 phase 4 wire system.

Cont’d
MI.18.0 AIR HEATERS ELECTRIC TYPE (Cont’d)

MI.18.05 The connections from each element shall be taken to a readily accessible terminal box arranged for conduit entry. Each heater section shall be separately fused and the neutral point of all 3 phase star connected sections shall be brought out to a link in the terminal box. Near any hot areas the wiring insulation shall be of appropriate quality.

MI.18.06 The total resistance of the heater to air flow shall not exceed 25N/m² and the velocity through the free area shall not exceed 6 m/s.

MI.19.0 AIR COOLERS

MI.19.01 Air coolers may be either chilled water coil type or direct expansion type, with general construction details as for air heaters, i.e. casings, supports, removal and inspection doors, etc.

MI.19.02 Unless otherwise indicated the cooler batteries shall be constructed either of copper tubes with copper fins tinned after manufacture, or of aluminium tubes with copper fins tinned after manufacture; the secondary extended cooling surfaces shall be bonded to primary cooling tubes. Headers for copper tube batteries shall be of copper bronze or cast iron; for aluminium tube batteries shall be of aluminium or steel.

MI.19.03 The resistance to air flow shall not exceed 125 N/m² and the face velocity shall not exceed 2.5 m/s. The battery shall be tested to 1½ times its working pressure or to 700 KN/m² which ever is the greater, before leaving manufacturer's works.

MI.19.04 Where the direct expansion type is specified the coil shall be arranged to provide the highest rate of heat transfer with the minimum pressure drop.

MI.19.05 Pressure type distributors shall be used on all multi-circuit coiler to ensure equal distribution of refrigerant.

MI.19.06 Externally equalised thermostatic expansion valves shall be used with these coils.

MI.19.07 Condensate drain trays will be required, fitted at vertical intervals of not more than 1 metre to facilitate proper drainage from the fins. Each such condensation collection tray must be drained using not less than 22mm connection and should be of not less than 2mm galvanised steel manufacture and then painted on inside with Bitumastic paint.

MI.19.08 If the face velocity of battery exceeds 2.25 m/s, eliminator plates will be required and will be indicated in the supplementary specification.
MI.20.0 HUMIDIFYING PLANT

MI.20.01 Humidifiers shall be provided as indicated on the Contract Drawings or in part MP of the Specification Document and are to give a minimum saturation efficiency of 85% with a limiting face velocity of 2.5 m/s.

MI.21.0 DUCTWORK GENERAL AND ERECTION

MI.21.01 The contract drawings are general arrangement drawings only and the Mechanical Services Installer shall include for taking site dimensions for the preparation of his own detailed fabrication and installation drawings. These drawings shall allow for full co-ordination of other services, ceiling layouts, lighting fittings etc, to ensure that no clash of interest occur during or after erection.

MI.21.02 All ductwork dimensions given for rectangular ductwork are for width x depth on both plan and section and the dimensions given will be clear internal dimensions and due allowance must be made for internal acoustic lining and external insulation where applicable for both manufacturing and clearance purposes. For circular ductwork the diameter dimension given will be clear internal dimensions.

MI.21.03 All the fabrication and installation drawings shall be submitted to the Contract Administrator in triplicate giving full details of the method of construction, overlaps, seam, stiffeners, rivets, flanges, bolts supports etc, for approval before construction commences.

MI.21.04 General arrangement drawings of filters, heater batteries, grilles, fans and louvres, etc., shall also to be submitted for approval.

MI.21.05 All ducting systems shall be erected in a workmanlike manner by an approved specialist contractor and when completed shall be rigid, true to size, free from movement, accurately aligned and airtight.

MI.21.06 During erection all open ends of ducting shall have a suitable covering securely tied in position to prevent entry of dust, dirt and other debris present during building operations.

MI.21.07 Before final fixing of grilles the ducting shall be blown through by running the fans for a period of at least one hour and the interior of all ducts, as far as accessible, thoroughly cleaned by means of an industrial type vacuum cleaner.
MI.22.0 MANUFACTURE OF SHEET STEEL DUCTWORK FOR AIR SYSTEMS

MI.22.01 This ductwork shall comply with BS EN 10346:2009 and HVCA Specification DW/144 including Appendix M revision 2002, and be constructed with mild steel angle, assembled with slip joints except for connections to fans, heater batteries, filter banks, diffusers, grilles etc.

MI.22.02 Self tapping screws shall not be used on any high velocity ductwork.

MI.22.03 All ducts shall be adequately stiffened and braced to prevent drumming and/or vibration and all ducts shall be free from internal sharp edges or projections.

MI.22.04 Cross-bracing" shall be permitted on sheet metal uninsulated ducts with one greater 475mm to give additional rigidity.

MI.23.0 MANUFACTURE OF NON-FERROUS SHEET METAL DUCTWORK & PVC COATED SHEET STEEL DUCTWORK

MI.23.01 Where aluminium ductwork is specified it shall comply with HVCA specification DW/144 including Appendix M revision 2002. Where PVC coated sheet steel ductwork is specified the sheet thickness, angle flange size etc shall be the same as for galvanised sheet steel ductwork of the same size.

MI.24.0 MANUFACTURE OF GLASS FIBRE RIGID FOAM DUCTWORK

MI.24.01 Glass Fibre ductwork shall have a density not exceeding 65 kg/m³ rectangular ductwork and not exceeding 80 kg/m³ for circular ductwork.

MI.24.02 The thickness of the material shall be 25mm, shall comply with HVCA specification DW/191:1973, and have at least Class I spread of flame BS 476 Part 7:1997.

MI.25.0 MANUFACTURE OF FLEXIBLE DUCTWORK

MI.25.01 Flexible ductwork can be used to connect local room air distributing headers, diffusers and items such as mixing boxes, and air handling units, etc, where indicated on the drawing(s).

MI.25.02 The length of flexible ducting connectors shall not without the Contract Administrator's approval, exceed 250mm run.

Cont’d
MI.25.0  MANUFACTURE OF FLEXIBLE DUCTWORK (Cont’d)

MI.25.03 Flexible ducting shall comply with BS 476 Part 7:1997(Class 1, Surface of very low flame spread) and shall be spring wire reinforced self extinguishing grade rot-proof airtight material or spirally or machine formed interlocking self extinguishing grade PVC, or alternatively consist of flexible corrugated metal tubing, such as aluminium or stainless steel.

MI.25.04 Joints shall be by hose type galvanised or sheradised metal clamps with final sealing by 50mm adhesive tape of approved quality, or as indicated in part MP of the Specification Document

MI.26.0  DUCTWORK SUPPORTS FOR RECTANGULAR DUCTWORK

MI.26.01 The ductwork shall be supported on mild steel angles beneath the ducts projecting about 76mm on each side of the duct. These angles are to be suspended on mild steel rods suitably threaded and located in the steel angles with nuts. All supports where site cut or modified are to be painted with galvafoild paint or equal and approved.

MI.26.02 The dimensions of the angle iron supports and the flat steel clamping the duct to the support shall be as follows:-

<table>
<thead>
<tr>
<th>Length of Bottom of Duct</th>
<th>Size of Angle Iron</th>
<th>Size of Flat Iron</th>
<th>Bolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 840mm</td>
<td>25 x 25 x 3.2mm</td>
<td>25 x 3.2mm</td>
<td>6.4mm</td>
</tr>
<tr>
<td>Over 840 to 1500mm</td>
<td>32 x 32 x 4.8mm</td>
<td>32 x 4.8mm</td>
<td>7.9mm</td>
</tr>
<tr>
<td>Over 1500mm</td>
<td>38 x 38 x 4.8mm</td>
<td>38 x 4.8mm</td>
<td>9.5mm</td>
</tr>
</tbody>
</table>

MI.26.04 In general ductwork shall not rest directly on the building structure. Where approved however, builders work supports may be used together with vibration packing material.

MI.26.05 Ducts shall be firmly and rigidly held in position and be free from vibration rattle or drumming. Approved anti-vibration material shall be inserted between the ducts and the supports.
MI.27 DUCTWORK SUPPORTS FOR CIRCULAR DUCTWORK

MI.27.01 The ductwork shall be supported by means of Mild steel flat iron band clips formed in two half sections bolted together and hung from two mild steel rod hangers.

MI.27.02 The dimensions of the flat iron supports for circular ducts shall be as follows:-

<table>
<thead>
<tr>
<th>Diameter of Duct</th>
<th>Size of Flat Iron</th>
<th>Bolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 750mm</td>
<td>25mm x 3.2mm</td>
<td>6.4mm</td>
</tr>
<tr>
<td>Over 750 to 1500mm</td>
<td>32mm x 4.8mm</td>
<td>7.9mm</td>
</tr>
<tr>
<td>Over 1500mm</td>
<td>32mm x 4.8mm</td>
<td>9.5mm</td>
</tr>
</tbody>
</table>

MI.27.03 All hangers shall have screwed sections incorporated for adjustment of ducting to ensure neat and true alignment.

MI.27.04 All nuts shall be provided with washes and locknuts or alternatively be patent self-locking types.

MI.27.05 Hangers used shall be made from mild steel rod to the sizes given below:-

<table>
<thead>
<tr>
<th>Circular Ducts Diameter</th>
<th>Rectangular Ducts Longer Side</th>
<th>Hanger Rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 400mm</td>
<td>Up to 300mm</td>
<td>9.5mm</td>
</tr>
<tr>
<td>Over 400mm to 850mm</td>
<td>Over 300mm to 700mm</td>
<td>12.7mm</td>
</tr>
<tr>
<td>Over 850mm to 1500mm</td>
<td>Over 700mm to 1500mm</td>
<td>15.8mm</td>
</tr>
<tr>
<td>Over 1500mm</td>
<td>Over 150mm</td>
<td>19.1mm</td>
</tr>
</tbody>
</table>

MI.27.06 Supports shall be spaced at not more than 1.83m centres according to the size and rigidity of the duct. Supports shall be provided at all branches, take-offs, bends and at all main flanged joints.

MI.27.07 Vertical runs of ductwork shall be supported by means of angle iron flanges to the duct and resting on channel irons securely fixed to the building structure. This support shall take the vertical loading. Material movement shall be prevented with flat bar straps clamped around the ductwork and bolted back to the channel iron.

Cont’d
MI.27.0 DUCTWORK SUPPORTS FOR CIRCULAR DUCTWORK (Cont’d)

MI.27.08 In general ductwork shall not rest directly on the building structure. Where approved however, builders work supports may be used together with vibration packing material.

MI.27.09 Ducts shall be firmly and rigidly held in position and be free from vibration rattle or drumming. Approved anti-vibration material shall be inserted between the ducts and the supports.

MI.27.10 Flexible ducting supports shall be as indicated in part MP of the Specification Document.

MI.28.0 TEST POINTS

MI.28.01 Air flow test points shall be provided in the air ducting at all branches and regulating damper, adjacent to each plant item and control item, at all fan inlet and discharges and elsewhere as required.

MI.28.02 The test points shall consist of a 38mm dia. hole drilled through the ducting and covered with a removable spring clip fastened cover.

MI.28.03 Generally air flow test points shall be provided as recommend in CIBSE Guide B.

