



Reading Town Hall Roof Improvements

011270-EAL-01-XX-T-Z-9002

MEP Engineering Performance Specification

T01 - Tender

Revision Summary

ISSUED	DOCUMENT PREPARED			DOCUMENT CHECKED		
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Ss_50_30_04_97**Above-ground internal stack wastewater drainage systems****Systems****Ss_50_30_04_97 Above-ground internal stack wastewater drainage systems**

1. Description: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order.

Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

The Public Health Engineering Systems will comprise the minimum pipework necessary to carry away the discharges from sanitary appliances and other dedicated discharge points, quietly and with freedom from nuisance or risk of injury to health. It is essential that air from the discharge pipes be prevented from entering the building.

The above ground foul drainage design will be based on System III as defined in BS EN 12056-2 and using the tabulated discharge units identified in Table 2 of the standard.

The system design will generally be based on the primary ventilated stack or modified primary ventilated stack system, with additional relief ventilation pipework being provided as necessary.

Existing drainage

All redundant existing branch drainage pipework as noted in the roof replacement works area will be cut back to the main vertical stacks or vents and capped, leaving existing main vertical stacks and vent pipes operational.

New drainage

New condensate drainage will be provided to serve the Art gallery air handling unit condensate drainage.

Repairs and replacement to the existing external cast iron or lead drainage stack as indicated on the performance drawings shall be provided.

General

All new main internal vertical and horizontal soil, waste and vent pipework shall be installed using UPVC to BS EN 1329-1:2000, BS 4514 and BS EN 15660 with solvent weld or ring seal joints.

Waste branch pipework and fittings shall be installed using MuPVC to BS EN 1566, BS 5255 and BS EN 1329-1:2000 with polypropylene traps to BS 5254:1976.

Allowance shall be made for thermal expansion by provision of expansion fittings within the

system.

Access doors or caps will be installed on sanitary pipework to facilitate rodding and maintenance access to installed pipework or fittings. Access through architectural casings will be co-ordinated with access fittings.

Intumescent firesleeves shall be provided on all plastic soil and waste pipework at all penetrations of a fire compartment including fire rated ducts or risers. Firesleeves shall have full 4-hour fire rating and comply with Building Regulations Approved Document B and BS 476 part 20.

All discharge pipework shall be insulated to prevent sound transmission between rooms or between floors, in accordance with the acoustic requirement. Noise sensitive areas are to be identified and treatment methods assessed during detailed design phase.

Condensate drainage pipework shall be installed using UPVC with solvent weld fittings. Dry-traps must be used at the connection to the main.

Borosilicate glass condensate traps, are to be used in air handling units.

The systems will be installed to comply with the appropriate British Standards and Design Codes, in particular;

- BS EN 12056 - Gravity drainage systems inside buildings; Part 2: Sanitary pipework layout and calculation
- BS 8000 - Workmanship on building sites; Part 13 - code of practice for above ground drainage and sanitary appliances
- Building Regulations - Approved Document H
- Manufacturer's technical guides

2. System performance: [Ss 50 30 04/210 Design of above-ground wastewater drainage systems](#); [Ss 50 30 04/290 Compliance of performance requirements](#)
3. System manufacturer: Compatible with the existing installation
4. Floor drainage
5. Sanitary pipework
 - 5.1. Small-diameter branch discharge pipework
 - 5.1.1. Traps: [Pr 65 52 25 75 Sanitary appliance traps](#)
 - 5.1.2. Pipelines and fittings: [Pr 65 52 03 87 Unplasticized polyvinyl chloride \(PVC-U\) above-ground drainage pipes and fittings](#)
 - 5.1.3. Accessories for jointing: [Pr 35 90 87 66 Polytetrafluoroethylene \(PTFE\) tapes](#)
 - 5.1.4. Supports: [Pr 20 85 09 01 Above-ground drainage pipe brackets](#)
 - 5.2. Large diameter branch discharge pipework
 - 5.2.1. Pipelines and fittings: [Pr 65 52 03 87 Unplasticized polyvinyl chloride \(PVC-U\) above-ground drainage pipes and fittings](#)
 - 5.2.2. Supports: [Pr 20 85 09 01 Above-ground drainage pipe brackets](#)
 - 5.2.3. Insulation: Un-insulated
 - 5.3. Discharge stack pipework
 - 5.3.1. Pipelines and fittings: [Pr 65 52 03 87 Unplasticized polyvinyl chloride \(PVC-U\) above-ground drainage pipes and fittings](#)
 - 5.3.2. Supports: [Pr 20 85 09 01 Above-ground drainage pipe brackets](#)
 - 5.3.3. Insulation: [Pr 80 77 76 54 Mineral wool pipe section insulation](#)
6. Pipework identification: [Pr 40 10 57 78 Self-adhesive colour pipe bands](#)
7. Fire-stopping

