



Carbon 4 Projects

Rochdale Mechanical Services Specification

P01

Specification Details

Client	Greater Manchester FRS
Project Number	312991
Project Name	Carbon 4 Projects
Specification Title	Rochdale Mechanical Services Specification
Specification Number	312991-HAH-RD-XX-SP-05001
Specification Status	Stage 4
Specification Revision	P01

Specification - Systems

Ss_55_20_34_57 Natural gas supply systems0

Ss_60_40_37_48 Low-temperature hot water heating systems1

Ss_75_70_54_10 Building monitoring and management systems16

Ss_55_20_34_57

Natural gas supply systems

Systems

Ss_55_20_34_57 Natural gas supply systems

1. **Description:** The existing gas supply system should be stripped out back to the meter as far as reasonably practical. Where pipework drops below ground this should be cut, capped and left in situ. Where the meter is a distance from the building an allowance should be made for a GPR survey to ascertain the exact route of redundant below ground pipework which should be recorded on a drawing for future reference.

Where the natural gas supply is found to serve appliances other than the heating systems, works should cease and the Contract administrator should be notified immediately.

Ω End of System

Ss_60_40_37_48

Low-temperature hot water heating systems

Systems

Ss_60_40_37_48 Low-temperature hot water heating systems

1. **Description:** The scope of work to the heating systems shall consist of the following:
 - Strip out of existing boiler installation and primary pipework up to the Low Loss Header Connections
 - Strip out of all above ground gas pipework back to the utility provider's meter as far as reasonably practical.
 - Strip out of Existing gas fired unit heaters within appliance bay and store room
 - Installation of new Low and zero carbon LTHW plant within a suitable enclosure remote from the building
 - Installation of new distribution pipework to connect to the existing primary connections of the Low Loss Header
 - Design and Install of new BMS Outstation to be integrated into existing Trend IQ4 system.

Workmanship and BWICs is to be of a good quality. Generally, Finishes will be scrutinised by the client and design team and any detailing being snagged until all parties are happy. The quality requirement shall be monitored by the quality control team throughout the works.

Pipework shall be insulated in foil faced mineral fibre where located in ceilings, floors and voids and shall be venture clad finished in the plantroom. Insulation shall be installed over all brackets and pipework supports. Pipework shall be labelled in accordance with BS 1710.

The proposed heating system shall be controlled via the BMS. This shall be via a user friendly front end that shall allow the user to programme the zones and areas accordingly.

The LTHW pipework shall be suitably valved with suitable access where required.

All LTHW pipework shall be installed in screwed mild steel. Precision lo carbon steel will not be accepted. Small or microbore pipework shall not be used.

All LTHW pipework to be insulated to BS 5422. Expansion joints shall be provided as required to relieve thermal movement, but generally expansion shall be taken up naturally through the pipework layout. Any point where a pipe is made good or fire stopped when passing through a wall or floor must be treated as a fixed point when arranging the position of expansion joints but should not be relied on to anchor the pipe. The pipework shall not come in contract with the structure and the installation shall be arranged to prevent pipework 'creaking' on heating and cooling.

All high points in the LTHW heating systems shall have AAVs, all low points drain off cocks, all pump sets shall have pressure gauges either side with suitable pigs tail tubes and isolation valves, a 15 litre dosing pot and valves shall be installed between the flow and return of one of the circuits, binder points shall be installed at strategic points to allow pressure and temperature readings to be taken for all circuits or part of, temperature gauges shall be installed on primary and secondary circuits to allow flow and return temperatures to read.

The heating installation in its entirety shall be pressure tested, flushed and commissioned prior to handover.

The heating installation in its entirety shall be tested operationally for 24 hours prior to handover, and a certificate of operation provided by the contractor.

Testing, schedules and commissioning certificates shall be included within the O&M manuals for

the installation.

All LTHW installations to be inspected, tested and commissioned in accordance with manufacturers specifications.

The contractor shall allow for a full (or modification of) mechanical piped services schematic (including gas) to be framed and installed within each plantroom including a valve chart with corresponding valve tags.

The contractor shall be responsible for the procurement, supply, installation, coordination, testing, certification and commissioning of the LTHW heating systems.

The 2-stage Cascaded Heat pump system is a specialist designed item and as such all drawings, schedules and specifications relating to the system shall be used for tendering purposes only. The Heat pump system shall be supplied, procured, transported, installed & commissioned by Kooltech Ltd (0)345 034 4171 or equal and approved.

The connection to the building will be made and insulated using a Rehau connection kit by a Rehau trained and certified operative. The joints will be certified. The joints will be photographed prior to insulation. The pipework joints shall be left open until a successful pressure test has been achieved.

The preinsulated pipework shall be brought into the building using Preformed 'hockey sticks' to make the connections into the buildings

The preinsulated pipe shall be suitably sealed where it enters buildings to prevent water gas and rodent ingress.

The preinsulated pipe shall be suitably supported where it enters buildings to the manufacturers recommendations.

The preinsulated pex pipework shall convert from the preinsulated pipe (Rehau Rauthermex PEX) to Medium grade steel with suitable valving and shall be fully insulated.

The BMS will also provide timeclock control, temperature control and logic functions to ensure the correct operation of the heating and calorifiers.

The heating systems throughout the estate shall be provided with suitable water treatment to the manufacturers recommendations. The water treatment will be tested to ensure the concentration meets the manufacturers recommendations and certificated.

All valves and uninsulated equipment including any PHEs and calorifier access doors will be insulated with removable insulated bags with velcro fastenings. The insulated bags will be suitably designed for the valve, plant or equipment being insulated to ensure a good fit.

The system shall be installed to be self-venting. drain cocks shall be provided at all low points to facilitate drain down.

LTHW heating pipework shall be sleeved where it passed through walls with suitable sleeves. The sleeves shall be fire sealed and certificated where a fire compartment is penetrated and acoustically sealed with suitable acoustic sealant in all other locations.

The heating system on the primary and secondary side shall be fully commissioned by a reputable and recognised commissioning engineer. The commissioning engineer will be employed to inspect the designs and ensure that all the systems are commissionable and there are sufficient control valves (commissioning sets, pressure control valves etc) in the correct locations.

