

YORKSHIRE NORTH & EAST METHODIST DISTRICT – PATHWAYS TO NET ZERO

PROJECT: ST JOHN METHODIST CHURCH, MARKET WEIGHTON

ASHP - MECHANICAL SPECIFICATION

INTRODUCTION

The proposed works are a move towards the decarbonisation of the building away from the present gas fired boiler which provides the space heating. An Air Source Heat Pump (ASHP) located externally adjacent to the existing boiler room and connected via additional plant and equipment to the existing heating system as described in this specification and drawings.

The Contractor shall employ the services of an Electrical Contractor to provide a design and the installation of the electrical requirements associated with these works.

Compliance with Statutory Instruments, Regulations and Byelaws

The Contractor shall install and complete the works in accordance with the following relevant requirements:-

- Building Regulations.
- British Standards Specifications.
- CIBSE
- BESA
- The Chartered Institute of Plumbing and Heating Engineering
- Health and Safety at Work Act.
- Statutory Instruments.
- Local Authority Byelaws.
- Electricity Supply Regulations.
- Current IEE Regulations for the Electrical Equipment of Buildings.
- Gas, Water and Electricity Authorities' requirements.
- All relevant Codes of Practice.
- Notify all Authorities in accordance with their Byelaws.

SCOPE OF WORK

It is the intention to retain the existing gas fired boiler and pump as a back-up for the new heat pump arrangement as well as the existing heating system. The existing under floor heating control shall remain and be incorporated into the new heat pump system to start the heat pump on demand signal from the existing. The existing boiler and pump shall be provided with a new time controller and temperature sensor to operate the boiler independently should the new heat pump be unavailable or fails to heat the spaces due to extremely cold weather. The switchover can be done manually by the user. The attached layout and schematic is indicative arrangement and any additional equipment that the contractor has deemed necessary shall be included in the tender.

The existing electricity supply is 2 phase 100A, the new heat pump requires a 3 phase supply, the contractor shall include for supplying all necessary information and to apply for an upgrade of this supply to a 3 phase with the DNO.

A drawing is provided to establish the minimum standards required, the contractor shall survey the existing installation, plant and distribution systems and incorporate accordingly into the new system.

Existing Heating

The existing heating arrangement consists of a single gas fired boiler distributing via a single pump to 3no heating zones which are controlled by a unit located adjacent to the underfloor heating manifold which provides a start signal to the boiler and time control.

- Zone 1: Chapel underfloor heating.
- Zone 2: Entrance.
- Zone 3: Upstairs.
- 2no 2 port valves in boiler room.

The heating system is pressurised via a quick fill mains cold water connection and expansion vessel.

Stripping Out

The intention is to safely isolate and strip out gas boiler with associated flue, and redundant pipework etc, both the pressurisation unit (not the expansion vessel) and dosing pot shall be carefully disconnected and reconnected to the new arrangements as shown on drawings, (a new expansion vessel shall be installed for the new system).

New Heating System with Air Source Heat Pumps

The new ASHP heating system shall generally consist of 1no Mitsubishi CAHV-R450YA-HPB operating to generate LPHW at 70°C, a 300L buffer vessel shall also be incorporated into the new heating system as well as a set of duty and standby circulation pumps. The new system shall be connected to the existing 2no heating zone arrangements.

NEW EQUIPMENT

ASHP for Heating

1no Mitsubishi CAHV-R450YA-HPB, operating at 50°C, 40 kW at -5°C, TP&N 50A complete with TW-TH16E Thermistor, PAR-W31MAA-J(HH) Remote controller, Procon MelcoBEMS mini A1M-R5 and anti-vibration mounts.

New Heating Circulation Pumps from HP to Buffer P-1 & P-2

Grundfos Magna 3 D 40-100 F, duty and standby, auto-change over, 1.9 Kg/s at 40 Kpa, SP&N 297W.

New Heating Circulation from Buffer to Heating System Pump P-3 & P-4

Grundfos Magna 3 D 32-100 F, duty and standby, **SP&N 165W.**

Buffer Vessel for Heating

Flamco, Flex Therm PS 300, factory insulated.

New Heating Expansion Vessel

Flamco 100L.

Dirt and Air separator

Arrow Valves Model ADR40FP551.

Dosing Pot

BOSS 3.5L.

PROGRAMME

The contractor shall provide an outline program for the works on awarding of contract.