- 7.1. Floor penetrations: [Pr_25_80_81_29 Flexible intumescent gap seals](#); [Pr_65_52_61_63 Pipe sleeves](#)
8. Execution: [Ss_50_30_04/622 Access to above-ground wastewater drainage systems for testing and maintenance](#); [Ss_50_30_04/612 Applying above-ground wastewater drainage internal pipework identification](#)
9. System completion: [Ss_50_30_04/840 Above-ground wastewater drainage system pre-handover checks](#); [Ss_50_30_04/860 Documentation](#); [Ss_50_30_04/850 Above-ground wastewater drainage system submittals](#); [Ss_50_30_04/830 Above-ground wastewater drainage system siphonage and back pressure tests](#); [Ss_50_30_04/810 Testing above-ground wastewater drainage systems](#); [Ss_50_30_04/890 Verification of performance](#)

System performance

[Ss_50_30_04/210 Design of above-ground wastewater drainage systems](#)

1. Design: Complete the design of the above-ground wastewater drainage system.
2. Standards: To [BS EN 12056-1](#), [BS EN 12056-2](#) and relevant parts of [BS EN 12056-4](#) and [BS EN 12056-5](#), and to [BS EN 12056-2](#) National Annexes NA-NG.
3. System configuration
 - 3.1. Form: System III, single discharge stack system with full-bore discharge branch pipes. System II, single discharge stack system with small bore discharge branch pipes.
 - 3.2. Configuration: Primary ventilated stack system. Secondary ventilated stack system. Unventilated discharge branches. Ventilated discharge branches.
4. Design discharges
 - 4.1. Design discharge types: Trade effluent. Domestic wastewater.
 - 4.2. Design discharge content: Design discharge temperatures and content as attached report. Greywater.
5. Requirements: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

[Ss_50_30_04/290 Compliance of performance requirements](#)

1. Requirement: Proof of compliance with specified performance.
2. Testing authority: Submit details.

Products

[Pr_20_85_09_01 Above-ground drainage pipe brackets](#)

1. Pipe location: Internal.
2. Arrangement: Vertical. Horizontal.

[Pr_25_80_81_29 Flexible intumescent gap seals](#)

1. Fire performance: Submit proposals

[Pr_35_90_87_66 Polytetrafluoroethylene \(PTFE\) tapes](#)

1. Fire performance
 - 1.1. Fire resistance: Submit proposals
 - 1.2. Reaction to fire: Submit proposals
2. Standards: To [BS 7786](#).

Pr_40_10_57_78 Self-adhesive colour pipe bands

Shared by: [Ss_60_40_37_48 Low-temperature hot water heating systems](#) and [Ss_55_70_38_15 Water Services](#)

1. Manufacturer: Contractor to propose
2. Standards: To match existing installation
3. Identification type: Adhesive colour bands.
4. Execution: [Pr_40_10_57/660 Installing identification on pipework](#)

Pr_65_52_03_87 Unplasticized polyvinyl chloride (PVC-U) above-ground drainage pipes and fittings

1. Standard: To [BS 4514](#).
2. Execution: [Pr_65_52_03/630 Fixing and jointing rainwater and above ground drainage pipes](#)

Pr_65_52_25_75 Sanitary appliance traps

1. Standard: To [BS EN 274-1](#).
2. Third-party product certification: BSI Kitemark-certified.
3. Trap: Submit proposals
4. Material: MUPVC. Polypropylene.
5. Colour: Black.

Pr_65_52_61_63 Pipe sleeves

Shared by: [Ss_60_40_37_48 Low-temperature hot water heating systems](#) and [Ss_60_40_17_12 Chilled water systems](#)

1. Description: Intumescent fire sleeves
2. Manufacturer: Contractors choice
3. Material: Submit proposals
4. Form: To BS 476

Pr_80_77_76_54 Mineral wool pipe section insulation

1. Manufacturer: Contractors choice
2. Standard: To [BS 3958-4](#).
3. Execution: [Pr_80_77_76/610 Installing insulation and protection products generally](#)
4. Verification

Execution

Pr_40_10_57/660 Installing identification on pipework

1. Application of basic identification colour: Over the whole length of the pipe.
2. Information: As existing
3. Direction of flow: As existing