This will include commissioning the flow rates for the bypass valves, pumps, calorifier PHEs, LTHW incoming flow rates, DHWS return systems and LTHW heating systems etc. and producing full and complete reports with schematics.

The primary and secondary LTHW pipework will be pressure tested to 1.5 times its operating pressure for two hours. No pressure drop will be permitted. The pressure test will be carried out using a calibrated pressure gauge of at least 150mm with a current and traceable calibration certificate from a suitable authority. The pressure test will be certificated and will counter signed by the Clients representative if correct.

In order to ensure good workmanship and proper operation of the heating system a thermography survey of the fabric will be required to be undertaken with remedial works to any identified areas of missed or poorly installed insulation. A thermographic survey during the Air pressure test will also identify any areas of poorly sealed fabric. If the Air pressure test returns as not meeting the design intent then remedial works to correct will be required to ensure correct operation of heating systems.

The contractor shall provide working drawings to all areas prior to work commencing.

2. System performance: [Ss_60_40_37/260 Heating system capacity](#) and [Ss_60_40_37/280 Chemical treatment for heating systems](#)
3. Distribution: As Existing.
4. Heat source: [Pr_70_60_37_04 Air-to-water heat pumps](#) and [Pr_70_60_37_98 Water-to-water heat pumps](#)
5. Fuel: Electricity.
6. Feed and expansion: [Pr_65_53_86_68 Pressurization units](#), fill loops and LTHW expansion vessels.
7. Pumps: As per Mechanical equipment schedules.
8. Water treatment plant
 - 8.1. Equipment: [Pr_60_55_97_12 Chemical dosing pots](#)
 - 8.2. Chemicals: [Pr_60_55_96_16 Corrosion inhibitor chemicals for closed circuits](#)
9. Pipework: [Pr_65_52_63_17 Copper pipes](#) and [Pr_65_52_63_82 Steel pipes](#)
10. Pipework ancillaries
 - 10.1. Venting devices: [Pr_65_54_93_05 Automatic air vents](#)
 - 10.2. Separators: [Pr_65_55_76_15 Combined air and dirt separators](#)
 - 10.3. Gauges: [Pr_65_52_34_88 Temperature gauges](#)
 - 10.4. Accessories: [Pr_65_57_96_99 Y-type water strainers](#), [Pr_65_52_61_63 Pipe sleeves](#) and [Pr_65_52_61_91 Tundishes](#)
 - 10.5. Pipe supports: [Pr_20_29_14_65 Pipe clips](#)
11. Fire-stopping: Individual services penetrations fire-stopping system. Multiple services penetration fire-stopping system.
12. Valves
 - 12.1. Isolating valves: As per Mechanical equipment schedules.
 - 12.2. Check valves: As per Mechanical equipment schedules.
 - 12.3. Regulating valves: As per Mechanical equipment schedules.
 - 12.4. Balancing valves: As per Mechanical equipment schedules.
 - 12.5. Mixing valves: As per Mechanical equipment schedules.
 - 12.6. Radiator valves: As per Mechanical equipment schedules.
 - 12.7. Draining devices: [Pr_65_54_95_27 Draining taps](#)
 - 12.8. Accessories: [Pr_65_54_93_87 Test points](#)
13. Thermal insulation: [Pr_80_77_76_62 Phenolic foam insulation](#) and [Pr_80_77_76_54 Mineral wool pipe section insulation](#)
14. Heat emitters: As existing.
15. Controls: via BMS

-
16. Plant and equipment identification: [Pr_40_10_57_29 Equipment labels and warning notices](#);
[Pr_40_10_57_78 Self-adhesive colour pipe bands](#);
[Pr_40_10_57_51 Mechanical plant and equipment identification labels](#);
[Pr_40_10_57_93 Valve charts and schematics](#) and [Pr_40_10_57_94 Valve identification labels](#)
 17. Execution: [Ss_60_40_37/650 Filling and pressure testing of water-based heating systems](#);
[Ss_60_40_37/660 Flushing and pre-commission cleaning of heating systems](#) and
[Ac_15_50_10/646 Air pressure testing](#)
 18. System completion: [Ss_60_40_37/810 Commissioning water heating systems](#);
[Ss_60_40_37/845 Demonstration of heating systems](#);
[Ss_60_40_37/850 Inspection and test records for heating systems](#) and
[Ss_60_40_37/860 Documentation for heating systems](#)

System performance

Ss_60_40_37/260 Heating system capacity

1. Requirement: Capacity as near as practicable to, but not less than, the existing heating system output.
2. WSHP Output: 70kW
3. Verification: Mechanical services design engineer's competencies.

Ss_60_40_37/280 Chemical treatment for heating systems

1. Treatment: In accordance with BSRIA [BG 50/2021](#) .
2. Fill water pre-treatment
 - 2.1. Water conditioning: As required.
 - 2.2. Microbiological control: Ultraviolet disinfection.
3. Chemical treatment
 - 3.1. Bacteria and biofouling inhibition: Treatment for nitrite reducing bacteria. Pseudomonads.
Treatment for sulfate reducing bacteria.
4. Non-chemical treatment
 - 4.1. Filtration: Dirt separators. Magnetic filtration.
 - 4.2. Deaeration: Vacuum deaeration.

Products

Pr_20_29_14_65 Pipe clips

1. Manufacturer: Contractor's choice
2. Clip type: Insulated.
3. Material: Copper. Carbon steel.
4. Execution: [Pr_20_29_14/620 Installing pipeline supports](#)

Pr_40_10_57_29 Equipment labels and warning notices

1. Manufacturer: Contractor's choice
2. Material: Face-engraved rigid plastic laminate.
3. Label size: As required.
4. Colour
 - 4.1. Background: White.
 - 4.2. Lettering: Black.
5. Typography
 - 5.1. Font: Helvetica medium.