MI.29.0 DAMPERS

MI.29.01 The Mechanical Services Installer shall supply and install dampers as indicated on contract drawings or in part MP of the Specification Document and will be either of the multi-vane or butterfly type as specified.

MI.29.02 All duct dampers, except fire dampers and self locking dampers shall be fitted with locking devices and position indicators.

MI.29.03 Each primary control damper shall be fitted with a non-corrosion label stating the actually air flow in m³/s and the cross sectional area.

MI.29.04 After final regulation and balancing of the system, the position of the dampers as set shall be indelibly marked on each damper quadrant.

MI.29.05 All dampers have an inspection door provided adjacent to them.

Cont’d
MI.29.0 DAMPERS (Cont’d)

MI.29.06 Multi-vane design dampers shall have blade widths not exceeding 127mm with felt insert at tips, with each alternative blade contra-rotating. Blades shall be of streamlined section mounted on square spindles linked together to heavy duty cast quadrant, indelibly marked open and shut, with finger operated locking device and spanner locking device for permanent setting.

MI.29.07 Butterfly design dampers shall have blades constructed of 3.2mm galvanised mild steel sheet with 9.5mm spindle mounted on stout galvanised mild steel bearings secured to duct walls. Quadrant to be indelibly marked open and shut and all materials shall be galvanised. Edges of damper shall be rolled.

MI.29.08 When air ducts are greater than 450mm in either plane, then splitters shall be incorporated, with rolled edges and two or more dampers, not greater than 450mm in either plane, shall be incorporated. Such dampers shall be linked to a single quadrant.

MI.29.09 In certain instances, dampers shall be arranged for motorised control, and these shall be specified in part MP of the Specification Document.

MI.29.10 Dampers shall be galvanised throughout and mounted in flanged casings.

MI.30.0 FIRE DAMPERS

MI.30.01 The Mechanical Services Installer shall supply and install dampers of the type and manufacture indicated in part MP of the Specification Document. These dampers shall be complete with a switch unit to isolate the fan in the event of damper closure.

MI.30.02 The fusible link installed with the fire dampers shall be set to operate when the duct temperature exceeds 68°C.

MI.30.03 Unless otherwise stated each fire damper shall have a fire resistance rating of two hours.

MI.30.04 External indication of operation of the damper shall be provided.

MI.30.05 A door giving access to the damper blade(s) and the fusible element shall be provided in the damper casing or in the adjoining ducting.

MI.30.06 The fusible links shall be capable of supporting the damper weight without softening or deterioration when constantly subject to air at 54°C.

Cont’d
MI.30.0  **FIRE DAMPERS** (Cont’d)

MI.30.07  If dampers are to operate on smoke detection this will be detailed in part MP of the Specification Document.

MI.31.0  **AIR INTAKES AND OUTLETS**

MI.31.01  Unless otherwise indicated fixed louvres on external walls at air intakes and outlet positions shall be provided by the Mechanical Services Installer and fixed by the Main Contractor in accordance with the manufacturer’s recommendations.

MI.31.02  The louvres shall be constructed of extruded aluminium c/w rear rain trap blade profile and of external flange pattern with drip cill unless otherwise indicated in part MP of the Specification Document.

MI.31.03  The louvres shall be provided with either bird screen or insect screen as indicated in part MP of the Specification Document.

MI.32.0  **ACCESS DOORS**

MI.32.01  Access doors shall be provided to give access to all dampers and at fans, each side of heater batteries and filters for inspection cleaning and maintenance purposes.

MI.32.02  Access for cleaning ducts and for internal inspection shall be provided on all ducts at intervals and at all bends, by means of approved type access doors mounted on the duct, as called for in DW144 including Appendix M revision 2002. The size of door shall normally be 610mm x 610mm but the shape and size may vary in individual cases to suit the size and form of duct. The door shall be secured in the closed position against an airtight gasket by three non ferrous swing-bolts and hand wheels, one to each side.

MI.32.03  Small inspection doors or access covers secured with non ferrous swing bolts shall be provided at dampers on branch ducts and at all internal duct fitments, i.e. thermostat and thermometer bulbs, etc.

MI.33.0  **GRILLES, REGISTERS AND DIFFUSERS**

MI.33.01  The Mechanical Services Installer shall supply and install grilles and registers as indicated in the part MP of the Specification Document.

Cont’d
MI.33  GRILLES, REGISTERS AND DIFFUSERS (Cont’d)

MI.33.02  Supply air grilles shall be manufactured from aluminium and for sidewall application shall have double aerofoil section blades key operated for air pattern and a key operated multi-leaf damper arrangements.

MI.33.03  For ceiling application supply grilles shall have single adjustable aerofoil blades for one or two way throw as required and multi-leaf damper arrangements.

MI.33.04  All extract grilles shall be fixed bladed within an extruded aluminium frame and based upon a free area of 75%.

MI.33.05  The Mechanical Services Installer shall supply and install diffusers as indicated in part MP of the Specification Document.

MI.33.06  Diffusers shall be manufactured from aluminium with fully adjustable diffuser cones to give the correct distribution of supply air and shall be fitted with either butterfly type or opposed-bladed dampers operable through the face of the diffuser.

MI.33.07  Grilles, registers and diffusers where required in corrosive atmospheres shall have a PVC finish as stated in part MP of the Specification Document.

MI.34.0  AIR HANDLING UNITS

MI.34.01  The Mechanical Services Installer shall supply and install, where indicated in part MP of the Specification Document packaged air handling units manufactured as specified All individual components of the units shall comply with the appropriate sections of this specification.

MI.34.02  Unless otherwise indicated in part MP of the Specification Document packaged air handling units shall be:

i. Framed modular construction with flanged or cleated connection with sections of maximum length 2400mm

ii. Double skinned minimum 18swg galvanised rolled steel casing

iii. Installed on purpose made upstand incorporating anti vibration mountings

iv. LPHW and CW coil sections shall be complete with water connections, drainage cock and air bleed valve

Cont’d
MI.34.0 AIR HANDLING UNITS (Cont’d)

MI.34.02 (Cont’d)

v. A condensate tray c/w drainage trap shall be supplied in the chilled water coil section

vi. Inspection doors c/w viewing windows secured with non ferrous swing bolts shall be provided

vii. Internal lighting shall be provided

viii. Fans shall be as specified in earlier clauses

ix. Filters shall be as specified in earlier clauses

x. Flexible connections shall be provided between the A.H.U. and the supply / discharge ductwork

MI.35.0 TERMINAL UNITS

MI.35.01 The Mechanical Services Installer shall supply and install where indicated in part MP of the Specification Document, terminal units (e.g. fan coil units) of the type and manufacture specified.

MI.35.02 The individual components of these terminal units shall comply with the appropriate sections of this specification, unless otherwise stated.

MI.36.0 ANTI-VIBRATION MOUNTINGS

MI.36.01 Fans, compressors, motors and any other vibration-inducing equipment shall be mounted on anti-vibration bases to isolate them from the main building structure.

MI.36.02 Centrifugal fans shall have a 50mm thick pad of anti vibration material incorporated in the foundation base for the fan unit. Axial flow fans shall be mounted on cradles which are to include bolted anti-vibration block mountings, two per cradle.

MI.36.03 Propeller fans shall be mounted on rubber shoes screwed to the ring plate previously specified.
MI.36.0 ANTI-VIBRATION MOUNTINGS (Cont’d)

MI.36.04 All other anti-vibrations shall be as indicated elsewhere in the contract documents.

MI.36.05 The Contract Administrator's decision as to the acceptability of levels of vibration is final and should special testing apparatus and personnel be required to establish remedial work, then this works apparatus and personnel change will not be chargeable to the employing authority, but direct to the Mechanical Sub Contractor.

MI.37.0 SOUND INSULATION (AIRBORNE NOISE)

MI.37.01 The Mechanical Services Installer shall supply and install acoustic insulation and attenuator units as indicated in part MP of the Specification Document and/or drawings, and shall be so installed in the ductwork that they offer low resistance to air flow.

MI.37.02 Where attenuation is to be achieved by lining the duct, the material used will be Barafoam or equal, of self extinguishing quality fixed with Barafoam adhesive.

MI.37.03 In all cases the dimensions shown shall be the clear internal dimensions the metal duct shall be increased in overall size where they are to be lined internally.

MI.37.04 All acoustic or sound absorbent material shall be incombustible or self extinguishing non-flame spread grade, vermin proof and securely fixed to ducting and/or plant chamber walls as stated in part MP of the Specification Document.

MI.37.05 Where proprietary units are used they shall be constructed of galvanised sheet steel with flanges for duct connection. Sound absorbent linings shall be suitable for the air temperatures within the duct.

MI.37.06 Where a silencer is used in a saturated atmosphere application the sound absorbent material shall be protected with a covering impervious to moisture.

MI.38.0 THERMOMETERS - AIR SYSTEM

MI.37.01 Thermometers shall be provided and installed in fresh air connection, recirculation air duct, before and after an air heater and air cooler and before and after a humidifying device, as appropriate, 12mm dia. holes in the ductwork should be provided where required and plugs fitted in them. Cont’d
MI.37.0 THERMOMETERS - AIR SYSTEM (Cont’d)

MI.37.02 Thermometers shall be mercury-in-glass type, at least 300mm long, accurate to + 0.5°C and scaled appropriately. Each thermometer shall be complete with a pierced plug to fit the hole at the point where the thermometer shall be used, and each wet bulb thermometer shall be provided with a fabric sleeve.

MI.39.0 THERMOMETERS - WATER SYSTEMS

MI.39.01 Thermometers shall be provided and installed on all water and brine systems adjacent to the water or brine flow and return connections of each air heater and cooler of up to 30kW capacity and each evaporator and condenser of up to 70kW capacity.

MI.39.02 Thermometer wells shall be provided and shall be filled with mineral oil, the depth of which shall be such as to ensure a true reading of the fluid temperature. Thermometers shall be as for the air system.

MI.40.0 AUTOMATIC CONTROLS

MI.40.01 Control systems generally will be as indicated in part MP of the Specification Document.

MI.40.02 However, the Mechanical Services Installer must include for the complete installation of the items of control equipment as enumerated in part MP of the Specification Document, all electrical connections to this equipment will be by others.

MI.41.0 REFRIGERATION PLANT

MI.41.01 Unless otherwise indicated refrigeration will be by mechanical refrigeration plant as indicated in part MP of the Specification Document.

MI.42.0 TESTING AND COMMISSIONING

MI.42.01 The Mechanical Services Installer shall engage the services of a specialist commissioning engineer to balance, test and commission the ventilation systems in accordance with C.I.B.S.E. requirements.

MI.42.02 All test figures shall be submitted to the Contract Administrator for his perusal prior to the system tests being repeated in the presence of the Contract Administrator or his nominated representative at an agreed time.
MI.42.0 TESTING AND COMMISSIONING (Cont’d)

MI.42.03 Following the aforementioned demonstrations all dampers shall be marked as earlier referred to and all readings shall be recorded for inclusion in the O. and M. Manuals both on individual sheets and on the record drawings.