Pr_65_52_03/630 Fixing and jointing rainwater and above ground drainage pipes

1. Fixing
 - 1.1. Supports
 - 1.1.1. Stability: Fix securely.

- 1.1.2. Fixing centres (nominal): 1.8 m.
- 1.2. Pipework
 - 1.2.1. Alignment: Plumb and/ or true to line.
 - 1.2.2. Externally socketed pipes and fittings: Fix with socket ends forming inlet for each individual pipe.
2. Jointing
 - 2.1. Jointing differing pipework systems: Use adaptors intended for the purpose.
 - 2.2. Cut ends of pipes: Clean and square. Remove burrs and swarf. Chamfer ends of plastics pipes before inserting into ring seal sockets. Where metal pipes are to be used, recoat bare metal with appropriate primer and paint.
 - 2.3. Jointing or mating surfaces: Clean and, where necessary, use jointing lubricant immediately to allow safe and efficient jointing assembly.
 - 2.4. Unsealed joints: Wedge unsealed joints to cast pipes with timber or sheet lead cut-offs to centralize pipe joints and reduce rattling.
 - 2.5. Expansion joint pipe sockets: Fix rigidly to buildings. Elsewhere, provide brackets and fixings that allow pipes to slide.
 - 2.6. Solvent-welded pipelines: Install ring seal joints in all long runs of solvent-welded pipework, as movement joints.

Pr_80_77_76/610 Installing insulation and protection products generally

Shared by: [Pr_80_77_76_53 Mineral wool duct slab insulation](#)

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.

Ss_50_30_04/612 Applying above-ground wastewater drainage internal pipework identification

1. Standard: To [BS 1710](#).
2. Method: Integral lettering on pipe wall, self-adhesive bands or identification clips.
3. Form
 - 3.1. Wastewater system without recycling
 - 3.1.1. Definition: All wastewater from sanitary appliances and sinks.
 - 3.1.2. Direction of flow: White arrow on black background.
 - 3.1.3. Wording: White lettering 'FOUL DRAINAGE' on a black background.
 - 3.2. Blackwater in system with recycling
 - 3.2.1. Definition: Containing faecal matter or urine.
 - 3.2.2. Direction of flow: White arrow on black background.
 - 3.2.3. Wording: White lettering 'FOUL DRAINAGE' on a black background.
 - 3.3. Grey water in system with recycling
 - 3.3.1. Definition: As defined in [BS EN 12056-1](#), clause 3.1.
 - 3.3.2. Direction of flow: Black arrow on light grey background.
 - 3.3.3. Wording: Black lettering 'GREYWATER' on a light grey background.

Ss_50_30_04/622 Access to above-ground wastewater drainage systems for testing and maintenance

1. General: Install pipework with adequate clearance to permit testing, cleaning and maintenance, including painting where necessary.
2. Access fittings and rodding eyes: Position to avoid obstruction.

System completion

Ss_50_30_04/810 Testing above-ground wastewater drainage systems

1. Dates for testing
 - 1.1. Notice: Required.
 - 1.2. Period of notice (minimum): Five working days.
2. Preparation
 - 2.1. Pipework: Securely fixed and free from obstruction and debris.
 - 2.2. Traps: Fill with clean water.
3. Testing
 - 3.1. Water for testing: Supply clean water, assistance and apparatus.
 - 3.2. Smoke for testing: Do not use.
4. Records of tests: Submit.

Ss_50_30_04/830 Above-ground wastewater drainage system siphonage and back pressure tests

1. Method
 - 1.1. WC pans: Test by flushing.
 - 1.2. Other appliances: Test by filling to overflow level, then removing the plug.
2. Number of tests: Test each appliance three times. Recharge traps before each test.
3. Self-siphonage testing: Test each appliance individually.
4. Induced siphonage and back pressure testing: Test by discharging the following appliances simultaneously on each stack.

Ss_50_30_04/840 Above-ground wastewater drainage system pre-handover checks

1. Temporary caps: Remove.
2. Permanent blanking caps, access covers, rodding eyes, floor gratings and the like: Secure complete with fixings.

Ss_50_30_04/850 Above-ground wastewater drainage system submittals

1. Content: Include manufacturers' drawings, technical information, calculations, literature, warranties and handling and maintenance instructions.
2. Timing: Hand over at completion.

Ss_50_30_04/860 Documentation

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. Electronic copy.
- 1.4. Number of copies: Three.
- 2. Record drawings
 - 2.1. Content: Location, size and route of above-ground services.
 - 2.2. Format: Electronic. A1 paper print.
 - 2.3. Number of copies: Three.
- 3. Submittal date: At handover.