5.2. Size: Manufacturer's standard.

Pr_40_10_57_51 Mechanical plant and equipment identification labels

1. Material: Face-engraved rigid plastic laminate.
2. Label size: Manufacturer's standard
3. Colour
 - 3.1. Background: White.
 - 3.2. Lettering: Black.
4. Typography
 - 4.1. Font: Helvetica medium.
 - 4.2. Size: Manufacturer's standard.
5. Information to be included: Equipment name; Equipment reference number and Service.
6. Execution: [Pr_40_10_57/611 Installing mechanical plant and equipment identification](#)

Pr_40_10_57_78 Self-adhesive colour pipe bands

1. Standards: To [BS 1710](#).
2. Identification label: Adhesive colour bands.
3. Execution: [Pr_40_10_57/660 Installing identification on pipework](#)

Pr_40_10_57_93 Valve charts and schematics

1. Description: Location and identification of pipework, regulating, isolating and control valves.
2. Material: Paper print, glazed frame.
3. Execution: [Pr_40_10_57/620 Installing valve charts and schematics](#)

Pr_40_10_57_94 Valve identification labels

1. Material: Face-engraved rigid plastic laminate.
2. Colour
 - 2.1. Background: White.
 - 2.2. Lettering: Black.
3. Typography
 - 3.1. Font: Helvetica medium.
 - 3.2. Size: Manufacturer's standard.
4. Information: Purpose and reference number.
5. Execution: [Pr_40_10_57/630 Installing valve identification labels](#)

Pr_60_55_96_16 Corrosion inhibitor chemicals for closed circuits

1. Description: The heating systems within the buildings will have suitable corrosion and bio inhibitor added. The concentration in each of the system will be to the water treatment manufacturers requirements. The contractor will test each system with the sampling with manufacturer's test kit and sending to the manufacturer for testing. If the results of the testing show the correct concentration of water treatment the system will be certificated. If not the heating system will have the concentration increased and retested until the concentration complies with the manufacturers requirements. The system will then be certificated. The water treatment will comply with the WSHP manufacturers requirements as well as ISO 9001-certified. ISO 14001-certified; submit current certification at tender. Net zero in accordance with PAS 2060, third-party-accredited. A firm currently registered under a third-party quality assurance scheme; submit registration at tender. A firm currently registered under a third-party environmental assessment scheme; submit registration at time of product submission for approval. Corrosion inhibitors are classified as

anodic, cathodic or organic film forming. BSRIABG 50/2013 describes the properties and application of each type. Many corrosion inhibitors include a scale inhibitor as scale is less of an issue in closed systems than in open systems. Any fluid containing water treatment whether existing or new will be disposed of in an approved manner and not disposed of via the drainage system

2. Manufacturer: Submit proposals

Pr_60_55_97_12 Chemical dosing pots

1. Manufacturer: Submit proposals
2. Standard: To [PD 5500](#).
3. Material: Mild steel.
4. Working pressure (maximum): 8 bar.
5. Execution: [Pr_60_55_97/610 Installing dosing equipment](#)

Pr_65_52_34_88 Temperature gauges

1. Manufacturer: Stewart Buchanan
2. Standard: To [BS EN 13190](#).
3. Format: Vapour pressure.
4. Diameter: 150.
5. Case: Manufacturer's standard.
6. Connections: Manufacturer's standard.
7. Integral accessories: Manufacturer's standard.

Pr_65_52_61_63 Pipe sleeves

1. Description: FloPlast Intumescent wrap Ref: FW110.
2. Manufacturer: FloPlast Ltd.
3. Form: Manufacturer's standard

Pr_65_52_61_91 Tundishes

1. Manufacturer: Contractor's choice
2. Material: Manufacturer's standard.
3. Connections: Diameter to suit drain line.

Pr_65_52_63_17 Copper pipes

1. Manufacturer: Submit proposals
2. Standard: To [BS EN 1057](#).
3. Third-party certification: [WRAS](#)-approved.
4. Grade: for 15mm to 54mm, R250. For 67mm and above, R290.
5. Finish: Plain.
6. Execution: [Pr_65_52_63/630 Installing copper pipework](#)

Pr_65_52_63_82 Steel pipes

1. Manufacturer: Contractor's choice
2. Standard: To [BS EN 10255](#), medium weight
3. Finish: Hot-dip zinc coating.
4. Pipe ends: Square, plain.
5. Execution: [Pr_65_52_63/680 Installing steel pipework](#), [Pr_65_52_63/700 Installing buried pipework](#) and [Pr_65_52_63/705 Protection of buried pipework](#)

Pr_65_53_86_68 Pressurization units

1. Manufacturer: Refer to Mechanical equipment Schedules.
2. Standards
 - 2.1. General: To [BS EN 13831](#).
 - 2.2. Domestic heating and hot water supply: In accordance with [BS 7074-1](#).
 - 2.3. Low and medium temperature hot water heating: In accordance with [BS 7074-2](#).
 - 2.4. Chilled water and condenser water: In accordance with [BS 7074-3](#).
3. Format: Fully automatic pre-wired packaged unit on common base plate.
4. Arrangement: Diaphragm expansion tank with air.
5. Duties
 - 5.1. Static head: Refer to Mechanical equipment schedules.
 - 5.2. Plant rating: Refer to Mechanical equipment schedules.
 - 5.3. Operating temperatures
 - 5.3.1.Flow: 45°C
 - 5.3.2.Return: 40°C
 - 5.4. Motor
 - 5.4.1.Nominal voltage: Refer to Mechanical equipment schedules.
 - 5.4.2.Frequency: Refer to Mechanical equipment schedules.
6. Components: Manufacturer's standard.
7. Accessories: Anti-vibration mountings. Flexible connections. High pressure switch. Low pressure switch. Manual fill unit for initial filling and routine maintenance.
8. Execution: [Pr_65_53_86/630 Installing pressurization units](#)

Pr_65_54_93_05 Automatic air vents

1. Manufacturer: Submit proposals
2. Arrangement: Vertical inlet with integral lockshield isolating valve.
3. Material: Gunmetal.
4. Connections: Threaded.

Pr_65_54_93_87 Test points

1. Manufacturer: Contractor's choice
2. Arrangement: Self-sealing.
3. Material: Brass.
4. Connections: Manufacturer's standard.