MI.42.04 Failure to comply with clauses MI.42.01 to MI.42.03 will result in withholding the issue of the Practical Completion Certificate.
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MJ.01.0  GENERAL DESCRIPTION
MJ.02.0  TRAPS
MJ.03.0  MATERIALS
MJ.04.0  BRACKETS
MJ.05.0  ACCESS
MJ.06.0  MAIN BELOW GROUND FLOOR LEVEL
MJ.07.0  OVERFLOWS AND WARNING PIPES
MJ.08.0  FIRE BARRIERS
MJ.09.0  SANITARY WARE
MJ.10.0  AIR ADMITTANCE VALVES
MJ.11.0  TESTING
MJ.01.0  GENERAL DESCRIPTION

MJ.01.01 The internal sanitary plumbing installation is to be installed so as to comply with the recommendation of BS EN 12056-1:2000, BS EN 12056-2:2000, BS EN 1329-1:2000 and BS 4514:2001.

MJ.01.02 The pipework and fittings shall be of one manufacturer and shall be installed entirely in accordance with their recommendations.

MJ.01.03 Wastes from sinks and basins shall be solvent welded MuPVC, and from W.C.’s and overflows shall be solvent welded PVC-U, sizes as detailed in Part MP of the Specification Document and indicated on the Contract drawings.

MJ.01.04 All high temperature waste pipes from Kitchens, Laundries, etc to be copper as BS EN 1057:2006+A1:2010, fittings to be easy sweep type and adequate unions for ease of removal.

MJ.01.05 Copper shall be used in areas where vandalism is likely to take place as detailed in Part MP of the Specification Document and indicated on the Contract drawings.

MJ.02.0  TRAPS

MJ.02.01 All traps are to incorporate a 75mm water seal. Wash hand basins require a 32mm diameter trap. Sinks and urinals require a 40mm diameter traps.

MJ.02.02 Traps associated with Laboratory equipment to be dilution type of Vulcathene manufacture and as detailed in Part MP of the Specification Document and indicated on the Contract drawings.

MJ.03.0  MATERIALS

MJ.03.01 All 100mm diameter soil and vent systems are to utilise materials complying with BS 4514:2001.

MJ.03.02 All 36, 42 and 50mm diameter soil and vent systems are to utilise materials complying with the recommendation of BS EN 274-1:2002, BS EN 274-2:2002, BS EN 274-3:2002.

MJ.03.03 Laboratory wastes shall be Vulcathene manufacture, incorporating a Mechanical Jointing System.

Cont’d
MJ.03.0 MATERIALS (Cont’d)

MJ.03.04 All copper pipework shall be fabricated from solid drawn phosphorous arsenical copper tubes complying in all respects with BS EN 1057:2006+A1:2010 as manufactured by Yorkshire Limited or equal approved.

MJ.03.05 Copper fittings and other items shall comply with the Water Supply (Water Fittings) Regulations 1999 as listed in the water fittings and material directory.

MJ.03.06 Fittings shall be in accordance with BS EN 1254-1:1998; BS EN 1254-2:1998, BS EN 1254-3:1998 BS EN 1254-4:1998 BS EN 1254-5:1998 and installed as detailed above in the General Clause. 'End feed' copper fittings installed in strict accordance with the manufacturer's recommendations are also acceptable.

MJ.03.07 End feed copper fittings may used but in all cases fittings shall be made up using the correct Tin / Silver solder and flux with both tube and fitting clean both before and after soldering.

MJ.03.08 All cuts in copper pipework shall be reamed to restore the full bore of the tube and the Contract Administrator shall reserve the right to have any joints disconnected for the purpose of checking that the full bore has been restored.

MJ.03.09 All pipework shall follow the lines of walls both vertically and horizontally and shall be spaced sufficiently far apart to allow for lagging separately (where necessary).

MJ.03.10 Joints must be wiped clean of surplus solder and flux to avoid discolouring and heat resistant mats must be used to prevent damage to the fabric of the building, decorations and woodwork, etc.

MJ.03.11 All fittings must be resistant to dezincification.

MJ.03.12 All 90° bends are to be formed using fittings with the exception of bends in cupboards, ceiling spaces etc., which may be pulled and bends in floor ducts or trenches, which must be formed without joints.

MJ.03.13 Multiple droppers to fitments and appliances where exposed to view shall be kept as close together as bracket fixing will allow.

MJ.03.14 All the copper fittings to be used with tin / silver solder only. The use of all aggressive type soldering fluxes where the label or instructions state that they are based on chlorides and / or self cleaning is NOT permitted.
MJ.04.0  BRACKETS

MJ.03.15  All plastic pipework shall comply with BS EN ISO 1452-1-5:2009.

MJ.04.01  Care must be given to the supporting of the internal drainage systems and the Manufacturer's recommendations must be strictly adhered to.

MJ.04.02  All pipework must be adequately supported whether vertical or horizontal.

MJ.04.03  Plastic pipework expands and contracts with changes in temperature – whether ambient temperature or the nature of the discharge through the pipework. Expansion joints must be provided to accommodate thermal movement as clause MJ.04.06

MJ.04.04  Pipe brackets must be used to anchor expansion joints with intermediate support provided to steady pipework between these joints.

MJ.04.05  Pipework must be supported at changes of direction.

MJ.04.06  Pipe Size | Maximum Support Distance | Maximum Support Distance
           | Vertical | Horizontal between Expansion Joints | mm |
           | mm       | mm | mm |
32       | 1200 | 500 | 2000 |
40       | 1200 | 500 | 2000 |
50       | 1200 | 900 | 2000 |
82       | 2000 | 900 | 4000 |
110      | 2000 | 1000 | 4000 |
160      | 2000 | 1000 | 4000 |

MJ.04.07  Steel brackets must be used on interior vertical soil stacks

MJ.05.0  ACCESS

MJ.05.01  Sufficient access points must be allowed so as to enable efficient inspection and maintenance.

MJ.06.0  PIPEWORK BELOW GROUND FLOOR LEVEL

MJ.06.01  In all cases where this applies, the pipework shall be of cast iron manufacture to satisfy the Fire Officer's requirements.
MJ.07.0 OVERFLOWS & WARNING PIPES
MJ.07.01 As Clause MJ.03. The Discharge positions will be detailed in Part MP of the Specification Document and indicated on the Contract drawings.

MJ.08.0 FIRE BARRIERS
MJ.08.01 Where PVC pipes pass through Fire Compartment Walls, fire stop precautions shall be required as denoted in Building Regulation B3 Section 11 and BS 476-20:1987.

MJ.09.0 SANITARY WARE
MJ.09.01 The supply and fixing of Sanitary Ware on certain contracts may be the responsibility of the Mechanical Services Installer. Details of this equipment will be given in Part MP of the Specification Document and indicated on the Contract drawings.
MJ.09.02 All drainage works shall comply with BS EN 12056-1-5:2000.
MJ.09.03 The Mechanical Services Installer is to allow for the removal and re-fixing of Sanitary Ware twice to suit other trades.

MJ.10.0 AIR ADMITTANCE VALVES
MJ.10.01 Automatic Air Admittance Valves, in accordance with BS EN 12380:2002, may be used in lieu of Vent stacks where indicated on the drawings.
MJ.10.02 These units are to be fitted to the manufacturer’s recommendations.

MJ.11.0 TESTING
MJ.11.01 On completion all traps shall be filled with water and an air or smoke test carried out on the soil installations. In the case of Air tests, the pressure indicated on the "U" tube shall remain constant for five minutes, and with the smoke test no smoke shall be observed to leave any joint.
MJ.11.02 All necessary equipment for testing shall be provided by the Mechanical Services Installer.
MJ.11.03 Any defects shall be made good and the test repeated until satisfactory results are obtained. Any sections of the installation which will be rendered inaccessible shall be tested before these sections are covered.
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MK.04.0  FLUE PIPES
MK.05.0  BOILERHOUSE/PLANT ROOM AND PUMP ROOM PIPEWORK
MK.06.0  EXTERNAL PIPEWORK EXPOSED TO ATMOSPHERE
MK.07.0  EXTERNAL AND INTERNAL PIPEWORK IN DUCTS
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MK.36.0  THICKNESS OF INSULATION FOR DOMESTIC HOT WATER SERVICE INSTALLATIONS
MK.37.0  THICKNESS OF INSULATION FOR COLD WATER SERVICES, HEATING AND HOT WATER SERVICES REQUIRING FROST PROTECTION
MK.01.0 GENERAL DESCRIPTION

MK.01.01 On completion of the hydraulic tests, to be satisfaction of the Contract Administrator, the boilers, cylinders and all pipework in the boiler house, ducts trenches, roof spaces, false ceilings, wall chases, etc., including the cold water services and all pipework not required as heating surface shall be thermally insulated in accordance with the following specification.

MK.01.02 All pipes and ironwork to be thoroughly wire brushed and cleaned to ensure complete removal of all rust and grease prior to the application of insulation and treated with two coats of red oxide or equal paint.

MK.01.03 In all cases where rigid sectional or flexible insulation is used, all care must be taken that its density is not impaired by compression when tie wires or bands are secured in position, or when further layers of materials or enclosures are applied.

MK.01.04 The whole of the work is to be carried out in accordance with the manufacturer’s installation procedures and in a neat and approved manner to conform with BS EN 12664:2001, BS EN 12667:2001, BS EN 12939:2001, BS EN ISO 8990:1996, BS 5422:2009, BS EN 13467:2001 and all associated standards and codes of practice.

MK.02.0 BOILER PLANT

MK.02.01 Boilers shall, wherever possible, be supplied with integral insulation jackets, provided by the boiler manufacturer, as specified in Part MP of the Specification Document.

MK.02.02 Should this method of insulation not be specified, the boilers shall be insulated with Fibreglass Crown Wired Mattress Slabs or other approved material. The insulation thickness shall be in accordance with Clause MK.32.

MK.02.03 The insulation shall be securely fixed and finished in 20 gauge class ‘O’ aluminium cladding fitted neatly and secured in position by means of pop rivets.

MK.02.04 The cladding shall be machined rolled and designed to provide a secure and snug fit, presenting a neat and tidy appearance completely free of any distortion.

MK.02.05 All cut-outs around pipes, valves, fittings, thermostats, bolts, doors, etc., shall be closed with purpose-made cover plates of first class approved quality and all joints shall be properly sealed so that the glass fibre insulation is completely hidden and sealed within the aluminium cladding.
MK.03.0 CYLINDERS IN BOILER HOUSES AND PLANT ROOMS

MK.03.01 As specified in Part MP of the Specification Document the indirect cylinders shall be pre-insulated at the manufacturer’s works with packed fibreglass encased in purpose made mild steel jackets in standard finish.

MK.03.02 Should this method of insulation not be specified, the cylinder insulation shall be as Clause MK.02.02 above.

MK.04.0 FLUE PIPES

MK.04.01 Flue pipes, with the exception of purpose made twin-wall (insulated) flues shall be provided with an expanded metal sheath fixed on metal spacers in such a way as to maintain a 40mm air space between the insulation and the outer surface of the flue pipe metal.