Ss_50_30_04/890 Verification of performance

- 1. Requirement: Check completed system and provide assurance of compliance with specified performance.
- 2. Submittals
 - 2.1. Format: Description of inspections, remedial works carried out and certification of compliance.
 - 2.2. Timing: At completion of wastewater system work.

Ω End of System

Ss_55_70_38_15

Water Services

Systems

Ss_55_70_38_15 Water Services

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Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

The water services works shall include the isolation, drain down, strip-out of the existing local domestic water services that need to be removed to enable the roof replacement works as outlined on the performance drawings.

All existing cold water pipework, to be retained, shall be drained down locally and cleaned.

Any new pipework as indicated on the performance drawings are to be installed flushed and chlorinated upon completion to provide a complete and operating system.

Sufficient access to be provided to ensure regular access and maintenance can be conducted.

Cold Water Services

Mains cold water (Potable water supply)

There is no expectation that any reinforcement works will need to be required to accommodate the proposed works.

The existing primary Mains cold water pipework distribution internally shall be extended from the plant room to serve the new ventilation plant humidifier with the required backflow protection.

The existing primary mains cold water pipework distribution across the roof to the chilled water plant room shall be extended across the roof to serve the existing chilled water system in the plant room.

All cold-water distribution pipework shall be copper and is to be insulated and vapour sealed where not exposed to view.

Back flow protection devices are to be provided where required to allow for flushing and pressure in accordance with the specification.

All new pipework is to be flushed and tested in accordance with the specification and relevant standards.

A flushing schedule shall be maintained to prevent water from stagnating in the works area.

All new water mains, service pipes and fittings must be disinfected, flushed and sampled before returning to service, irrespective of the size of the system.

Water services must be cleaned and disinfected within the seven days prior to handover and a representative number of potable water samples, including samples to be tested for pseudomonas, must be taken no less than five days after disinfection. Water quality must be at an acceptable level according to independent lab testing, and the installation will not be approved unless all samples are satisfactory.

The contractor is recommended to take water samples prior to commencement to understand any pre-existing quality issues within the domestic water systems.

The contractor is responsible for daily flushing of all outlets in the works area before acceptance, and this must be appropriately recorded.

2. System performance: [Ss 55 70 38/210 Design and detailing hot and cold water systems](#); [Ss 55 70 38/250 Pipeline sizes for hot and cold water systems](#)
3. Pipelines
 - 3.1. Above ground: [Pr 65 52 63 17 Copper pipelines](#)
4. Valves
 - 4.1. Backflow prevention devices: [Pr 65 54 95 05 Backflow prevention check valves](#)
 - 4.2. Isolating valves: [Pr 65 54 95 06 Ball valves](#)
 - 4.3. Check valves: [Pr 65 54 95 14 Copper alloy check valves](#)
 - 4.4. Regulating valves: [Pr 65 54 95 26 Double regulating valves](#)
 - 4.5. Draining devices: [Pr 65 54 95 27 Draining taps](#)
 - 4.6. Accessories: [Pr 65 54 93 87 Test points](#)
5. Fire-stopping: Individual services penetrations fire-stopping system.
6. Thermal insulation
 - 6.1. Pipelines: [Pr 80 77 76 54 Mineral wool pipe section insulation Type A](#)
7. Vibration isolation: Spring isolators
8. Flush control devices: [Pr 75 50 46 31 Flush control devices](#)
9. Plant and equipment identification: [Pr 40 10 57 78 Self-adhesive colour pipe bands](#); [Pr 40 10 57 94 Valve identification labels](#)
10. Execution: [Ss 55 70 38/610 Removing hot and cold water systems](#); [Ss 55 70 38/620 Installing hot and cold water systems generally](#); [Ss 55 70 38/650 Hydraulic pressure testing of hot and cold water supply systems](#); [Ss 55 70 38/660 Flushing hot and cold water systems](#); [Ss 55 70 38/670 Disinfection of hot and cold water systems](#)
11. System completion: [Ss 55 70 38/810 Commissioning of hot and cold water supply systems](#); [Ss 55 70 38/820 Inspection and test records](#); [Ss 55 70 38/830 Demonstrations](#); [Ss 55 70 38/840 Documentation](#); [Ss 55 70 38/850 Water quality tests](#); [Ss 55 70 38/860 Spares](#); [Ss 55 70 38/870 Operating tools](#); [Ss 55 70 38/880 Maintenance](#)

System performance

Ss_55_70_38/210 Design and detailing hot and cold water systems

1. Design: Complete the design and detailing of the hot and cold water supply.
2. Standard: To [BS 8558](#) or [BS EN 806-2](#) and in accordance with [HSE publication L8: Legionnaires' disease. The control of Legionella bacteria in water systems. Approved Code of Practice and guidance on regulations](#).
3. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturer's literature.