Pr_65_54_95_27 Draining taps

1. Manufacturer: Contractor's choice
2. Standard: To [BS 2879](#).
3. Arrangement: Type 1.
4. Material: Copper alloy.
5. Connections: Threaded joints to [BS EN 10226-1](#).
6. Accessories: Lever pattern key and Spare hose union.
7. Execution: [Pr_65_54_95/610 Installation of valves generally](#)

Pr_65_55_76_15 Combined air and dirt separators

1. Manufacturer: Submit proposals

-
2. **Arrangement:** Vertical housing with internal large surface area mechanism to remove microbubbles via coalescence effect.
 3. **Material:** Carbon steel.
 4. **Connections:** Flanged.
 5. **Execution:** [Pr_65_55_76/640 Installing combined air and dirt separators](#)

Pr_65_57_96_99 Y-type water strainers

1. **Manufacturer:** Oventrop
2. **Pattern:** Simplex basket.
3. **Baskets**
 - 3.1. **Mesh size:** 40 mesh.
4. **Material:** Bronze.
5. **Connections:** Threaded. Flanged.
6. **Integral accessories:** Plugged connections for drain, air vent and differential pressure monitoring.
7. **Execution:** [Pr_65_57_96/650 Installing strainers](#)

Pr_70_60_37_04 Air-to-water heat pumps

1. **Manufacturer:** Mitsubishi Electric
2. **Contact Details:** Kooltech Ltd
 - 2.1. **Contact Name:** Erling Binns
 - 2.2. **Address:** Strathaird, 12 Mossland Rd, Hillington Park, Glasgow, G52 4XZ
 - 2.3. **Web:** <https://www.kooltech.co.uk/>
 - 2.4. **Email:** erling.binns@kooltech.co.uk
3. **Standards**
 - 3.1. **Safety and environmental:** To [BS EN 378-1](#) and [BS EN 378-2](#).
 - 3.2. **Test requirements:** To [BS EN 14511-1](#), [BS EN 14511-2](#), [BS EN 14511-3](#) and [BS EN 14511-4](#).
 - 3.3. **Electrical safety:** To [BS EN 60335-2-40](#).
4. **Heat pump type:** Monobloc.
5. **Mode:** Heating.
6. **Coefficient of performance (minimum):** 2.3
7. **Output**
 - 7.1. **Heating:** 53 kW Total
8. **Fan**
 - 8.1. **Type:** Axial.
 - 8.2. **Fan drive:** Manufacturer's standard.
 - 8.3. **Configuration:** Vertical.
9. **Electrical supply type:** Three phase.
10. **Compressor**
 - 10.1. **Type:** Scroll.
 - 10.2. **Sealing:** Hermetically sealed.
 - 10.3. **Drive:** Inverter driven.
11. **Accessories:** 20 Mesh strainer or more as a minimum on unit inlet.
12. **Refrigerant:** R454C.

Pr_70_60_37_98 Water-to-water heat pumps

1. Manufacturer: Climaveneta EW-HT
2. Contact Details: Kooltech Ltd
 - 2.1. Contact Name: Erling Binns
 - 2.2. Address: Strathaird, 12 Mossland Rd,
Hillington Park, Glasgow,
G52 4XZ
 - 2.3. Web: <https://www.kooltech.co.uk/>
 - 2.4. Email: erling.binns@kooltech.co.uk
3. Standards
 - 3.1. Safety and environmental requirements: To [BS EN 378-1](#) and [BS EN 378-2](#).
 - 3.2. Test requirements: To [BS EN 14511-1](#), [BS EN 14511-2](#), [BS EN 14511-3](#) and [BS EN 14511-4](#).
 - 3.3. Performance: To [ISO 13256-2](#).
 - 3.4. Electrical safety: To [BS EN 60335-2-40](#).
4. Heat pump type: Water-to-water heat pump.
5. Mode: Heating.
6. Coefficient of performance (minimum): 4.0
7. Output
 - 7.1. Heating: 70kW
8. Electrical supply type: Three phase.
9. Compressor
 - 9.1. Type: Scroll.
 - 9.2. Sealing: Manufacturer's standard.
 - 9.3. Drive: Manufacturer's standard.
10. Transfer medium: R134a.

Pr_80_77_76_54 Mineral wool pipe section insulation

1. Manufacturer: [ROCKWOOL Ltd](#)
2. Product reference: Rockwool Rocklap H&V Pipe Sections
3. Insulation thickness (minimum): To [BS 5422](#).
4. Execution: [Pr_80_77_76/625 Installing foil-faced mineral wool insulation on pipelines](#)

Pr_80_77_76_62 Phenolic foam insulation

1. Manufacturer: [Kingspan Insulation](#)
2. Contact details
 - 2.1. Address: Kingspan Insulation Ltd
Pembroke
Leominster
Herefordshire
United Kingdom
HR6 9LA
 - 2.2. Telephone: +44 (0)1544 388601
 - 2.3. Web: <https://www.kingspan.com/gb/en-gb>
 - 2.4. Email: info@kingspaninsulation.co.uk
3. Product reference: [Kingspan Kooltherm Pipe Insulation](#)
4. Standard: To BS EN 14314:2009+A1:2013.

-
5. Form: Pipe section.
 6. Thermal conductivity: 0.025 W/m·K at 10°C (37 kg/m³) and 0.045 W/m·K at 10°C (120 kg/m³).
 7. Finish: Aluminium.
 8. Fire performance: Euroclass RtF BL-s1,d0.
 9. Insulation thickness (minimum): 15–150 mm.
 10. Vapour barrier
 - 10.1. Material: Factory-applied aluminium foil vapour barrier facing.
 11. Protection: For external application the insulation must be covered with a waterproof finish.
 12. Execution: Installing phenolic foam insulation on pipelines.
 13. Vapour barrier material: Factory-applied aluminium foil.
 14. Vapour barrier vapour permeability: Low.
 15. Protection: For external application the insulation must be covered with a waterproof finish.
 16. Density: Depending on Type, 37–120 kg/m³.
 17. FM approved: FM Approved per FM Approval Standard 4924 where manufactured and installed in accordance with the details of the FM Approval. Please contact Kingspan technical services for further information.
 18. Green guide rating: A+/A depending on temperature application and pipe dimension.
 19. Closed cell content: ≥90%.
 20. Third party product certification: Eurofins Gold.
 21. Execution: [Pr_80_77_76/640 Installing phenolic foam insulation on pipelines](#);
[Pr_80_77_76/610 Installing insulation and protection products generally](#)