INSTALLATION REQUIREMENTS

All services shall be installed to achieve reliability and disruption free operations. All components shall be fully accessible for maintenance and replacement. Items requiring regular adjustment or affording isolation facilities, where located in concealed positions shall have removable access covers, tiles, or other suitable provision made to afford ease of access.

Contractor to satisfy himself that all plant spaces are adequate to house all items of plant as described.

The Contractor shall confirm all equipment sizes prior to ordering.

All services shall be installed with all aspects of Health and Safety at Work fully considered. All systems shall be installed to be economical in operation and particular emphasis shall be placed on the use of energy conserving design techniques and reliable components.

When preparing installation drawings, the Contractor shall have due regard for all aspects of the building design, location of all proposed services and shall make himself aware of any co-ordination problems which need to be resolved before the installation commences.

All dimensions given on drawings shall be verified by the Contractor on site before the installation commences.

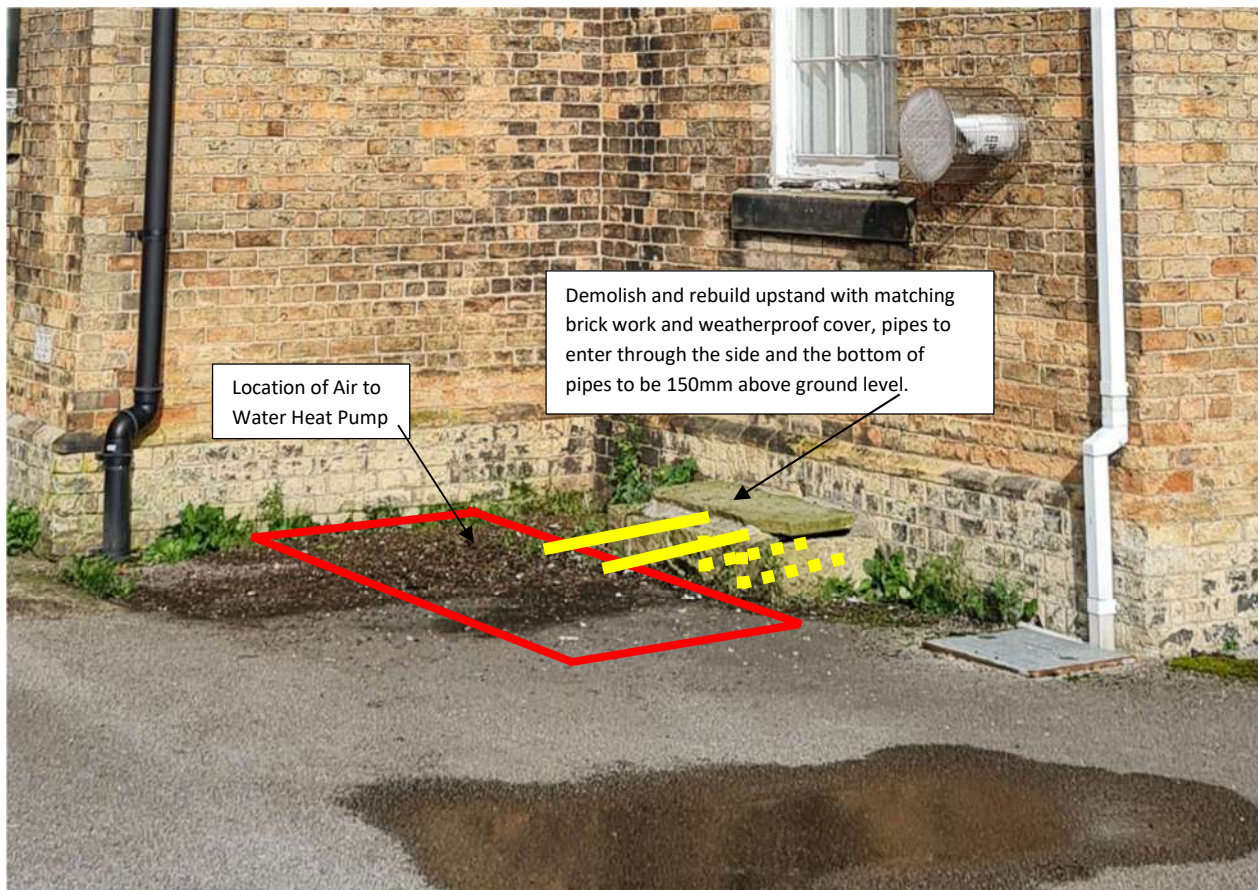
Builders Work

The builders work associated with the Mechanical Installation works shall be executed by this Contractor. The builders work comprises the elements of building work necessary to incorporate the services installation into the building/structure, fabric and finishes including cutting out of all chases, holes, forming openings and pipe sleeves, provision of supports/noggins in walls to accommodate fixing of services equipment.