MK.04.02 The outer surface of the expanded metal sheath is then to be completely insulated with fibreglass Crown Wired Mattress, wired one side, or other approved material, to a thickness of 40mm securely fixed and further enclosed in 22 gauge class ‘O’ aluminium cladding in accordance with details previously described in Clause MK.02 in respect of the aluminium cladding.

MK.05.0 BOILER HOUSE/PLANT ROOM AND PUMP ROOM PIPEWORK

MK.05.01 All pipes carrying water are to be insulated with Fibreglass Plain Rigid Sections, to the thickness detailed in Clause MK.035, MK.36 or MK.37, as applicable.

MK.05.02 Sections are to be close butted with bends insulated to the same standard, mitred and cut to fit on site, all neatly wired (for larger bored pipework) or overlap self adhesive (for smaller bore pipework) as approved by the Contract Administrator.

MK.05.03 Where pipes are likely to be used to support weight then limited use of a heavier density material will be specially selected positions to prevent undue distortion of the insulation and cladding.

MK.05.04 After the Rigid Sections have been fixed in position, they are to be further enclosed and finished in 22 gauge aluminium cladding or 'Isogenopak' plastic cladding, as detailed in the Part MP of the Specification Document, which shall be machined rolled and designed as described in Clause MK.02 in respect of fixing, finishing, jointing and securing, etc.

Cont’d
MK.05.0 BOILER HOUSE/PLANT ROOM AND PUMP ROOM PIPEWORK
(Cont'd)

MK.05.05 Where applicable all ends are to be capped off with aluminium cover plates securely fixed in a neat and approved manner so that bolts may be easily withdrawn from flanged joints.

MK.05.06 Care must be taken that all glands, valves, unions, flange joints, thermostats and other pipe immersion accessories, etc., are to be insulated with purpose made boxes which shall ensure that they are not fouled in any way and that easy access is maintained at all times to facilitate maintenance or repair without recourse to dismantling in any way the finished insulation.

MK.05.07 When 'Isogenpak' cladding is used for Boilerhouse pipework the connections from Boilers, for a minimum distance of 250mm, must be made with aluminium cladding to avoid the possibility of the 'Isogenpak' plastic cladding scorching or burning.

MK.06.0 EXTERNAL PIPEWORK EXPOSED TO ATMOSPHERE

MK.06.01 All heating, hot water, cold water and vent pipes fitted externally, shall be insulated with Fibreglass Plain Rigid Sections, to the thickness detailed in Clause MK.37.

MK.06.02 The Sections shall be held in position by four ties per section. Sections are to be carefully mitred around bends and obstructions etc., and similarly supported. Insulation to be finished with 22 gauge class 'O' aluminium cladding, fitted so as to shed water and to be secured by means of rivets. The finish shall be neatly cut and rolled to fit.

MK.06.03 All bends, flanges and valves shall be insulated with specially fabricated covers in the same material as the pipework.

MK.07.0 EXTERNAL AND INTERNAL PIPEWORK IN DUCTS

MK.07.01 All heating, hot water, cold water and vent pipes fitted in drained structural ducts or ducts within floor slabs, are to be insulated with Fibreglass Plain Rigid Sections (with Class 'O' facing), to the thickness detailed in Clause MK.035, MK.36 or MK.37, as applicable.

MK.07.02 The section shall be held in position by four ties per section.
MK.07.03 The insulation shall be covered with 0.8mm PIB sheeting, all edges and end laps to be sealed with white spirit.

MK.07.04 Sections shall be carefully fitted around bends, etc., and covered with tailored 0.8mm PIB sheeting and sealed with white spirit.

MK.07.05 Points where the PIB is penetrated are to be sealed with a suitable sealant to the manufacturer's recommendations.

MK.08.0 PIPEWORK IN CEILING VOIDS, VERTICAL DUCTS/TANK ROOMS AND ALL OTHER CONCEALED LOCATIONS

MK.08.01 All heating, hot water, cold water and vent pipes are to be insulated with Fibreglass Rigid Sections, (with Class 'O' facing) to the thickness detailed in Clause MK.035, MK.36 or MK.37, as applicable.

MK.08.02 Sections held in position by 3 bands per section are to be close butted and all longitudinal overlaps are to be sealed with a suitable adhesive to the manufacturer's recommendations.

MK.08.03 Butt joints are to be sealed with 100mm wide self adhesive white lacquered dead soft aluminium foil tape, applied over a clean surface and firmly pressed down.

MK.08.04 Bends shall be insulated mitred and cut to fit, with joints sealed with adhesive and matching self adhesive tape.

MK.08.05 The installer must be careful not to damage the decorative facing.

MK.09.0 PIPEWORK IN ROOF SPACES

MK.09.01 All pipework for heating, hot water and cold water, shall be insulated if the following conditions prevail.

MK.09.02 Cold Roof (i.e. insulation at Ceiling level) Heating, hot water and cold water shall be insulated (with Class 'O' facing) to the thickness as indicated for external cold water services Clause MK.37 with thermal conductivity 0.056 - 0.070

MK.09.03 Warm Roof (i.e. insulation at tile level) Heating, hot water, cold water shall be insulated all as per Clause MK.08

MK.09.04 Valves All valves shall be fitted with glass fibre jackets with hooks and eyes for secure fixing. The insulating level within the jackets shall be equivalent to that of the pipework.
MK.10.0 PIPEWORK IN EXTERNAL BACKFILLED TRENCHES
MK.10.01 All external cold water and gas mains, buried in the ground shall be installed in accordance with the local Water Board and Gas Board regulations and as described elsewhere in Part MP of the Specification Document.

MK.11.0 PIPEWORK IN INTERNAL ROOMS AND BASEMENT AREAS
MK.11.01 All visible heating and domestic hot water pipework where not required as useful heating surface, situated in occupied or building circulating areas, where appearance is of some importance, shall be insulated as indicated in Clause MK.05, incorporating an aluminium or 'Isogenpak' plastic clad finish. These areas are to be clearly indicated on the contract drawings.

MK.12.0 PIPEWORK IN KITCHENS AND FOOD STORES
MK.12.01 All high level heating and domestic hot/cold water pipes in kitchens not required as useful heating surface, and all water service pipes at high and low level in Food Stores shall be insulated as indicated in Clause MK.05, incorporating an aluminium or 'Isogenpak' plastic clad finish. The external cladding shall be sealed with bands to provide a vapour barrier.

MK.13.0 OIL PIPELINES
MK.13.01 Installations using 28 and 35 seconds oil should have oil lines Denso wrapped only. Denso wrapping shall be applied to all buried or external lines including oil feed, fill line and vent. Insulation and/or Denso wrapping shall be applied only after all pipework has been cleaned of all rust and grease and painted with two coats of red oxide or equal paint. The tape shall be of width 50mm or 100mm with 50% overlap.

MK.14.0 COLD WATER FEED AND STORAGE TANKS
MK.14.01 All cold water feed and storage tanks, unless otherwise stated on contract drawings, shall be insulated with Fibreglass Rigid Duct Insulation, Foil Faced (with Class 'O' facing), or other approved material to thickness given in Clause MK.37, fixed externally to all four sides, top and bottom of each tank.

Cont’d
**MK.14.0 COLD WATER FEED AND STORAGE TANKS** (Cont’d)

**MK.14.02** The top slab to be fitted over cover slotted for expansion pipes, etc. Slabs shall be firmly and permanently secured in position by means of an approved adhesive in a neat and tidy manner providing full safeguards against frost damage.

**MK.14.03** Care should be taken that insulation does not foul or impede access to any drain or control valve, float switch gear, thermostats, or pressure switches, etc., fitted to tank or adjacent pipework.

**MK.14.04** It should be noted that all works shall conform to Water Supply (Water Fittings) Regulations 1999.

**MK.15.0 FEED AND VENT PIPES**

**MK.15.01** All feed and vent pipes shall be insulated for their full length with insulating material in accordance with this specification and their position relative to the building, ensuring full protection against possible frost damage.

**MK.16.0 ELASTOMERIC INSULATION**

**MK.16.01** Where called for in the Part MP of the Specification Document insulation may be used as an alternative to rigid fibreglass as detailed below.

**MK.16.02** Cold Water Services Frost protection in accordance with Part II

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>Class I</th>
<th>Class 'O'</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>25mm</td>
<td>32mm</td>
</tr>
<tr>
<td>22mm</td>
<td>19mm</td>
<td>22mm</td>
</tr>
<tr>
<td>28mm</td>
<td>19mm</td>
<td>22mm</td>
</tr>
<tr>
<td>35mm</td>
<td>9mm</td>
<td>13mm</td>
</tr>
</tbody>
</table>

**MK.16.03** Hot Water Services and Central Heating Energy conservation with building regulations.

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>Class I</th>
<th>Class 'O'</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm</td>
<td>13mm</td>
<td>19mm</td>
</tr>
<tr>
<td>22mm</td>
<td>19mm</td>
<td>22mm</td>
</tr>
<tr>
<td>28mm</td>
<td>22mm</td>
<td>32mm</td>
</tr>
<tr>
<td>35mm</td>
<td>28mm</td>
<td>35mm</td>
</tr>
<tr>
<td>above 35mm</td>
<td>32mm</td>
<td>40mm</td>
</tr>
</tbody>
</table>

Cont’d
MK.16.0 ELASTOMERIC INSULATION (Cont’d)

MK.16.04 For 15mm pipes in unheated areas, e.g. loft spaces, insulation for frost protection will be required, i.e. 25mm of Class I or 32mm of Class 'O'.

MK.16.05 Above tables are based on minimum thickness in accordance with sections 1.52 and 1.53 of approved Building Regulations Document L or BS 5422:2001 as appropriate.

MK.16.06 In BS5422:2001, heated areas have an ambient still air temperature of 20°C, while unheated areas have ambient still air temperature of -1°C.

MK.16.07 The thickness of insulation has been calculated on a thermal conductivity at 40°C of 0.039W (mK) for Class I elastomeric material and 0.044W/(mK) for Class 'O' elastomeric insulation.

MK.17.0 PLASTIC INSULATION

MK.17.01 Plastic insulation must comply with the Control of Asbestos Regulations 2006 together with all relevant and current health and safety regulations.

MK.17.02 In the event of plastic insulation being specifically requested for the boiler house and/or Plant Room, on the contract drawing, or alternatively in the case of a need to match new or replacement boiler house equipment with existing, such plastic insulation shall be completely free of any asbestos content and provided as detailed in the following clauses.

MK.18.0 BOILERS AND CYLINDERS (PLASTIC INSULATION)

MK.18.01 All to be covered with 85% magnesia plastic composition, applied in three or four coats, depending on thickness, in the following manner:-

(a) Wire brush and clean down all pipes to remove all rust and grease.

(b) Apply first layer of 6mm heat resistant high quality plastic insulation to form key coat.

(c) Apply 85% magnesia plastic composition in layers of 12.5mm - 25mm to final thickness detailed in Clause MK.035, or MK.36 as appropriate with reinforcing mesh included as necessary. Sufficient time must be allowed to ensure that each coat is properly dried out before subsequent coat. A minimum time of twelve hours shall be allowed between each coat and also before painting.