Execution

Ac_15_50_10/646 Air pressure testing

1. Purpose of testing: To verify that the air pressure characteristics of a new building are compliant with the design intent.
2. Standard: In accordance with [CIBSE TM 23](#).
3. Test method: Fan pressurisation method in accordance with [BS EN ISO 9972](#).
4. Air permeability: The building has been designed to achieve an air permeability of 5 m³/(hr/m²) at an applied pressure difference of 50 Pa.
5. Surveyor: The building air pressure test shall be carried out by a member company of ATTMA (the Air Tightness Testing and Measurement Association). The company shall also be UKAS-certified.
6. Measuring instruments: The instrumentation used to carry out the building test shall be UKAS-certified and have a valid calibration certificate dated within the last 6 months.
7. Methods of assessing failure: Infrared thermography (thermal imaging). Smoke testing.

Pr_20_29_14/620 Installing pipeline supports

1. Position
 - 1.1. In plant rooms: One-piece strap, sling rod, washer and nuts.
 - 1.2. Distribution corridors and risers: Pipe clip, sling rod, washer and nuts.
 - 1.3. Surface mountings: Split ring, spacer nipple and backplate.

Pr_40_10_57/611 Installing mechanical plant and equipment identification

1. Fixing: Adhesive.
2. Position: On equipment.

Pr_40_10_57/620 Installing valve charts and schematics

1. Fixing: Plug and screw to wall.
2. Position: Boiler houses;
Calorifier rooms and Plant rooms.

Pr_40_10_57/630 Installing valve identification labels

1. Fixing: Secure with metal chain.

Pr_40_10_57/660 Installing identification on pipework

1. Application of basic identification colour: Coloured bands as [BS 1710](#) Over the whole length of the pipe.
2. Safety colour identification: On or next to the colour bands.
3. Information: Colour bands as [BS 1710](#).
4. Direction of flow: Indication arrow and the word FLOW or the letter F and Indication arrow and the word RETURN or the letter R.

Pr_60_55_97/610 Installing dosing equipment

1. Position: Install where there is a high differential pressure between flow and return pipeline.
2. Drain point: Provide adjacent to the unit.
3. Fixing: Securely to a wall using mounting bracket.

Pr_65_52_63/610 Pipework installation generally

1. Standard: [BESA Technical Report TR/20/4 Hot water service](#) and [BESA Technical Report TR/20/5 Cold water service](#).
2. Dissimilar metals: Prevent electrolytic corrosion.

Pr_65_52_63/615 Installing pipe fittings

1. Bushes: Use only at radiators.
2. Fabricated junctions and fittings: Same material as the main pipe.
3. Demountable joints: Regularly spaced along pipe runs and at items of equipment.

Pr_65_52_63/630 Installing copper pipework

1. General requirements: [Pr_65_52_63/610 Pipework installation generally](#); [Pr_65_52_63/690 Spacing of pipework](#); [Pr_65_52_63/615 Installing pipe fittings](#); [Pr_65_52_63/710 General inspection and testing](#)
2. Standard: In accordance with [CDA publication 88 Copper tube in buildings](#) and [149 Large diameter copper tubes](#).
3. Jointing method
 - 3.1. Permanently concealed joints: Brazed.
 - 3.2. Accessible joints: Press-fit.
4. Expansion loops: Formed bends from single pipe length.
5. Anchor
 - 5.1. Method: Two flanges fixed to copper female adaptors.
 - 5.2. Pipe restraints: Saddle clamps.

Pr_65_52_63/680 Installing steel pipework

1. General requirements: [Pr_65_52_63/610 Pipework installation generally](#), [Pr_65_52_63/615 Installing pipe fittings](#), [Pr_65_52_63/690 Spacing of pipework](#) and [Pr_65_52_63/710 General inspection and testing](#)
2. Permanently concealed joints: Welded.
3. Accessible joints: Screwed, up to and including 50 mm. Welded and flanged, 65 mm and over.
4. Expansion loops: Submit Proposals.
5. Anchor
 - 5.1. Method: Submit Proposals.
 - 5.2. Pipe restraints: Submit Proposals.

Pr_65_52_63/690 Spacing of pipework

1. Minimum clearance between insulated pipework and
 - 1.1. Wall finish: 25mm.
 - 1.2. Ceiling finish or soffit: 100mm.
 - 1.3. Floor: 150mm.
 - 1.4. Electrical services: 150mm.
 - 1.5. Adjacent services: 100mm.
 - 1.6. Uninsulated pipework: 75mm.
 - 1.7. Adjacent insulated pipework: 25mm.
2. Minimum clearance between uninsulated pipework and
 - 2.1. Wall finish: 25mm.
 - 2.2. Ceiling finish or soffit: 100mm.
 - 2.3. Floor: 150mm.
 - 2.4. Electrical services: 150mm.
 - 2.5. Adjacent services: 150mm.
 - 2.6. Adjacent uninsulated pipework: 25mm.

Pr_65_52_63/700 Installing buried pipework

1. Depth of cover: 900 mm.
2. Setting out: Lay in straight lines.
3. Concealment: Lay as required to achieve shortest distance below concrete Apron.
4. Trench excavations: Carefully prepare to a firm even base. Remove sharp objects and replace with pea gravel to give 100 mm (minimum) cover above and below the pipe.
5. Installation: Thoroughly clean lengths of pipe internally before laying. Temporarily cap until jointing takes place. After laying and jointing keep leading end capped.
6. Thrust blocks: Install at changes of direction and blank ends.
7. Backfilling: Excavated material free from large stones and sharp objects. Leave joints exposed until after pipe pressure testing. Lay and compact in 300 mm maximum layers. Do not use heavy compactors before backfill is 600 mm deep.