The contractor shall include for all access equipment, lifting tackle, scaffolding, manual handling equipment, personal protective equipment and site operatives to enable all materials required for the works to be safely delivered, moved around the site, hoisted into position and installed.

The following is a schedule of the builder's work which shall be adopted as guidance only and shall be not limited to it:

ASHP and Builders Work



- Contractor shall excavate existing tarmac surface and construct a concrete pad for mounting ASHP's; 1250 mm wide x 2150 mm long x 100 mm high above ground level.
- Provide purpose made Security Enclosure for ASHP's, to be chain link type to provide free air flow. Enclosure shall be fixed to wall and base and enclosing ASHP's on three sides, 2300 mm wide x 4100 mm long x 2400 mm high. Enclosure shall have single door with pad lock to allow maintenance to the units.
- An existing upstand, which is a redundant coal chute, shall be demolished and similar built to allow a route for new pipework to the existing basement boiler room. This enclosure shall be suitably constructed to prevent rainwater entering.

TENDER DRAWINGS

DRAWING NUMBER	DRAWING TITLE
1838-MWE-D3A-XX-XX-DR-A-0101 P01	EXISTING PLANS
1838-MWE-D3A-XX-XX-DR-A-0105 P01	EXISTING ELEVATIONS
1838-MWE-D3A-XX-XX-DR-A-2005 P01	PROPOSED SITE PLAN
1838-MWE-D3A-XX-XX-DR-A-3601 P01	PROPOSED ELEVATIONS
1838-MWE-D3A-XX-XX-DR-A-5601 P01	PROPOSED PLANS & MECH. LAYOUT

INSTALLATION OF HEAT PUMP UNIT

It shall be the contractor’s responsibility to locate the units to provide unobstructed air flow, access for servicing and maintenance and correct installation of pipe work. The units shall be complete with extended height anti-vibration mounts and located and securely fixed on a concrete pad with security fencing and a lockable access door.

All field supplied pipework shall be connected to the unit(s) by two 600 mm long braided steel flexible pipes, (insulated) on the flow and return connections, supplied with the unit. All internal and external pipework shall be insulated to ensure minimal heat loss and with external pipework having maximum weather protection. The insulation shall be closed cell foam insulation (Armaflex or equivalent). All insulation joints shall be joined by tape/glue to reduce heat losses and with external pipework protected with an approved paint finish to prevent UV degrading.

Electrical Installation

The contractor shall employ a fully qualified Electrical Contractor and Control Specialist to provide the power and the necessary controls as required below. It will be required that the contractor includes for an electrical load test be carried out on the existing electrical system before any works commence, it shall be left to the contractor to decide the duration of the test to determine the existing maximum load. As previously mentioned, the existing 2 phase electricity supply will require upgrading to a 3 phase, the contractor shall include all necessary works to facilitate this.

Electrical requirements of New Equipment (To be confirmed by contractor)

ASHP’s for Heating

1 no Mitsubishi CAHV-R450YA-HPB, **TP&N 50A**.

New Heating Circulation from HP to Buffer Pump

Grundfos Magna 3 D 40-100 F, duty and standby, **SP&N 269 w**.

New Heating Circulation from Buffer to Heating System Pump

Grundfos Magna 3 D 32-100 F, duty and standby, **SP&N 165 w**.

PIPEWORK AND FITTINGS

Pipework

D3A-1838-013-T30-R1

All pipework shall be copper tube to BS 2871 Part 1 Table X assembled with Yorkshire 'YP' capillary ring fittings up to and including 54 mm to BS 864 employing 'lead free' solder rings or GEBERIT MAPRESS, Carbon steel for heating. For ease of maintenance compression type fittings shall be used at connections to equipment.

Pipework Insulation

The following services shall be thermally insulated:

- The LTHW Heating installation, internal and external, different.

Insulation shall be carried out by an approved firm being a member of the Thermal Insulation Contractors' Association. Insulation shall not be applied to any service until all the systems have been tested and witnessed and be in accordance with this specification. All surfaces shall be thoroughly cleaned down and damaged areas painted before insulation is applied.