Cont’d
MK.18.0 BOILERS AND CYLINDERS (PLASTIC INSULATION) (Cont’d)

(d) Apply 25mm mesh 19 s.w.g. galvanised wire netting reinforcement to boilers, or cylinders (also pipes of 65mm dia. and over) which must be securely fitted.

(e) Apply 12.5mm thick hard setting coat trowelled perfectly smooth.

(f) The whole to be painted as described in Clauses MK.30 & MK.31

MK.19.0 FLUE PIPE (PLASTIC INSULATION)

MK.19.01 Boiler flue pipes and horizontal steel chimneys shall be covered with high temperature plastic composition applied as described above, to a total thickness of 40mm and reinforced with wire netting beneath hard setting coat. (Drying out and painting sequence as described above).

MK.19.02 A 25mm air space must be provided between flue pipe and covering by means of an expanded metal foundation securely fixed to metal bands with spacing pieces.

MK.19.03 The rectangular smoke box on boilers shall not be insulated, nor inspection covers and blank flanges.

MK.20.0 BOILER HOUSE AND PLANT ROOM PIPEWORK (PLASTIC INSULATION)

MK.20.01 All heating and domestic hot water pipes in boiler house and/or plant room shall be insulated with plastic composition as specified for boilers in Clause MK.17. Covering to have straight tapers formed at flange joints to allow bolts to be withdrawn and all edging to be formed by the use of flat angle taper rather than by concave or convex finish.

MK.20.02 Thickness of plastic covering to be as follows:-

<table>
<thead>
<tr>
<th>Pipe Bore</th>
<th>Key Coat</th>
<th>Magnesia Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mm-150mm incl.) Boilers &amp; Cylinders</td>
<td>6mm</td>
<td>Clause MK.35 or MK.36 as appropriate</td>
</tr>
</tbody>
</table>
MK.21.0   EXISTING WORK
MK.21.01 Where existing covering is damaged or disturbed due to alterations or extensions it must be made good or replaced to the standard indicated in this specification compatible with the matching-up of existing insulation and finish as far as is practicable.

MK.22.0   RECTANGULAR AIR DUCTWORK IN PLANT ROOMS
MK.22.01 Unless otherwise indicated on the contract drawings, all ductwork situated in boiler houses or plant rooms shall be insulated with Fibreglass Rigid Duct Insulation of 65mm thickness with type ‘O’ facing, or other approved material.
MK.22.02 The insulation is to be cut to fit so that top and bottom pieces overlap the sides and shall be bonded to the ducting using a suitable adhesive, applied in accordance with the manufacturer’s recommendations.
MK.22.03 The insulation on the underside of the ducting is to be additionally supported by means of suitable insulation hangers at 300mm centres.
MK.22.04 All insulation slabs are to be closely butted together and all joints are to be sealed by means of matching self adhesive tape, 100mm wide.
MK.22.05 In order to maintain the continuity of the vapour barrier, where hangers penetrate the finish, it shall be sealed with a recommended sealant.
MK.22.06 The insulation shall be protected by means of 22 gauge aluminium cladding.
MK.22.07 The Installer must ensure that the vapour barrier is not punctured when applying the aluminium cladding.

MK.23.0   CIRCULAR/oval AIR DUCTWORK IN PLANT ROOMS
MK.23.01 Unless otherwise indicated, on the contract drawings, all ductwork situated in boiler houses or plant rooms shall be insulated with Fibreglass ‘Lamella Mat’ of 80mm thickness or other approved material.
MK.23.02 The insulation is to be wrapped around the ductwork and bonded with a recommended adhesive applied in accordance with the manufacturer’s instructions.

Cont’d
MK.23.0 CIRCULAR/OVAL AIR DUCTWORK IN PLANT ROOMS (Cont’d)

MK.23.03 All insulation joints are to be sealed by means of a matching self adhesive tape, 100mm wide. Any exposed edges of the insulation and any other points, where the covering is penetrated, are to be sealed with a suitable sealant.

MK.23.04 The insulation shall be protected by means of 22 gauge aluminium cladding.

MK.23.05 The installer must ensure that the vapour barrier is not punctured when applying the aluminium cladding.

MK.24.0 AIR DUCTWORK WHERE VISIBLE INSIDE BUILDING

MK.24.01 Where appearance is important and ductwork is fixed in visible position inside the building, the insulation and finish is to be in accordance with Clause MK.21.

MK.24.02 This must apply in all cases where insulation is subject to maltreatment or vandalism. These areas are to be clearly indicated on the contract drawings.

MK.25.0 RECTANGULAR AIR DUCTWORK IN ROOF SPACE, VOIDS AND CONCEALED LOCATIONS

MK.25.01 Unless otherwise indicated, on the contract drawings, all ductwork in concealed locations shall be insulated with Fibreglass 'Lamella Mat' of 80mm thickness or other approved material, except that the aluminium cladding may be omitted.

MK.25.02 The insulation shall be wrapped around the ductwork and bonded with a recommended adhesive, applied in accordance with the manufacturer’s instructions.

MK.25.03 All insulation joints shall be sealed by means of a matching self-adhesive tape, 100mm wide. Any exposed edges of the insulation and any other points, where the covering is penetrated, are to be sealed with a suitable sealant.

MK.25.04 As extra security, galvanised wire netting shall be used to secure the bonded insulation to the ductwork.

MK.25.05 The Installer must ensure that the vapour barrier is not punctured when applying the wire netting.
MK.26.0 CIRCULAR/OVAL AIR DUCTWORK IN ROOF SPACE, VOIDS AND CONCEALED LOCATIONS

MK.26.01 Unless otherwise indicated on the contract drawings, all ductwork shall be insulated with class 'O' facing Fibreglass 'Lamella Mat' of 80mm thickness or other approved material.

MK.26.02 The insulation shall be wrapped around the ductwork and bonded with a recommended adhesive, applied in accordance with the manufacturer's instructions.

MK.26.03 All insulation joints shall be sealed by means of a matching self-adhesive tape, 100mm wide. Any exposed edges of the insulation and any other points, where the covering is penetrated, are to be sealed with a suitable sealant.

MK.26.04 As extra security, galvanised wire netting shall be used to secure the bonded insulation to the ductwork.

MK.26.05 The Installer must ensure that the vapour barrier is not punctured when applying the wire netting.

MK.27.0 RECTANGULAR AIR DUCTWORK (EXTERNAL)

MK.27.01 Unless otherwise indicated on the contract drawings, all ductwork run externally shall be insulated with Fibreglass 'Lamella Mat' of 80mm thickness or other approved material.

MK.27.02 The insulation shall be wrapped around the ductwork and bonded with a recommended adhesive, applied in accordance with the manufacturer's instructions.

MK.27.03 All insulation joints shall be sealed by means of a matching self-adhesive tape, 100mm wide. Any exposed edges of the insulation and any other points, where the covering is penetrated, are to be sealed with a suitable sealant.

MK.27.04 The Installer must ensure that the aluminium or PIB cladding is so installed as to shed water and is completely waterproof.

MK.28.0 CIRCULAR/OVAL DUCTWORK WARM AIR/AIR CONDITIONING (EXTERNAL)

MK.28.01 Unless otherwise indicated on the contract drawings, all ductwork, run externally, shall be insulated.

Cont’d
MK.28.0  CIRCULAR/oval DUCTWORK WARM AIR/air CONDITIONING (EXTERNAL) (Cont’d)

MK.28.02  The insulation shall be wrapped around the ductwork and bonded with a recommended adhesive, applied in accordance with the manufacturer's instructions.

MK.28.03  All insulation joints shall be sealed by means of a matching self-adhesive tape, 100mm wide. Any exposed edges of the insulation and any other points, where the covering is penetrated, are to be sealed with a suitable sealant.

MK.28.04  The Installer must ensure that the aluminium or PIB cladding is so installed as to shed water and is completely waterproof.

MK.29.0  SCAFFOLDING, LADDERS, CLEANING, FINISHING, ETC

MK.29.01  The Installer is to provide his own scaffolding, ladders, etc., where necessary and all plastic materials are to be mixed in his own receptacles. All residue and surplus materials are to be cleared from the site on completion and the boiler houses and/or plant rooms left thoroughly clean and tidy.

MK.29.02  Where the painting and/or decoration of the boiler house / plant room etc is to be carried out by others the Installer should liaise for this to be carried out after the covering has been completed, but before it is painted, i.e. insulation finishes to be applied only after all other work is completed. The Installer should also ensure that all ducts or trenches are properly cleaned out and reasonably dry prior to commencing the insulation work therein.

MK.30.0  PAINTING (PLASTIC)

MK.30.01  All plastic insulation in boiler houses and/or plant rooms shall be painted as follows:-

(a)  2 coats of Crown Sealer - Clear or equal
(b)  1 coat Crown Hard Gloss (Undercoat) - White or equal
(c)  1 coat Crown Hard Glass (Finish) - White or equal.

MK.30.02  Each coat to be thoroughly dry before applying the next.

MK.30.03  This sequence of treatment is to apply in all reference to 'painting' incorporated in any other clause, or note on contract drawing(s), in which the colour may be the same or may vary according to description.

Cont’d
MK.30.0 PAINTING (PLASTIC) (Cont’d)

MK.30.04 25mm wide identification colour bands are to be painted on all paintwork covering at approx. 2m centres.

MK.30.05 Identification colours are also to be painted on all flanged joints and valves in boiler houses and/or plant rooms

MK.31.0 GENERAL PAINTING AND IDENTIFICATION BANDS

MK.31.01 Where insulation is enclosed in aluminium cladding it is to be left thoroughly clean and in natural finish. Under no circumstances should the aluminium be painted. PVC identification colour bands shall be provided at 2m intervals in accordance with BS 1710 and applicable to colour chart code. PVC flow direction arrows shall be fitted at 3m intervals.

MK.31.02 Oil lines are to be painted in accordance with BS 1710:1984 and colour chart code in boiler houses and/or plant rooms. Oil lines external to building to be treated with two coats of red oxide paint, further wrapped in Denso or Lanofilm weather proofing tape.

MK.31.03 All pumps, flanges and valves in boiler houses and/or plant rooms are to be treated with two coats of paint in accordance with the applicable services colour indicated on the colour chart.

MK.31.04 Where boilers, oil burners, calorifiers and/or accelerators have tubular, brick, concrete bases or piers, these shall be painted black.

MK.31.05 Boiler platwork, doors, bases, brackets, supports and all exposed ironwork in boiler house, plant room and ducts to be treated 2 coats of black heat resisting Crown paint after being thoroughly cleaned. All copper and galvanised drip-pipes in boiler house to be treated with two coats of paint in accordance with the colours indicated on the colour chart.

MK.31.06 All plastic covering in boiler houses and/or plant rooms will continue to be painted in one standard colour, i.e. white. Bare pipework, flanges and valves etc situated between straight tapers, shall be painted to the colours indicated on the colour chart.

MK.31.07 Pipes in trenches, if in plastic covering, to be painted throughout in accordance with the colour chart. If these pipes however are insulated in glassfibre, identification colour bands only will be used every 2m irrespective of finish.

Cont’d
MK.31.0 GENERAL PAINTING AND IDENTIFICATION BANDS (Cont’d)

MK.31.08 All pipework, whatever the finish, which is not immediately identifiable must have identity colour bands fitted at 2m intervals in accordance with BS 1710:1984 colour code indicated on chart.