Ss_55_70_38/250 Pipeline sizes for hot and cold water systems

1. Sizing: Calculate sizes to meet simultaneous demand for the building in accordance with [BS EN 806-3](#).
2. Performance
 - 2.1. Water velocity (maximum): 1.0 m/s for hot water and 1.5 m/s for cold water.

Products

See [Pr 40 10 57 78 Self-adhesive colour pipe bands](#) in [Ss 50 30 04 97 Above-ground internal stack wastewater drainage systems](#)

Pr_40_10_57_94 Valve identification labels

Shared by: [Ss 60 40 37 48 Low-temperature hot water heating systems](#) and [Ss 60 40 17 12 Chilled water systems](#)

1. Material: Face-engraved rigid plastic laminate.
2. Colour
 - 2.1. Background: White.
 - 2.2. Lettering: Black.
3. Information: Service. Valve Type. Purpose.

Pr_65_52_63_17 Copper pipelines

1. General requirements: [Pr 65 52 63 18 Copper pipeline fittings](#)
2. Standard: To [BS EN 1057](#). BS EN13348
3. Grade: R220.
4. Finish: Plain (Chrome plated if exposed)
5. Jointing materials: Mechanically crimped fittings
6. Execution: Installing copper pipelines

Pr_65_52_63_18 Copper pipeline fittings

1. Description: Soldered fittings will not be accepted.
2. Standards
 - 2.1. Capillary: To [BS EN 1254-1](#), solder ring.
 - 2.2. Compression: To [BS EN 1254-2](#), type A.
 - 2.3. Flanges: To [BS EN 1092-3](#)
 - 2.4. Press fittings: To [BS 8537](#)

Pr_65_54_93_87 Test points

Shared by: [Ss 60 40 37 48 Low-temperature hot water heating systems](#) , [Ss 60 40 17 12 Chilled water systems](#) and [Pr 65 54 95 30 Flow-measuring valves](#)

1. Arrangement: Self-sealing.
2. Material: Brass.

Pr_65_54_95_05 Backflow prevention check valves

1. Standard: To [BS EN 13959](#).
2. Third-party certification: [WRAS](#) approval.
3. Family and type: EC – verifiable double check valve.
4. Pressure class: PN 10.

5. Execution: [Pr 65 54 95/610 Installation of valves generally](#); [Pr 65 54 95/615 Installation of back flow prevention devices](#)

Pr_65_54_95_06 Ball valves

Shared by: [Ss 60 40 37 48 Low-temperature hot water heating systems](#) and [Ss 60 40 17 12 Chilled water systems](#)

1. Material: Brass copper alloy. Bronze.
2. Finish: Natural. (chrome plated if exposed)
3. Execution: [Pr 65 54 95/610 Installation of valves generally](#)

Pr_65_54_95_14 Copper alloy check valves

1. Standard: To [BS 5154](#).
2. Lift type
3. Execution: [Pr 65 54 95/670 Installation of check valves](#)

Pr_65_54_95_26 Double regulating valves

Shared by: [Ss 60 40 37 48 Low-temperature hot water heating systems](#)

1. Standard: To [BS 7350](#).
2. Arrangement: Globe.

Pr_65_54_95_27 Draining taps

Shared by: [Ss 60 40 37 48 Low-temperature hot water heating systems](#) and [Ss 60 40 17 12 Chilled water systems](#)

1. Standard: To [BS 2879](#).
2. Material: Copper alloy.
3. Connections: Threaded joints to [BS EN 10226-1](#).

Pr_75_50_46_31 Flush control devices

1. Standards
 - 1.1. General: To [BS EN 12541](#).
 - 1.2. Electrical safety: To [BS EN 60335-1](#) and [BS EN 60335-2-84](#).
2. Third-party certification: [WRAS](#)-approved

Pr_80_77_76_54 Mineral wool pipe section insulation Type A

Shared by: [Ss 60 40 37 48 Low-temperature hot water heating systems](#) and [Ss 60 40 17 12 Chilled water systems](#)

1. Standard: To [BS EN 14303](#).
2. Recycled content: 50% (minimum) to [BS EN ISO 14021](#).
3. Thermal conductivity: 0.032 W/m·K at 0°C.