The thickness of the insulation (based on a 'k value' of 0.04 W/mK) shall be in accordance with the details indicated in the following table.

Pipe Size mm	LTHW Htg	HWS	MCWS
15	25	30	30
20/22	25	30	30
25/28	25	30	30
32/35	25	40	30
40/42	25	40	30
50/54	25	40	30

Insulation materials containing CFCs or where CFCs are used in the manufacturing process shall not be permitted.

INSULATION MATERIALS

Internal Plant Room: Insulation material for internal pipework shall be mineral rock fibre rigid sections complying with BS 3958 Part 4; BS 5422, BS 476 Part 4 or 'Koolpen'. The internal pipework insulation shall be finished in aluminium paper foil providing a Class 'O' surface spread of flame with all joints sealed. Bends and fittings shall be insulated with similar sections neatly mitred to fit with all joints sealed with aluminium tape with waterproof covering OSOGENOPAK or equal.

External pipework: Insulation material for external pipework shall be 'Kooltherm' pipe insulation in accordance with BS EN 14314. Insulation shall have factory applied reinforced foil vapour barrier jacket with waterproof covering OSOGENOPAK or equal and insulated pipe supports (see external brackets).

Insulation of all valves and flanges in plant spaces shall be by fully insulated with purpose made ceramic filled valve/flange jackets neatly sewn throughout complete with velcro band fasteners and draw chords.

BRACKETS AND HANGERS

All brackets and hangers shall be fitted with special attention to freedom for expansion either in horizontal or vertical planes and for air elimination and drainage. Supports for pipework shall be arranged to allow freedom for expansion movement.

Where it is not practicable to use standard commercially manufactured brackets, the Contractor shall supply and fix suitable purpose made supports to suit the positions. All pipelines shall be individually supported; pipes slung from other pipes shall not be permitted.

All metal supports, tees, angle and channel iron, screws, bolts, etc. shall be provided and fixed by the Contractor who shall be responsible for the accurate setting out of same.

Table of Maximum Spacings for Pipework Supports

	Horizontal Spacings Metres			Vertical Spacings Metres		
Nominal Pipe Size mm	Steel or Iron Pipes	or UPVC ABS Pipes	or Copper Pipes	Steel or Iron Pipes	or UPVC ABS Pipes	or Copper Pipes
15	1.8	0.8	1.2	2.4	1.2	1.8
20	2.4	0.8	1.2	3.0	1.2	1.8
25	2.4	0.9	1.5	3.0	1.3	2.4
32	2.4	1.0	1.8	3.0	1.5	3.0
40	2.4	1.1	1.8	3.7	1.6	3.0
50	2.4		1.8	3.7		3.0

ISOLATING VALVES

Sizes up to and including 50 mm shall be Crane Fig. D155C/D151A/D237A gate valve, solid wedge disk, non rising stem, screwed in bonnet handwheel or lockshield pattern as applicable, threaded to BS 21, pressure rating PN20 or equal and approved. Alternatively, Crane Fig. D171 ACEXS improved leak resistance, bronze ball valve, quarter turn, lever operation, with extended stem to suit insulation thickness shall be used, include for adaptor kits for copper pipe. All valves on domestic Hot and Cold Water Services shall be WRAS approved.

Double Regulating Valves (DRV)

Sizes up to and including 50mm shall be Crane Fig. D921/ D923 double regulating valve (Y-Pattern globe valve incorporating a characterised throttling disk), 1" to 2" taper threaded to BS EN 10226-2 (ISO 7 – 1), ½" and ¾" parallel threaded to BS EN ISO 228-, pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Fixed Orifice Double Regulating Valves (FODRV)

Sizes up to and including 50mm shall be Crane Fig. D933/ D934 double regulating valve (Y-Pattern globe valve incorporating a characterised throttling disk), 1" to 2" taper threaded to BS EN 10226-2 (ISO 7 - 1), ½" and ¾" DN15 & DN20 parallel threaded to BS 2779 EN ISO 228-, pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Commissioning Valve Sets (CS)

Sizes up to and including 50mm shall be Crane Fig. D942, D941 or D940 depending on flow rate, fixed orifice double regulating valve, 1" to 2" threaded to BS EN 10226-2 (ISO 7-1), ½" and ¾" DN15 & DN20 BS 2779 (ISO 228) pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Check Valve (NRV)

Sizes ¾" to 3" shall be Crane Fig. D138, depending on flow rate, bronze swing check valve with metal disk, taper threaded to BS EN 10226-2 (ISO 7-1), pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Strainer (STR)

Heat Pump shall be fitted with heat pump manufacturers type F1 filter.