MK.31.09 In order to standardise on colour bands for engineering pipework, the following colour chart will be used. This chart is in accordance with the latest B.S.1710:1984 (See also table 15:8 - Part 15 Symbols and Notations).

<table>
<thead>
<tr>
<th>Pipe Contents</th>
<th>Basic Colour</th>
<th>Colour Code Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking Water</td>
<td>Green</td>
<td>Blue</td>
</tr>
<tr>
<td>Cooling Water</td>
<td>Green</td>
<td>White</td>
</tr>
<tr>
<td>Boiler Feed Water</td>
<td>Green</td>
<td>Crimson/White/Crimson</td>
</tr>
<tr>
<td>Condensate Water</td>
<td>Green</td>
<td>Crimson/White/Crimson</td>
</tr>
<tr>
<td>Central Heating</td>
<td>Green</td>
<td>Blue/Crimson/Blue</td>
</tr>
<tr>
<td>&lt;100°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Heating</td>
<td>Green</td>
<td>Crimson/Blue/Crimson</td>
</tr>
<tr>
<td>&gt;100°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold, down Service</td>
<td>Green</td>
<td>White/Blue/White</td>
</tr>
<tr>
<td>Rainwater</td>
<td>Green</td>
<td>Green/Black/Green*</td>
</tr>
<tr>
<td>Greywater</td>
<td>Green</td>
<td>Green/Black/Green**</td>
</tr>
<tr>
<td>Hot Water Supply</td>
<td>Green</td>
<td>White/Crimson/White</td>
</tr>
<tr>
<td>Fire Extinguisher</td>
<td>Green</td>
<td>Safety Red</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Light Blue</td>
<td>Light Blue</td>
</tr>
<tr>
<td>Steam</td>
<td>Silver Grey</td>
<td>Silver Grey</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Yellow Ochre</td>
<td>Yellow Ochre</td>
</tr>
<tr>
<td>Oil (Furnace Fuel)</td>
<td>Brown</td>
<td>Brown</td>
</tr>
</tbody>
</table>

*Reclaimed water: green/black/green bands with an additional white band in the centre and the words RECLAIMED WATER

**Grey water: green/black/green bands and the words GREY WATER

MK.31.10 All pipework above duct level and within the building, which is not included elsewhere in this specification will be finished by others.

MK.31.11 On repair work, or where alterations to existing plant are involved, all covering which is disturbed must be made good and repainted as called for in this specification. Where this work is in an existing boiler house the whole of the equipment, new and existing, is to be repainted in accordance with this specification.

MK.31.12 Cylinders and pipes in boiler houses, insulated in plastic, must be completely dried out and dust free before any painting is carried out. Prime with Crown Universal Primer thinned with up to one pint of white spirit to one gallon of primer. Follow with two coats of Crown Duradio Gloss used as supplied. Allow 24 hours drying time between coats.

Cont’d
MK.31.0  GENERAL PAINTING AND IDENTIFICATION BANDS (Cont’d)

MK.31.13  Suitably degrease all galvanised iron or copper surfaces before painting. Primer all bare metal with Crown Calcium Plumbate Metal Primer and finish with two coats of Crown Duradio Gloss or two coats of Crown Plus Two.

MK.32.0  DUCTWORK PAINTING AND IDENTIFICATION

MK.32.01  In accordance with BS 1710:1984 identification tags are to be placed at 3m intervals, or as appropriate, on all ductwork outside the plant room for easy identification, indicating 'Warm Air Supply', 'Conditioned Air Supply', 'Recirculation Air', 'Fresh Air', 'Extract', or as appropriate.

MK.33.0  CROSS REFERENCE

MK.33.01  This part of the Specification document must be read in conjunction with the contract drawings and Part MP of the Specification Document which may incorporate overriding cross reference clauses.

MK.34.0  LIAISON

MK.34.01  Insulation work must be programmed in such a way as to ensure that no part of the work causes inconvenience or delay, either to other trades or the client, particularly in respect of services situated in ducts or trenches, which if left open for protracted periods of time, whilst awaiting the insulation works, can seriously impede the progress of the Contractor's programme of works.

MK.34.02  It is the Installer’s responsibility to ensure against any such delays or hold-ups and to arrange the programme of his specialist works to comply in full with the requirements of the Contract. Boiler house and plant room insulation and painting are to be completed in its entirety within a reasonable time of the completion of the plant and pipework installation therein.
MK.35.0  THICKNESS OF INSULATION FOR HEATING INSTALLATIONS

Declared thermal conductivity (Wm°C)

<table>
<thead>
<tr>
<th>Size of Tube</th>
<th>LTHW Systems 50°C to 100°C</th>
<th>MTHW Systems 101°C to 150°C</th>
<th>HTW Systems 151°C to 200°C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.035</td>
<td>0.042</td>
<td>0.050</td>
<td></td>
</tr>
<tr>
<td>to</td>
<td>to</td>
<td>to</td>
<td></td>
</tr>
<tr>
<td>0.042</td>
<td>0.050</td>
<td>0.060</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cu/Fe (mm/mm)</th>
<th>Minimum thickness of insulation (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/15</td>
<td>25</td>
</tr>
<tr>
<td>22/20</td>
<td>25</td>
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<td>28/25</td>
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<td>25</td>
</tr>
<tr>
<td>54/50</td>
<td>25</td>
</tr>
<tr>
<td>67/65</td>
<td>25</td>
</tr>
<tr>
<td>76.1/80</td>
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<tr>
<td>108/100</td>
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<td>133/125</td>
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<tr>
<td>159/150</td>
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<td>175</td>
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<tr>
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</tr>
<tr>
<td>300</td>
<td>32</td>
</tr>
<tr>
<td>Flat Surfaces</td>
<td>32</td>
</tr>
</tbody>
</table>

Glass Fibre Thermal Conductivity = .055 W/m°C  
Rocksil = .043 W/m/ m°C
### MK.36.0  THICKNESS OF INSULATION FOR DOMESTIC HOT WATER/COLD WATER SERVICES WITHIN THE BUILDING

Declared thermal conductivity (W/m°C)

<table>
<thead>
<tr>
<th>Size of Tube</th>
<th>10°C - .031</th>
<th>50°C - .035</th>
<th>100°C - .042</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>mm</th>
<th>Minimum thickness of insulation (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>25</td>
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<tr>
<td>22</td>
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<tr>
<td>67</td>
<td>32</td>
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<td>76.1</td>
<td>32</td>
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<td>108</td>
<td>32</td>
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<td>133</td>
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<tr>
<td>Flat Surfaces</td>
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</tbody>
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____________________________________________________
MK.37.0 THICKNESS OF INSULATION FOR COLD WATER SERVICES AND HEATING AND HOT WATER SERVICES REQUIRING FROST PROTECTION

<table>
<thead>
<tr>
<th>Size of tube</th>
<th>Pipework within Buildings/External pipework</th>
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<tr>
<td></td>
<td>10°C - .031</td>
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<tr>
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</tbody>
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<table>
<thead>
<tr>
<th>Cu/Fe Minimum thickness of insulation (mm)</th>
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<tbody>
<tr>
<td>mm/mm</td>
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<tr>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>15/15 32 38</td>
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<tr>
<td>22/20 32 38</td>
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<tr>
<td>28/25 32 38</td>
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<td>35/32 32 38</td>
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<tr>
<td>54/50 25 25</td>
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<tr>
<td>67/65 25 25</td>
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<tr>
<td>76.1/80 25 25</td>
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<tr>
<td>108/100 19 25</td>
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<tr>
<td>133/125 19 25</td>
</tr>
<tr>
<td>159/150 19 25</td>
</tr>
<tr>
<td>Flat 19 25</td>
</tr>
</tbody>
</table>
INDEX TO CLAUSES

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ML.01.0 GENERAL

ML.01.01 The control system will be detailed in Part MP of the Specification Document and the Contract drawings.

ML.01.02 For all control systems other than direct one-to-one methods, e.g. a Building Energy Management Systems (BEMS) controls package, the Mechanical Installer shall engage the services of a Controls Specialist who shall liaise with the Contract Administrator and/or his authorised representative to discuss the philosophy of operation of all plant and associated equipment and finalise the strategy. And finally carry out all the works

ML.01.03 Prior to the commencement of any works on site the Controls Specialist shall submit to the Contract Administrator for approval in both paper and electronic format three copies of the following:

i. all schematic drawings,
ii. point schedules,
iii. valve schedules,
iv. panels and ancillary equipment,

all of which shall fulfil the operational philosophy as delineated in Part MP of the Specification.

ML.01.04 The aforementioned schematic drawings shall include not only panel wiring but field wiring as well to present a complete package.

ML.01.05 Dimensioned drawings showing the front layouts and internal wiring arrangements of all Control Panels shall be submitted to the Contract Administrator for approval before manufacture of the Control Panels commences.

ML.01.06 Whilst Testing and Commissioning of the Controls is covered by another part of the Specification Document, the Controls Specialist shall ensure that all of his work is fully tested and set to work prior to the commencement of works by the Commissioning Engineer.

ML.01.07 All of the controls wiring installation shall be carried out under the direction and supervision of the Controls Specialist as an integral part of the controls package and carried out to BS 7671: 2008 + A1: 2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition in conjunction with the Electrical Services Installer and the Mechanical Services Installer.
ML.02.0 SITING OF CONTROL PANELS

ML.02.01 All control panels shall be installed in positions easily accessible without the requirement for ladders or other staging equipment.

ML.02.02 All control panels shall be so installed as to ensure that the area in front of the panel is unobstructed for a minimum of 1000mm and 500mm to each side.

ML.02.03 The Installer shall ensure that control panels are well illuminated and are provided with emergency illumination.

ML.03.0 CONTROL PANEL CONSTRUCTION

ML.03.01 The control panel shall be constructed of sheet metal of 2mm minimum thickness and be of the totally enclosed, floor and/or wall mounting as specified in Part MP of the Specification or as agreed with the Contract Administrator following the discussions referred to in Clause ML. 01.02 .

ML.03.02 The control panel shall be cubicle type suitable for front access, and constructed to comply with all relevant British Standards. All door sections shall be vertically hinged.

ML.03.03 Panel construction shall typically be Form 2, unless instructed otherwise, with separate power and control sections linked together. The power section shall be door isolator interlocked. Door isolators shall be self-supporting and must engage without obstruction when closing the cabinet door.

ML.03.04 The power section shall not contain any item of equipment which may have to be accessed, for maintenance or monitoring purposes, during normal running of the plant. Outstations, Motor Speed Inverters with displays and keypads, all 24 volt control relays, switching modules with manual overrides etc shall all be located outside the power section. Motor Speed Inverters should normally be fitted without the control panel to keep panel size to a minimum.

ML.03.05 Removable gasketted gland plates shall be provided on control panels as either top or bottom entry in accordance with the Controls Engineer’s requirements. Gland plates should be removed for any on-site drilling, to prevent ingress of metal cuttings into contactors and relays. If this is unavoidable then care must be taken when drilling gland plates in situ by protecting all internal controls equipment.