0.034 W/m·K at 10°C.

0.037 W/m·K at 50°C.

0.040 W/m·K at 75°C.

0.044 W/m·K at 100°C.

4. Finish: Aluminium foil-faced.
5. Insulation thickness (minimum): To [BS 5422](#).
6. Vapour barrier
 - 6.1. Vapour permeability: To [BS 5422](#), clause 5.6.
7. Protection: [Pr_80_77_76_64 Polyisobutylene insulation protection](#)
8. Accessories: Loadbearing pipeline support insulation
9. Execution: Installing foil-faced mineral wool insulation on pipelines; [Pr_80_77_76/780 Installing vapour barriers](#)

Pr_80_77_76_64 Polyisobutylene insulation protection

1. Material: Polyisobutylene.
2. Colour: Self-finish.
3. Execution: Installing polyisobutylene (PIB) protection

Execution

See [Pr_40_10_57/660 Installing identification on pipework](#) in [Ss_50_30_04_97 Above-ground internal stack wastewater drainage systems](#)

Pr_65_54_95/610 Installation of valves generally

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

Pr_65_54_95/615 Installation of back flow prevention devices

1. Standard: In accordance with [Water Regulations Advisory Scheme Water regulations guide](#)
2. Type BA: In accordance with [Water Regulations Advisory Scheme Approved Installation Method: Type BA device - Verifiable backflow preventer with reduced pressure zone \(RPZ valve\). Requirements for installation, on-site testing and maintenance.](#)

Pr_65_54_95/670 Installation of check valves

1. General requirements: [Pr_65_54_95/610 Installation of valves generally](#)
2. Lift type: Install in direction of flow as indicated on the body.
3. Disc type: With spring, fit in any plane. Without spring, fit in vertical plane with flow from bottom to top.
4. Wafer type: Install between flanges. Fit in horizontal plane or vertical upward flow.
5. Split disc: Install between flanges. Fit in horizontal plane or vertical upward flow.

Pr_80_77_76/780 Installing vapour barriers

1. Integrity: [BS 5970](#).

Ss_55_70_38/610 Removing hot and cold water systems

1. Scope: Localised removal of domestic and laboratory water supplies to sanitary ware and equipment within the laboratories. Deadlegs to be fully eliminated.

Ss_55_70_38/620 Installing hot and cold water systems generally

1. Standard: To [BS 8558](#) and [BS EN 806-4](#).

2. Performance: Free from leaks and the audible effects of expansion, vibration and water hammer.
3. Fixing of equipment, components and accessories: Fix securely, parallel or perpendicular to the structure of the building.
4. Preparation: Immediately before installing tanks and cisterns on a floor or platform, clear the surface completely of debris and projections.
5. Corrosion resistance: In locations where moisture is present or may occur, avoid contact between dissimilar metals by use of suitable washers, gaskets, and the like.

Ss_55_70_38/650 Hydraulic pressure testing of hot and cold water supply systems

1. Standard: To [BS 8558](#) and [BS EN 806-4](#).
2. Notice (minimum): One week.
3. Pressure: 2 times working pressure.
4. Duration of test: Two hours

Ss_55_70_38/660 Flushing hot and cold water systems

1. Standard: To [BS EN 806-4](#).
2. Water analysis: Analyse water samples before treatment.
3. Preliminary checks: Thoroughly inspect pipework. Complete pressure tests before cleaning or chemical treatment.
4. Waste products : Neutralize, and dispose of to drain. Preferably direct to manhole.

Ss_55_70_38/670 Disinfection of hot and cold water systems

1. Standard: To [BS EN 806-4](#).
2. Samples for analysis: Provide after disinfection and flushing.

System completion

Ss_55_70_38/810 Commissioning of hot and cold water supply systems

1. Pre-commissioning: In accordance with [BSRIA BG 2/2010](#) and [CIBSE Commissioning Code W](#).
2. Commissioning: In accordance with [BS EN 806-4](#), [BSRIA BG 2/2010](#) and [CIBSE Commissioning Code W](#).
3. Notice (minimum): One week.
4. Equipment: Check and adjust operation of equipment, controls and safety devices.
5. Outlets: Check operation of outlets for satisfactory rate of flow and temperature.

Ss_55_70_38/820 Inspection and test records

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. Number of copies: Electronic.