Pr_65_52_63/705 Protection of buried pipework

1. Earth cover (minimum)
 - 1.1. Water pipework: 900 mm, 1200 mm maximum.
 - 1.2. Under roadways: 900 mm.
2. Protection: Apply an anticorrosive, non-cracking, non-hardening, waterproof sealing tape.

3. **Application:** After cleaning the pipework, wrap two layers of tape helically around the pipe in opposing directions with 50% minimum overlap
4. **Marker tape:** Required.

Pr_65_52_63/710 General inspection and testing

1. **Inspection of joints**
 - 1.1. **Joints:** Cut out, cut open and inspect if required.
 - 1.2. **Number of joints:** 10%
2. **Safety precautions:** In accordance with [HSE Guidance Notes: General Series \(GS\) GS 4](#).

Pr_65_53_86/630 Installing pressurization units

1. **Standards:** Low and medium temperature hot water heating systems in accordance with [BS 7074-2](#).
2. **Location of expansion vessel:** In the system return pipeline close to the heat source or chilled water unit.

Pr_65_54_95/610 Installation of valves generally

1. **Installation:** In accordance with [BS 6683](#).
2. **Position:** As detailed on drawings and schematics.
3. **Isolation and regulation valves:** Provide at equipment and on sub-circuits.
4. **Access:** Locate valves so they can be readily operated and maintained. Locate next to equipment which is to be isolated.
5. **Connection to pipework:** Fit with joints that suit the pipe material.

Pr_65_55_76/640 Installing combined air and dirt separators

1. **Position:** Fit with dirt drain at lowest point for removing dirt that sinks.

Pr_65_57_96/650 Installing strainers

1. **Orientation:** Install with strainer cap at the bottom. Inlet at the top or side.
2. **Direction of flow:** Install in direction of flow with the pocket in the horizontal plane.

Pr_80_77_76/610 Installing insulation and protection products generally

1. **Standard:** In accordance with [BS 5970](#).
2. **Timing:** Insulate after installed system has been fully tested and joints proved sound.
3. **Insulation:** Do not enclose adjacent units together.
4. **Clearance:** Maintain between pipes.
5. **Finish:** Neatly finish joints, corners, edges and overlaps.

Pr_80_77_76/625 Installing foil-faced mineral wool insulation on pipelines

1. **Joints:** Close butt; seal with 50mm class 0 tape on both longitudinal and circumferential joints.
2. **At fittings:** Mitre. Secure with tape.
3. **Vapour seal:** Tape exposed insulation membrane. Seal vapour barrier at pipe support with class 0 tape.

Pr_80_77_76/640 Installing phenolic foam insulation on pipelines

1. **Joints:** To BS 5970.
2. **At fittings:** To BS 5970.
3. **Vapour seal:** To BS 5970.

Ss_60_40_37/650 Filling and pressure testing of water-based heating systems

1. Testing: Water tightness test to [BS EN 14336](#), annex A. Pressure testing to [BS EN 14336](#), annex B. Procedure for filling and pressure testing in accordance with BSRIA [BG 29/2021](#).
2. Notice (minimum): Five working days.
3. Pressure: 1.5 times working pressure.
4. Inspection and witnessing: In accordance with BSRIA [BG 29/2021](#).
5. Duration of test: Two hours.

Ss_60_40_37/660 Flushing and pre-commission cleaning of heating systems

1. Preliminary checks: Thoroughly inspect pipework. Complete pressure tests before cleaning.
2. Flushing: In accordance with BSRIA [BG 29/2021](#).
3. Cleaning: In accordance with BSRIA [BG 29/2021](#) and BSRIA [BG 50/2021](#).
4. Waste products: Neutralize, and dispose of to drain. Preferably direct to manhole.

System completion

Ss_60_40_37/810 Commissioning water heating systems

1. Pre-commissioning: In accordance with BSRIA [BG 2/2010](#), CIBSE [Commissioning Code M](#), section M6 and CIBSE [Commissioning Code W](#).
2. Commissioning: In accordance with BSRIA [BG 2/2010](#), CIBSE [Commissioning Code M](#) and CIBSE [Commissioning Code W](#).
3. Seasonal commissioning: In accordance with BSRIA [BG 44/2013](#).
4. Variable flow systems: In accordance with CIBSE [Knowledge Series KS09](#).
5. Notice (minimum): One week.

Ss_60_40_37/845 Demonstration of heating systems

1. Running of plant
 - 1.1. Operation: Run, maintain and supervise the installations under normal working conditions.
 - 1.2. Duration: One week.
2. Instruction: Instruct and demonstrate the purpose, function and operation of the installations.

Ss_60_40_37/850 Inspection and test records for heating systems

1. Construction phase reports: System design is commissionable. Post-installation. System cleanliness. System commissionable.
2. Records for water systems: In accordance with BSRIA [BG 2/2010](#).
3. Record sheets
 - 3.1. Submission: On completion.
 - 3.2. Number of copies: Three.

Ss_60_40_37/860 Documentation for heating systems

1. Operating and maintenance instructions
 - 1.1. Scope: Submit for the system giving optimum settings for controls.
 - 1.2. Product information: Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
 - 1.3. Format: Paper copy and PDF.
 - 1.4. Number of copies: Three.
2. Record drawings

- 2.1. **Content:** Location and arrangement of plant in plant rooms. Location, size and route of mechanical services. Location, size, route and depth of underground services. Location and identification of pipework regulating, isolation and control valves. Location of outlets.
- 2.2. **Format:** A1 paper print drawing. Electronic drawing.
- 2.3. **Number of copies:** Three.
3. **Submittal date:** At handover.

Ω End of System

Ss_75_70_54_10

Building monitoring and management systems

Systems

Ss_75_70_54_10 Building monitoring and management systems

1. **Description:** The contractor will responsible for the design supply procurement, transportation, coordination and installation of the BMS extension.

The extension of the BMS system shall be compatible with the existing Trend system on site. Where possible the BMS points made available by the removal of the existing boilers shall be re-used to monitor and control the new Heat pump systems.