Cont’d
ML.03.0 CONTROL PANEL CONSTRUCTION (Cont’d)

ML.03.06 In order to maintain the IP Rating of the panel the installation electricians must plug any unused holes left in the control panel gland plates.

ML.03.07 All doors, mounting and gland plates shall be earth bonded in accordance with BS 7671: 2008 + A1: 2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition.

ML.03.08 The power and control sections of the panel shall be lockable and must be supplied with the same key number for every panel.

ML.03.09 Each panel shall have a minimum of 10% surplus space on the backplate and 10% spare incoming terminal connections to allow for future modifications.

ML.03.10 Each panel shall have a fixed document holder fitted on the inside of the control section door. This shall be large enough to accommodate the soft-backed O&M Manual supplied for that panel.

ML.03.11 On completion of commissioning, the panel shall be cleaned, inside and out, and all redundant drawings and equipment removed before presentation for handover.

ML.04.0 CONTROL PANEL CIRCUITRY

ML.04.01 Rigid, slotted plastic trunking, capable of accepting an additional 25% volume of wiring, shall be used for internal wiring. Incoming field wiring must not be routed through this trunking. However, where applicable, e.g. on larger panels or panels with vertical termination blocks down the side of the panel, additional slotted plastic trunking shall be provided by the panel manufacturer to accommodate the incoming field wiring.

ML.04.02 DIN Rail mounted terminals shall be provided as required, each individually numbered with clip-on permanent markers, to correspond with the panel wiring diagrams. Sufficient space shall be left above the terminal rails for incoming cable looms and trouble-free connection of terminations. The smallest terminal must be capable of accepting a 2.5mm² conductor.

Cont’d
ML.04.0 CONTROL PANEL CIRCUITRY (Cont’d)

ML.04.03 Mains and three phase conductors shall be segregated from extra low voltage conductors. Under no circumstance should “Banked” terminal rails be installed. Both panel and field terminals should be easily accessible at all times. Knife type terminals shall be provided for all low voltage field power supplies such as actuators, humidity sensors, pressure transmitters etc.

ML.04.04 All control circuits shall be extra low voltage (ELV) 24 volts AC, supplied via a transformer with a minimum rating of 500VA to ensure proper operation in the event of a power off / power on situation. A separate 24 volt transformer shall be provided for equipment power supplies e.g. actuators, sensors etc.

ML.04.05 All ELV power supplies shall have “panel healthy” lamps and be BEMS monitored. Transformers shall be protected by MCB’s on the primary and secondary sides. The secondary side shall be appropriately earthed. No other fusible protection such as packaged internal fuses shall be acceptable.

ML.04.06 “Permanently Live” circuits should not be engineered unless it is a specified requirement of the installation i.e. critical plant. (except internal socket, see Clause ML.03.16). Plant that will automatically reset on resumption of power or gas circuits feeding such items do not require to be permanently live. All permanent live circuits should be properly shrouded and identified with “white on red” traffolyte warning labels.

ML.04.07 All control circuits and transformers shall be fed from the Brown Phase.

ML.04.08 All internal wiring shall be in LSF cable. Control wiring to be 0.75mm² minimum. Power cables to be rated to the full load current according to the current IEE regulations. All cables to be colour coded as follows:

a. 3 Phase: Brown, Black, and Grey
b. Neutral: Blue
c. Control Wiring: 24V AC White, 0V AC Grey
d. ELV DC: Purple

ML.04.09 24-volt control circuits shall be wired in LSF cable with a cross sectional area capable of carrying the higher currents associated with ELV control circuits, in the event of a power off / power on situation.

ML.04.10 Where multiple 24-volt AC control circuits are supplied from the same transformer, then the 24-volt and zero-volt leg of each circuit shall be protected by a two-pole MCB.

Cont’d
ML.04.0  CONTROL PANEL CIRCUITRY (Cont’d)

ML.04.11 Critchley type ferrule markers shall be used to identify all control panel terminations in line with the panel wiring diagrams supplied by the Controls Specialist Contractor.

ML.04.12 All internal cables shall be crimped at both ends and any screened cable insulated with Neoprene type sleeving to prevent accidental earthing.

ML.04.13 All exposed live electrical connections and terminations within both the power and control sections shall be shrouded against accidental contact.

ML.04.14 Control panel drawings shall have these Input/Output reference numbers clearly identified to allow panel manufacturers and site electricians to label correctly.

ML.04.15 Critical plant interlocks shall be designed such that all protection is hard-wired and fail-safe. These interlocks shall be duplicated on the BEMS system as software alarms but never used as a substitute for hard-wired interlocks e.g. fire alarm, pressurisation units, airflow switches, water flow switches, damper end switches etc.

ML.04.16 Each control panel shall have a 13amp switched socket outlet, supplied from the live side of the main panel isolator, fitted inside the control section to power a laptop computer for commissioning and service engineers.
ML.05.0 PANEL EQUIPMENT

ML.05.01 Motor Starters shall be of the non enclosed type with coils rated at 24 volts AC. No motor starters should be switched directly from a control circuit in the field due to potential volt drops. These should be fed via pilot relays.

ML.05.02 MCBs shall provide electrical protection for all fans, pumps, and control circuits. Fuses shall not be used. Motor rated MCB’s should be used throughout.

ML.05.03 An MCB identification chart shall be supplied and permanently fitted inside the control section door of the panel inside a plastic wallet.

ML.05.04 Fixed engraved traffolyte labels shall be used to identify all equipment within the control panel viz. relays, contactors, MCBs, thyristors, timers, inverters, transformers and associated equipment.

ML.05.05 A hard wired 10 second delay timer shall be fitted in the control panel to prevent all the commands within an outstation switching on instantaneously after a power off / power on or fire alarm. This timer shall then initiate software hold off timers within the outstation to facilitate a staggered start sequence of plant.

ML.05.06 Control relays shall be Omron or approved equivalent with 8 or 11 pin plugs in bases. Relay coils shall be of a suitable size so that induced voltages or leakage currents do not maintain the relay when de-energised. All control relays shall have visual indication to show they are energised, e.g. flag or LED, and have a "manual override lever" for test purposes.

ML.05.07 Where there is a combination of different coil voltages for plug-in relays within a control panel then the relay bases shall be of a different pin configuration to avoid the possibility of inadvertently plugging in a relay of one voltage into the base of another voltage.

ML.06.0 FASCIA EQUIPMENT

ML.06.01 All fascia switches and indicating lamps shall be identified with fixed engraved black on white traffolyte labels. The panel reference number shall be engraved on a fascia plate located at the top centre of the power section door.

ML.06.02 Fascia switches which override automatic functions of plant shall have “HAND/OFF/BEMS” or “HAND/OFF/AUTO” engraved on their fascia plates.

Cont’d
ML.06.0 **FASCIA EQUIPMENT** (Cont’d)

ML.06.03 A common lamp test pushbutton shall be provided on the panel door.

ML.06.04 Panel fascia lamps shall be provided to display all run and fault conditions of the plant and panel power supply statuses. These shall be duplicated on the BEMS as software alarms and digital inputs. Where starters are provided, the run signal shall be from an auxiliary contact.

ML.06.05 Field equipment such as Inverters, Boilers, VSD pumps etc shall have a “true run” signal provided. Fascia indication lamps must not be switched directly from circuits in the field; pilot relays shall be used where necessary.

ML.06.06 LED type indicator lamps shall be used for panel fascia indication in the following colour configuration as defined by BS EN 60204-1:2006+A1:2009

<table>
<thead>
<tr>
<th>Colour</th>
<th>Meaning</th>
<th>Explanation</th>
<th>Action by operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td>Emergency</td>
<td>Hazardous condition</td>
<td>Immediate action to deal with hazardous condition (for example switching off the machine supply, being alert to the hazardous condition and staying clear of the machine)</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Abnormal</td>
<td>Abnormal condition Impending critical condition</td>
<td>Monitoring and/or intervention (for example by re-establishing the intended function)</td>
</tr>
<tr>
<td>BLUE</td>
<td>Mandatory</td>
<td>Indication of a condition that requires action by the operator</td>
<td>Mandatory action</td>
</tr>
<tr>
<td>GREEN</td>
<td>Normal</td>
<td>Normal condition</td>
<td>Optional</td>
</tr>
<tr>
<td>WHITE</td>
<td>Neutral</td>
<td>Other conditions; may be used whenever doubt exists about the application of RED, YELLOW, GREEN, BLUE</td>
<td>Monitoring</td>
</tr>
</tbody>
</table>
ML.07.0 BEMS SYSTEMS HARDWARE

ML.07.01 Outstations shall be complete with all necessary input/output cards, modules etc. required to provide a fully operational controls package.

ML.07.02 All outstations shall have 10% spare capacity for each point type.

ML.07.03 The outstation power supply shall be fed from the live side of the main panel isolator, through a discrete MCB, to enable the outstation to remain on line when opening the power section of the panel.

ML.07.04 Where outstations are supplied and mounted within other Original Equipment Manufacturers’ supplied package plant (A/C Units, AHUs, and Fan Coils etc), the Controls Specialist shall complete all the necessary work to connect into the networks, commission the communications and provide the necessary displays. They shall not change any pre-configuration of the OEM supplied control/monitoring strategies without written permission of the unit manufacturer.

ML.07.05 Where modems are required they shall be permanently fitted using a bracket within either the control section of the panel, mounted in the outstation or mounted externally in a separate box. Modem indicating LED’s shall be visible to plant operators. Modems shall be silent in operation.

ML.08.0 FIELD WIRING

ML.08.01 The field wiring shall be carried out by the Electrical Services Installer under the direction and supervision of the Controls Specialist following approval of the drawings submitted in clause ML1.03.

ML.08.02 The Controls Specialist, as an integral part of the Controls Package, shall install all control panels and field equipment.

ML.08.03 The installation shall comply with BS 7671: 2008 + A1: 2011, Requirements for Electrical Installations Wiring Regulations Seventeenth Edition and Section ED of the C.L.A.W. Electrical Specification Document. These shall be adhered to in conjunction with the following requirements.

ML.08.04 Critchley type ferrule numbers shall be used to clearly identify all field wiring at both the equipment and control panel ends. The numbers shall match the terminal numbers shown on control panel drawings. Cont’d
ML.08.0 FIELD WIRING (Cont’d)

ML.08.05 Communication cables between outstations shall be clearly identified at both ends with Critchley type ferrule numbers and stating cable destination. All LAN and WAN drawings shall be updated with this information after each project.

ML.08.06 Electrical isolation of field equipment shall ensure complete isolation of ELV control circuits in addition to Phase power supplies. E.g. 24-volt control circuits to boilers, chillers, pressure units etc. Sufficient poles shall be provided to meet any design requirement.

ML.08.07 Inverters shall be installed with full isolation on both the input and output sides. An early break contact on the output side should be allowed for as a fourth pole in accordance with the manufacturer’s recommendations. All control circuits must be isolated on the input side through additional poles on the local isolator.

ML.08.08 All low voltage input / output wiring from outstations to field equipment shall be wired in screened, twisted-pair cable (see Appendix A for exact specification) with the screen grounded to earth at the Outstation end only. The field end of the cable shall have the screen removed and the cable end insulated with Neoprene type sleeving to protect against inadvertent connection to earth.