Ss_55_70_38/830 Demonstrations

1. Instruction: Instruct and demonstrate the purpose, function and operation of the installations.

Ss_55_70_38/840 Documentation

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: Electronic
2. Record drawings
 - 2.1. Content: Location and arrangement of plant in plant rooms. Location, size and route of hot and cold water services. Location, route and depth of underground services. Location and identification of regulating, isolation and control valves. Location of outlets.
 - 2.2. Format: A1 paper print. Electronic.
 - 2.3. Number of copies: Three.
3. Submittal date: At handover.
4. Wholesome water consumption notice: Submit within 30 days.

Ss_55_70_38/850 Water quality tests

1. Standard: To [BS EN 806-4](#).
2. Samples
 - 2.1. Sample points: Selected hot and cold water outlets.
 - 2.2. Samples for analysis: Submit samples for bacteriological analysis.
3. Water temperature: Record at each sampling point at the time of taking the sample.
4. Test results
 - 4.1. Record: Details of all analyses.
 - 4.2. Submit: On completion.
 - 4.3. Number of copies: Three.

Ss_55_70_38/860 Spares

Ss_55_70_38/870 Operating tools

1. Tools: Supply tools for operation, maintenance and cleaning purposes.
2. Keys: Supply keys for valves and vents.

Ss_55_70_38/880 Maintenance

1. Servicing and maintenance: Provide a quotation below the line for 12 months maintenance

Ω End of System

Ss_60_40_17_12

Chilled water systems

Systems

Ss_60_40_17_12 Chilled water systems

1. Description: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order. Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

Chilled Water Cooling is provided to the building by an existing Trane CGAM140E refrigerant R410A air cooled chiller. The contractor shall allow for the removal and reinstatement of the air cooled chiller to enable the necessary roof repairs.

The chiller has been validated and is anticipated to have 5-10years economical life.

The contractor will seek a temporary location to house the chiller as there is currently understood there is no space on site.

The contractor will allow for an approved FGAS specialist to carry out refrigerant leak detection before the chiller has been removed and after it has been reinstated to ensure that no refrigerant leaks have occurred due to the handling of the chiller.

It is understood that the proprietary controller is soon to be obsolete. As such the contractor will upgrade the proprietary controller to the latest appropriate/compatible controller by the manufacturer Trane for the chiller as part of the works.

The external ChW water circuits to the chiller to be appropriately protected against frost and freezing external conditions. Allowance shall be made in the tender for the removal and reinstatement of the existing trace heating system to all new chilled water pipework.

The contractor shall provide a new chilled water coil to the art gallery air handling unit. The coils shall have a three port control valve, commissioning set, isolation valve and strainers to provide a complete system.

The CHW circuit water quality shall be protected and maintained through chemical dosing regime.

Circulation of the chilled water system will be via existing pump sets. These are controlled via a motor control panel in the chilled water plant room. The contractor will allow for the new proprietary controller to be fully interfaced with the existing motor control panel to ensure a complete, efficient operating system.

Automatic air vents shall be provided at all high points, and drain cocks provided at all low points within the pipework distribution.

The Contractor shall be responsible for the design and installation of all thermal expansion and contraction. Expansion shall be accommodated by natural changes in direction and the appropriate use of anchors and guides.

The Contractor shall employ a water treatment specialist to carry out system flushing, cleaning and final water treatment. On completion of all pipework installations, the entire system shall be pressure tested, flushed/cleaned and dosed. All debris sensitive components shall be temporarily looped out of circuit to prevent blockage and provisions installed to enable back flushing of these components to ensure that the system is cleaned in its entirety.

All systems shall be hydraulically balanced. The systems shall be provided with all regulation and monitoring devices, insulation, couplings, expansion devices, commissioning components and safety equipment and ancillaries to ensure proper, safe and efficient commissioning, operation and maintenance of the complete system.

Commissioning of the system shall be fully witnessed. Testing and commissioning results, as fitted drawings and operation and maintenance information shall be provided prior to handover.