The extension of the BMS system shall interface with but not limited to:

- 2 No. Mitsubishi ASHP's
- ASHP circuit pressurisation Unit
- 2 No. ASHP shunt pumps
- Buffer Vessel Temperature Sensors
- WSHP source side circulator
- Mitsubishi WSHP
- WSHP Load side Circulator
- Load Side return temperature Sensor
- Load side return Mixing valve

The building management system shall provide control, status and monitoring for the heating systems, existing hot water systems and existing ventilation systems in the Fire station.

The control specialist will allow for visiting the site (3 days) to determine the exact method of control in the existing buildings to allow the controls interfaces to the new system to be appropriately designed.

A full description of operation will be developed conjunction with the BMS specialist.

The BMS designer shall allow for producing a points list to be reviewed by the client team prior to the works commencing. It is the responsibility of the BMS designer to ensure the points list is correct.

2. System performance: [Ss_75_70_54/210 Design](#), [Ss_75_70_54/240 Heating systems monitoring and management](#)
3. Water supply systems linked to BMMS: As Existing
4. Liquid fuel supply systems linked to BMMS: As Existing
5. Firefighting systems linked to BMMS: As Existing
6. Heating systems linked to BMMS: Air source heat pump system. Water source heat pump system.
7. Ventilation systems linked to BMMS: As Existing
8. Air conditioning systems linked to BMMS: As Existing
9. High-voltage electricity supply systems linked to BMMS: As Existing
10. Low-voltage electricity supply systems linked to BMMS: The existing Low voltage sub meters shall be replaced with meters capable of interfacing with the BMS to allow monitoring electrical of electrical consumption across the various Distribution Boards.

Any new sub-meters installed as part of the Electrical works shall be capable of interfacing with the BMS to allow monitoring of electrical use downstream of the new meter.

11. Lighting systems linked to BMMS: As Existing

-
12. Communication systems linked to building monitoring and management system (BMMS): As Existing
 13. Television and data systems linked to BMMS: As Existing
 14. Security systems linked to BMMS: As Existing
 15. Detection and alarm systems linked to BMMS: As Existing
 16. Communications network type: Wired local area network.
 17. Equipment: [Pr_80_77_28_49 Low-voltage switchgear and controlgear assembly enclosures](#); [Pr_75_50_20_29 Field controllers](#)
 18. Computer components: [Pr_70_75_15_21 Desktop computers](#), [Pr_70_75_15_15 Computer keyboards](#), [Pr_70_75_15_16 Computer monitors](#) and [Pr_70_75_15_66 Printers](#)
 19. Equipment interconnectivity: Wired.
 20. Cables: As specialist's recommendations.
 21. Containment: Submit Proposals.
 22. Containment accessories: Submit Proposals.
 23. Rewireable installations: Required.
 24. Concealed installation: Required.
 25. Control equipment power supply: Mains supply.
 26. Execution: [Ss_75_70_54/620 Installation of building monitoring and management systems](#); [Ss_75_70_54/630 Installation of field controllers](#); [Ss_75_70_54/650 Installation of sensors](#)
 27. System completion: [Ss_75_70_54/810 Inspection and testing](#), [Ss_75_70_54/820 Commissioning](#) and [Ss_75_70_54/830 Documentation](#)

System performance

Ss_75_70_54/210 Design

1. Design: Complete the design of the building monitoring and management system.
2. Standards
 - 2.1. Communications network: To [BS EN 50174-1](#).
 - 2.2. Communications protocol: To [BS EN ISO 16484-5](#).
 - 2.3. Documentation of plant and application specific functions: To [BS EN ISO 16484-3](#).
3. Requirements: Submit proposal including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_75_70_54/240 Heating systems monitoring and management

1. Input: Generally main plant items Run status / Failure alarms.

Including but not limited to:
 - ASHP Run status, time scheduling and fault alarm
 - WSHP Run status, time scheduling and fault alarm
 - Buffer vessels Temperature Reports
 - Primary Pumps Run Status / fault alarm
 - Secondary Pumps Run Status / fault alarm
 - Flow and Return Temperature Reports
 - System pressure monitoring and low pressure alarm
2. Output: Reports / alarms to site specific BMS monitoring system.

Products

Pr_70_75_15_15 Computer keyboards

1. **Description:** Provide a QWERTY keyboard with full upper/lower case ASCII key-set, numeric keys and mouse. (Where a touch-screen facility is provided ensure that a keyboard connection and associated functionality is also provided.)
2. **Standard:** To [BS EN ISO 9241-400](#) and [BS EN ISO 9241-410](#).
3. **Connectivity:** USB or Wireless.
4. **Features:** QWERTY with full upper/ lower-case ASCII key-set and numeric keys.

Pr_70_75_15_16 Computer monitors

1. **Standard:** To [BS EN ISO 9241-303](#), [BS EN ISO 9241-304](#), [BS EN ISO 9241-305](#) and [BS EN ISO 9241-307](#).
2. **Format:** LCD.
3. **Size (nominal diagonal):** 20 inch.
4. **Resolution:** 1280 x 1024.
5. **Response time:** 5 ms.
6. **Display screen:** Anti-glare coated.
7. **Connectivity:** HDMI
8. **Display positions:** Adjustable height, swivel, and tilt.

Pr_70_75_15_21 Desktop computers

1. **Description:** Ensure that the processor speed of each operator workstation is adequate to meet the data processing requirements.

Pr_70_75_15_66 Printers

1. **Description:** Ensure that the printer can print:
 - all monitored and logged data (including graphs of logged data)
 - all point data (hard and soft)
 - control logic diagrams and plant/building schematics in colour
 - alarm data/text
 - system help text.

Ensure that the automatic printing of alarm data can be switched on/off.

Ensure that the printer has a minimum output of four pages per minute.

Pr_75_50_20_29 Field controllers

1. **Description:** Field controllers shall perform all control actions independently of the operator workstation.

Field controllers shall be able to operate independently and in real time following a failure of the BMS communication network.

2. **Enclosure**

2.1. **Ingress protection (minimum):**

To [BS EN 60529](#), IP54 Internally,
To [BS EN 60529](#), IP65 Externally

2.2. **Mounting:** Suitable for DIN rail mounting.