ML.08.09 Outstation communication cable shall be installed in screened four core cable as standard with the screen earthed in accordance with the Control Specialist’s recommendations.

ML.08.10 Where field equipment is supplied with "flying leads" attached, e.g. damper actuators, valve actuators etc, then these must be left intact and joint boxes used for final terminations.

ML.08.11 The wiring shall be contained in trunking, basket and or conduit as specified in Part MP of the Specification Document and the Contract drawings and particular attention shall be taken to regulation 5.28.1. of BS 7671: 2008 + A1: 2011.

ML.08.12 All cables shall be drawn in after the erection of the conduit and trunking systems complete with all outlet boxes etc. Cable runs between terminal points shall be installed without intermediate joints.

ML.08.13 Where it is necessary to make direct connection between the hard wiring and flexible cables, the wiring is to terminate in a circular conduit box behind the fitting which shall contain a porcelain shielded connector and heat resisting tails shall connect to the equipment item.

Cont’d
ML.08.0 FIELD WIRING (Cont’d)

ML.08.14 Care shall be taken over bends and Tees to avoid undue cable stress. Never pull / stretch structured cables with more than 25 pounds (3.456kgs) of force.

ML.08.15 Care shall be taken to ensure that bends do not exceed 4 times the cable overall diameter as a minimum radius and that conduits do not exceed 40% capacity.

ML.08.16 Cables shall be fixed to the wire basket by means of Velcro straps in such a manner to avoid ‘pinching’.

ML.08.17 During installation the Electrical Services Installer shall ensure that no undue stress is placed upon any cables. Cables shall not be left coiled trailing from cable baskets on to the floor where they may be trodden upon or otherwise damaged. Any cable found to be in a degraded condition will be rejected.

ML.08.18 Where controls cables are contained in trunking / basket with other similar cables they shall be taped together at intervals of no more than 2 metres using PVC marking tape bearing the words ‘control cables’.

ML.09.0 FIELD EQUIPMENT GENERAL

ML.09.01 Field equipment shall be fully accessible for inspection and maintenance and due consideration should be given to this when locating and installing equipment.

ML.09.02 All field equipment shall be installed to the manufacturer’s recommendations. It shall be the Control Specialist’s responsibility to identify the optimum position of all field equipment at the appropriate time in the contract.

ML.09.03 Special consideration should be given to the IP Rating of field equipment located externally. The Controls Specialist shall include for weatherproof boxes/housings to protect all actuators, sensors, duct thermostats, pressure switches etc which shall be installed outside the weatherproof envelope of the building.

ML.09.04 All modulating control valves shall have characterised ports. Rotary shoe valves should not be used for control of coils or heat exchangers. Installed valves and actuators should meet the design requirements of temperature, medium, pressure and speed of control.

Cont’d
ML.09.0  FIELD EQUIPMENT GENERAL (Cont’d)

ML.09.05  All field equipment, sensors, actuators, pressure switches, thermostats etc shall be clearly identified with a fixed traffolyte engraved label. These should be engraved as per the control drawing description and reflect mechanical plant references.

ML.09.06  Safety interlocks to field equipment such as pressurisation units shall be designed and installed as hard-wired, fail-safe to ensure panel interlocks are operated during local isolation. Sufficient poles shall be supplied on local isolators for this purpose.

ML.09.07  Field switches where positive operation is required shall be designed as “normally open” i.e. makes on operation; e.g. airflow prove, water flow prove etc.

ML.09.08  All critical systems and major AHUs, pumps and fans shall be monitored by Differential Pressure switches or other appropriate equipment. Where Variable Speed Inverter controlled pumps are installed, differential pressure switches shall be fitted to monitor positive flow condition. These switch signals shall be duplicated in software on the BEMS system with indicating lamps on the control panel fascia.

ML.09.09  Automatic gas valves should be of the 240-volt solenoid type with provision of an auxiliary contact for individual BEMS and control panel fascia lamp indication.

ML.09.10  All items of mechanical equipment e.g. valves, actuators etc. shall be handed to the Mechanical Installer, under signature, for installation.

ML.10.0  SENSORS

ML.10.01  All sensors must be capable of being removed from ductwork/pipework for inspection and maintenance purposes without removal of ductwork, pipework or thermal insulation.

ML.10.02  All sensors shall be installed to operate within the design range of the medium and as close to the middle range as practicable. All sensors must be suitable for their operating environment, installed in the optimum position for control and calibrated as appropriate.

ML.10.03  Where over-boiler high heat sensors are fitted, then these shall be manual reset “mercury drop” type
ML.11.0 ACTUATORS

ML.11.01 Actuators for all modulating valves and dampers shall have a power supply voltage of 24 volts AC and a control voltage of 0-10 volts DC. Actuators shall be fully open at 10 volts DC and fully closed at zero volts DC. On/off applications may use digital actuators in conjunction with auxiliary switches as appropriate. “Pulsed Pair” actuators shall NOT be used for modulating control. All actuators shall be capable of manual override with provision of a lever for this purpose.

ML.11.02 Fresh air dampers on full fresh air systems shall have 24-volt AC shut off damper actuators complete with end switches. Each end switch shall energise a dedicated relay in the control panel. One pole of this relay will interlock with the fan starter circuit and another pole will provide a dedicated damper open / closed signal to the BEMS system.

ML.11.03 Where the actuator is required to be overridden open in a duct frost condition then a separate 10-volt DC supply unit mounted in the control panel shall supply it.

ML.12.0 UTILITY SERVICES METERING

ML.12.01 Water, gas and electricity meters shall normally be monitored by the BEMS system via pulsed outputs from utility meters.

ML.12.02 Meter pulses shall be collated in the outstations and relayed daily back to a database on the main Supervisory Terminal

ML.12.03 The utility services metering database shall be easily accessible to the Contract Administrator in both graphical and tabulated formats to enable energy analysis of each installation.

ML.13.0 OPERATION & MAINTENANCE MANUALS

ML.13.01 Four copies of the Operation & Maintenance (O&M) Manuals shall be submitted in a consistent format to the Contract Administrator within two weeks of completion of each project.

ML.13.02 Three sets of Manuals shall be hardback ring-bound copies. The fourth copy shall be soft backed, suitable for insertion in the control panel document holder described in the Control Panel section.

ML.13.03 Manuals shall be titled with project name, date on front cover and on the spine. Manuals shall be indexed with page numbers and sections clearly identified to assist navigation.

Cont’d
ML.13.0 OPERATION & MAINTENANCE MANUALS (Cont’d)

ML.13.04 The Manuals shall be broken down into the following sections:

Section 1 - Description of Operation.
This section shall contain floor plans and a plant summary followed by a general Controls Narrative with a detailed description of the operation of each item of plant controlled by the BEMS system.

Section 2 - Outstation Data Tables / Outstation Connection Drawings.
This section shall contain input and output usage charts for outstation hardware and software points including all sensors, nodes etc.

Section 3 - Outstation Strategy Drawings / Flow Charts and Points Display List.
This section shall contain all relevant software strategy diagrams and relevant flow charts for each item of plant controlled. This section shall also contain a display printout of all points contained within each of the outstations on the project.

Section 4 - Control Panel Drawings / Wiring Diagrams.
This section shall contain all wiring diagrams and panel fascia layout drawings associated with the project including details of any revision changes that have taken place. Wiring diagrams shall be presented in a standard, consistent, structured format. They shall contain all wiring core numbers and panel termination numbers. A relay cross-reference chart shall be included in this section to enable relay contacts to be traced. Outstation LAN communication wiring diagrams shall be included in this section clearly showing the “break in” connections to existing communications buses.

Section 5 - Commissioning Details and Controls Settings.
This section shall contain all commissioning test and record sheets for control panels, fans, pumps, valve actuators etc. It shall also include settings for all control loops including set points, proportional bands, integral action times, differentials etc. The settings shall be recorded in Excel Spreadsheet format with additional columns for recording changes to the control loops after final commissioning.

Section 6 - Maintenance Instructions.
This section shall contain the relevant service schedule and instructions for maintaining all controls equipment to the standard that is required by the equipment supplier.
ML.13.0 OPERATION & MAINTENANCE MANUALS (Cont’d)

ML.13.04 (Cont’d)

Section 7 - Technical Literature.
This section shall contain all relevant data sheets and instructions for control equipment on the project.

Section 8 – Handover Documentation.
This section shall contain copies of all completion/acceptance/handover documentation, duly signed by the Controls Specialist and the Contract Administrator, together with a Snagging List of items of works outstanding at time of handover, together with proposal dates for completion.

ML.13.05 In addition to the four copies of the Operation & Maintenance (O&M) Manuals referred to in clause ML.13.01 the whole of the content shall also be submitted in electronic format to the Contract Administrator within two weeks of completion of each project.

ML.14.0 COMPLETION CERTIFICATE

ML.14.01 On completion of the installation and testing of the system a "Completion Certificate" stating that all the works have been carried out in a satisfactory manner in accordance with all relevant standards and to the approval of the Contract Administrator.

ML.15.0 INSTRUCTION PERIOD

ML.15.01 After the installation has been completed, tested and handed over to the Employer, and when instructed, the Controls Specialist shall demonstrate to the persons appointed by the Employer to be in charge, the operation of the system, correct settings and controls etc. to attain the desired functions of the whole controls package.

ML.15.02 The instructional period may not take place immediately on completion, but when considered desirable by the Contract Administrator and the Controls Specialist shall include for three separate all day visits.

ML.15.03 Any particular project requirements concerning the instructions shall be as indicated in Part MP of the Specification Document.

Cont’d
ML.16.0 WARRANTY

ML.16.01 The Controls system shall include a 12 months warranty period, commencing from the issue of the Certificate of Practical Completion by the Client, which is to include the replacement of any defective equipment and the necessary labour costs.

ML.16.02 The Controls Specialist shall include for a return visit to site each and every month during the 12 months warranty period to check the operation of all equipment.

ML.16.03 Any adjustments which prove necessary shall be carried out and a written report shall be issued to the User Client with a copy to the Contract Administrator.
SAMPLE
SUMMARY OF TENDER

FOR

Project Title
Mechanical Services.

<table>
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Installation of Heating .............................................
Installation of Cold Water Services ..................................
Installation of Cold Water Services ..................................
Installation of Gas Services .........................................
Installation of Fire Fighting Equipment ..............................
Installation of Ventilation .............................................
Installation of Air Conditioning ......................................
Installation of Controls System .......................................
Installation of Internal Sanitary Plumbing ...........................
Installation of Thermal Insulation ....................................
Provisional Sum Access 5000.00
Maintenance .................................................................
Working Drawings ...........................................................
Record Drawings ............................................................
Manuals ...........................................................................

TOTAL TENDER FIGURE .....................................................

State total amount of tender in words

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SIGNED .................................................................

FOR AND ON BEHALF OF .............................................

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DATE .................................................................

Note: VAT is not included in the above totals, but shall be shown as a separate amount as follows:-

(VAT at 17.5% of the Sub Total equals £.................................)