Air Vents

Air cocks and air bottles shall be provided and fixed in the positions indicated on the drawings and where they may be required to vent the installations. Three air cock keys shall be handed to the Employer. Automatic air vents shall be installed at all high points in the system in order that the full system is automatically vented. These shall be Flamco Flexvent Super installed complete with an isolating ball valve or equal.

Drain Cocks (DC)

The Contractor shall fit drain cocks to ensure that the entire system can be drained down. Drain cocks in Plant Rooms shall be of the gunmetal plug type with interchangeable hose unions and loose level handles. Emptying cocks above floors shall be fixed as unobtrusively as possible and are to be brass draw-off plugs type.

Thermometers.

Provision shall be made for temperature measurement by installing thermometer pockets in the positions indicated on the drawings and where specified. Pockets shall be stainless steel and comply with BS 2765 with external threads for attachment to the pipework and internal threads to accept the detecting element of a thermometer. Fittings shall be arranged so that the thermometer can be easily read from an access area. Pockets shall be filled with an approved paste or oil to ensure an accurate reading.

Thermometers shall be mercury in steel direct monitoring type with 100mm dial complying with BS 5235. The dial shall be graduated so that the normal working temperature is in the midpoint of the scale.

Pressure Gauges

Provision shall be made for pressure measurement by installing gauge connections in the positions indicated on the drawings and where specified. Gauge connectors shall comprise copper syphon pipe to BS 2871 Table X complete with gauge cock. Gauge cocks shall be bronze construction with lever handles and ends screwed to BS 21 to suit connections to the pressure gauge. Pressure gauges shall be direct mounting Bourdon type with 100mm dials complying with BS 1780 scaled in kPa on the outer scale and bar on the inner scale. Each pressure gauge shall be complete with an adjustable red pointer which can be set at the normal working pressure of the system. Pressure gauges shall have dials calibrated to read from zero to 1.3 times and not more than twice the operating pressure.

TESTING AND COMMISSIONING

The Contractor shall include for the Testing and Commissioning of only the systems and plant installed under this contract.

Commissioning generally shall be carried out in accordance with the CIBSE Commissioning Codes and Publications.

Plant and Equipment

All plant and equipment specified of this specification shall be tested either on site or at the manufacturer's works in accordance with the appropriate British Standards and Statutory requirements.

Heating Systems

The existing heating system shall NOT be pressure tested to prevent damage, the new pipework shall be tested to a working pressure (TBC), the test shall be maintained for a period of not less than 1 hour or as necessary.

All plant and equipment specified of this specification shall be tested either on site or at the manufacturer's works in accordance with the appropriate British Standards and Statutory requirements.

Commissioning

After the foregoing tests have been satisfactorily completed by the Contractor and at the appropriate stage of the works the Contractor shall carry out the necessary commissioning procedures which shall include the following:-

- a) Setting to work all systems and plant together with associated control systems as specified and ensuring that the performance requirements have been achieved.
- b) Balancing and regulating all systems and plant to meet specified performance requirements shall include the preparation of records/drawings giving the following typical information: -

OPERATION AND MAINTENANCE MANUALS

Digital cad files shall be provided by the consultant for the contractor, to be digitally updated for the provision of "as fitted drawings" to be incorporated into the O&M manuals.

The manual shall contain full Operating and Maintenance Instructions for each item of equipment presented in a form to deal systematically with each system and shall include for, but not be limited, to the following:

- Health and Safety Information
- Risk Assessment for the installations.
- Plant with nameplate details.
- Valves
- Automatic control items and systems and control settings.
- Type of lubricant required for each item and frequency of lubrication.
- Legend for colour coding of all services.
- Internal wiring diagrams of equipment and panels.
- Procedures for fault finding.
- Procedure to adopt in an emergency should any item fail in its operation.
- Itemised lists of essential and secondary spares for all plant and equipment.

- Index of As Fitted Drawing numbers and titles.
- Records of Performance Tests.

The manual shall contain Manufacturer's standard Operating and Maintenance Instructions and leaflets where these are applicable. Where the equipment is non-standard then information for the manual shall be obtained by the Contractor from the Manufacturer.