3. **Network communications options:** To Interface with Existing BMS.

-
4. Controller inputs, sensors and devices: As data point schedule.
 5. Controller outputs, actuators and switching devices: As data point schedule.
 6. Internal power backup
 - 6.1. Type: Non-rechargeable batteries.
 - 6.2. Battery functions: Real-time clock battery back-up for two years minimum.
 7. User interfaces: Access password protected programmable LCD with back light. Keypad.
 8. Execution: [Pr_75_50_20/606 Installing control components](#)

Pr_80_77_28_49 Low-voltage switchgear and controlgear assembly enclosures

1. Description: **THE DESIGN, PROCUREMENT AND INSTALLATION OF THE BUILDING MANAGEMENT SYSTEM IS THE RESPONSIBILITY OF THE CONTRACTOR, THE BELOW SHALL BE USED FOR GUIDANCE ONLY**

Construct BMS equipment enclosures to give the minimum degree of protection to IP54 in accordance with BSEN 60529:1992. Where the enclosure is fitted inside another panel (eg a motor control centre) the protection can be reduced to IP41. (Note that greater levels of protection are required in outside locations. Such requirements should be specified in the Particular Specification.)

Ensure that access doors are of a rigid construction and mounted on stout metal hinges capable of supporting the full weight of the open door. Ensure that doors will not sag or drop when open. Fit doors with stout locking handles to prevent access by unauthorised personnel.

Allow safe access to the BMS equipment where the BMS equipment is incorporated into another control panel without having to isolate the panel.

Ensure that the layout of control panels reflects the layout of the plant being served. Ensure that indicators and controls for associated plant are grouped.

Ensure that all doors on panels containing exposed dangerous voltages are provided with interlocked isolators such that the door cannot be opened except with the isolator in the 'off' position. Ensure that isolation complies with BS 7671.

Ensure that equipment that requires on-line adjustment and testing by non-electrically qualified personnel is accessible and usable without interrupting the supply or overriding safety interlocks. Ensure that in general, field controllers are not located within control panels where isolation is necessary to gain access.

Design panels to maintain all components within their environmental tolerance limits taking into account ambient environmental conditions. Install fans with thermostatic control and air extract grilles and air intake grilles with replaceable filters where mechanical ventilation is required to control the environmental conditions. Ensure that the specified ingress protection (IP) ratings are maintained.

2. Standard: To [BS EN 62208](#).
3. Ingress protection (minimum): To [BS EN 60529](#), IP55 Internally, To [BS EN 60529](#), IP65 Externally
4. Dimensions
 - 4.1. Length: As Required.
 - 4.2. Width: As Required.
 - 4.3. Height: As Required.
5. Material: Low-carbon sheet steel.
6. Finish: White powder-coated.

-
7. Access: Hinged door.
 8. Handles: Not required.
 9. Internal mounting plate: 35 mm DIN rail.
 10. Cable gland plate: Removable.
 11. Mounting: Surface-mounted.
 12. Arrangement: Wall.
 13. Rated insulation voltage (Ui): 1000 V a.c.
 14. EMC shielding performance (minimum): To [BS EN 61000-5-7](#),
 15. Service conditions: Normal.
 16. Hardware: Cylinder lock and handle. Standardize key type.
 17. Labelling: Ensure that all panels and individual panel sections are provided with exterior labels to BS5378 Part 1 indicating the voltage within the panel along with clear warnings of risk and instructions for isolation. Display requirements for informing the BMS supervisor and/or disabling alarms prior to isolation of control circuits.

Label all switches, controls and indicators on control panels as to function and associated plant.

Fix a notice to the front of the panel warning of the need for isolation elsewhere if the panel does not totally control the electricity supply to associated plant.

Identify all cables with permanently fixed ferrules. Ensure that the numbering corresponds to the numbers fixed to the terminals. Ensure that identification and coding matches that used on the design drawings, schematics and schedules.

Execution

Pr_75_50_20/606 Installing control components

1. Standard: In accordance with [BS 7671](#).
2. Equipment and sensor identification labels: Provide.
3. Insulation: Submit details of proposed insulation method where control components are on insulated pipelines.
4. Supports: Do not strain components.
5. Access: Adequate for operation and maintenance.

Ss_75_70_54/620 Installation of building monitoring and management systems

1. General: Install in accordance with [BSRIA AG 9/2001](#).

Ss_75_70_54/630 Installation of field controllers

1. Clearance (minimum)
 - 1.1. Front access: 1000 mm in front of field controller.
 - 1.2. Mounting height: 1000 mm from finished floor level.
2. Fixing equipment: Fix on DIN rail mounted within enclosure.

Ss_75_70_54/650 Installation of sensors

1. General: Install in accordance with [BCIA Controls for End Users](#).

System completion

Ss_75_70_54/810 Inspection and testing

1. Standard: In accordance with [BS 7671](#).
2. Notice before commencing tests (minimum): 24 h.
3. Certificates
 - 3.1. Submission: On completion.
 - 3.2. Number of copies: Two.
4. Test equipment identity: Record on test certificates.
5. Certificates of calibration: Submit for each test instrument.
6. Control panel test certificates
 - 6.1. Submission: On completion.
 - 6.2. Number of copies: Two.

Ss_75_70_54/820 Commissioning

1. General: [BSRIA](#) AG 9/2001.

Ss_75_70_54/830 Documentation

1. Operation and maintenance instructions
 - 1.1. Scope: Submit giving optimum settings for controls.
 - 1.2. Product information: Date of installation. Product description. Part number. Operating instructions. Cleaning and maintenance requirements. Warranty details. Manufacturer's contact information.
 - 1.3. Format: Paper copy.
 - 1.4. Number of copies: Three.
2. Record drawings
 - 2.1. Content: Location of control panels, equipment and repeater panels.

For all controls cabling, the cable origin, circuit designation, route, conductor material and insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder.
 - 2.2. Format: A1 paper print and Electronic.
 - 2.3. Number of copies: Three.
3. Submittal date: At handover.

Ω End of System