Standard 'hand-out' cards supplied by the manufacturers with the equipment shall be fixed by the Contractor to plant room walls adjacent to the equipment.

Demonstrations of plant operations to user.

The contractor shall include for arranging and demonstrating to the user the operation and maintenance requirements for all items of plant and equipment. This shall include but not limited to:

- Ascertaining the user's operation of the building and setting all automatic controls to suit these requirements without the detriment to the plant and equipment.
- Explaining and detailing the maintenance requirements of all plant and equipment during and after the 12-month defects liability period.
- Providing emergency contact details for defects to all equipment occurring during the 12-month defects liability period.

A record of the above shall be made by the contractor detailing the name(s) of the users and the contractors' representatives present and submitted as part of the O and M manuals.

Add in handover information required testing & commissioning certs etc.

HAND OVER REQUIREMENTS

Operating and Maintenance Instructions

No later than two weeks prior to the commencement of commissioning provide one draft copy of the manual for comment.

Issue the final version of the manual on completion of the works. (3 copies required plus one electronic copy). Each manual should be A4 size, in plastic covered loose-leaf ring binders with hard covers.

Ensure each manual contains the following information: -

Section 1 - General Index.

This section shall contain the index for the entire content of the manual.

Section 2 – Emergency Procedures

This section shall describe actions to be undertaken in the event of an emergency and shall include a full directory of names addresses and telephone numbers of individuals, or organisations to be contacted. A guide to fault finding.

Section 3 – System Operation

This section shall contain a description of each system, its operational intent, and a schedule of the parameters used as a basis for the design of that particular system.

A full legend for the colour coding of all services.

Section 4 – System Operation & Set points.

This section shall contain a description of operational routines, which includes procedures to be followed to 'start up' and 'shut down' all items of plant and equipment, how to undertake various testing procedures and fault finding.

A schedule of set point control settings for normal operation of each system shall also be included. Schedules system by system, of plant and equipment stating their locations, duties, and performance figures.

Section 5 – Schedule of Plant & Equipment

This section shall contain a full schedule of all plant and equipment, including duty, electrical load, flow rates and the like where applicable. A schedule of all equipment settings established during commissioning. Procedures for seasonal changeovers. The manufacturers name, address and telephone number for each item of plant and equipment.

Section 6 – Spares

This section shall contain comprehensive lists of spares and materials as proposed, a list of normal consumables and recommended lubricants.

Section 7 – Planned Maintenance Instructions

This section shall contain a description of planned maintenance instructions, for all systems and each item of plant and equipment, and must include step by step instructions, to supplement the manufacturer's literature.

This section shall contain manufacturer's literature, relevant equipment data only shall be extracted from the manufacturer's literature and included within these documents, literature which contains descriptions of equipment, which is of concern to the end user, shall not be included.

Recommendations as to the preventative maintenance frequency and procedures to be carried out to ensure efficient operation.

Where equipment is non-standard, information for the maintenance manual shall be obtained from its manufacturer.

Section 8 – Commissioning Results

This section shall contain a full set of the commissioning results for each system, presented in a format which is easily understandable, and which contains equipment and valve references which relate exactly to references noted on the installation and record drawings.

Originals of the following shall be provided:

- Main Plant Testing & Commissioning sheets.
- Chemical Cleaning Certificates.
- Water treatment analysis & regime.
- I.E.E. inspection and completion certificates.
- Manufacturer's Test Certificates for specialist equipment.
- Electrical services associated with the Mechanical Services Testing & Commissioning certificates.

Section 9 – As-Installed Drawings

The use of the base services layout drawings prepared by the Services Engineer will be permitted to enable the drawings required by this section of the works to be prepared. The engineer will not, under any circumstances, accept any responsibility for any discrepancies, errors or omissions in any of the base drawings provided by him.

These drawings shall indicate the routes and sizes of all external and internal services and the actual positions of all terminal points.

Section 10 – Electronic Copy of Documents

Three copies of the Operating & Maintenance Manuals shall be completed and Issued to the Engineer by the date of Practical Completion, Partial Possession or Taking Over.

Receipt of the completed Manuals by the Engineer shall be a condition precedent to the issue of any Certificate of Practical Completion, Partial Possession or Taking Over.

If for other reasons a Certificate of Practical Completion or Taking Over Certificate is issued without the Manuals being provided the adoption process may be delayed.