2. System performance: [Ss 60 40 17/220 Basic design temperatures for chilled water systems](#); [Ss 60 40 17/250 System operating parameters for chilled water systems](#); [Ss 60 40 17/260 Cooling system capacity for chilled water systems](#); [Ss 60 40 17/270 Water treatment for chilled water systems](#)
3. System
 - 3.1. Arrangement: Two pipe F&R chilled water circuits
 - 3.2. Pipeline circuits: Submit proposals.
4. Cooling source: Existing
5. Pressurization units: Existing
6. Pumps: Existing
7. Water treatment
 - 7.1. Plant: [Pr 60 55 97 12 Chemical dosing pots](#)
 - 7.2. Chemicals for closed circuit systems: [Pr 60 55 96 16 Corrosion inhibitor chemicals for closed circuits](#); [Pr 60 55 96 06 Bacteria and biofouling inhibitors](#)
8. Pipelines: [Pr 65 52 63 82 Steel pipes](#)
9. Pipelines accessories
 - 9.1. Venting devices: [Pr 65 54 93 05 Automatic air vents](#)
 - 9.2. Expansion devices: [Pr 65 52 28 05 Axial expansion compensators](#); [Pr 65 52 28 46 Lateral expansion compensators](#)
 - 9.3. Separators: Existing
 - 9.4. Gauges: [Pr 65 52 34 66 Pressure gauges](#); [Pr 65 52 34 88 Temperature gauges](#)
 - 9.5. Accessories: [Pr 65 52 61 50 Masking plates](#); [Pr 65 57 96 08 Basket water strainers](#); [Pr 65 52 61 63 Pipe sleeves](#)
10. Valves
 - 10.1. Isolating valves: [Pr 65 54 95 08 Butterfly valves](#); [Pr 65 54 95 82 Steel globe valves](#); [Pr 65 54 95 06 Ball valves](#)
 - 10.2. Check valves: [Pr 65 54 95 83 Steel globe stop and check valves](#)
 - 10.3. Regulating valves: [Pr 65 54 95 63 Pressure-independent control valves](#)
 - 10.4. Draining and venting devices: [Pr 65 54 95 27 Draining taps](#)
 - 10.5. Accessories: [Pr 65 54 93 87 Test points](#)
11. Thermal insulation: [Pr 80 77 76 54 Mineral wool pipe section insulation Type A](#)
12. Emitters: [Pr 60 65 37 12 Chilled water cooling coils](#)
13. Controls: [Ss 75 70 52 17 Cooling system control systems CHW](#)

14. Plant and equipment identification: [Pr 40 10 57 93 Valve charts and schematics](#); [Pr 40 10 57 51 Mechanical plant and equipment identification labels](#); [Pr 40 10 57 94 Valve identification labels](#)
15. Execution: [Ss 60 40 17/615 Installing water based cooling systems](#); [Ss 60 40 17/620 Filling and pressure testing of chilled water systems](#); [Ss 60 40 17/630 Flushing and pre-commission cleaning of chilled water systems](#); [Ss 60 40 17/640 Installing water treatment for chilled water and condenser water systems](#)
16. System completion: [Ss 60 40 17/810 Commissioning chilled water systems](#); [Ss 60 40 17/830 Performance testing chilled water systems](#); [Ss 60 40 17/840 Inspection and test records for chilled water systems](#); [Ss 60 40 17/850 Demonstrations](#); [Ss 60 40 17/860 Documentation](#); [Ss 60 40 17/870 Operating tools](#); [Ss 60 40 17/880 Servicing and maintenance](#)

Ss_75_70_52_17 Cooling system control systems CHW

1. Description: It is understood that the proprietary controller is soon to be obsolete for the air cooled chiller. As such the contractor will upgrade the proprietary controller to the latest appropriate/compatible controller by the manufacturer Trane for the chiller as part of the works.

An automatic controls specialist shall be appointed to design, supply, install, commission, set-to-work and commission (including seasonal commissioning) the reinstated chiller and its new proprietary controller and all modifications to the chilled water system.

The new motor control panels serving the art gallery ventilation plant will be provided within the internal plant room. The system shall control and/or monitor the following

- Chilled water 3 port motor control valve.
- LTHW 3 port motor control valve
- Supply air temperature and humidity sensors to control the above.

The installation shall be carried out using LSF single core cables in galvanized steel conduit in accordance with the IEE Regulations BS 7671. Cables shall be sized with a maximum volt drop between the control panel and remote equipment of 2%.

In general, the controls specialist is to ensure that the controls system is designed to minimise energy consumption. The controls must also prioritise selected plant to ensure the performance of this plant is achieved.

The appearance of any controls which will be in non-plant room areas are to be approved by the project manager prior to manufacture. Exposed wiring routes will not be acceptable other than in plant room areas.

Please note that the control system will not be accepted by the project manager as practically complete until the system has been commissioned, validated and the operation and maintenance information and record drawings have been provided and checked.

The controls specialist is to include for 1 full days of on-site training in the operation of the system for the Client.

2. System performance: [Ss 75 70 52/212 Time control](#); [Ss 75 70 52/201 Design](#)
3. Pressurization plant control strategies: Existing
4. Pumps control strategies: Existing
5. Water chillers control strategies: Existing
6. Additional functions: [Ss 75 70 52/296 Plant monitoring](#)
7. Equipment: [Pr 65 54 95 53 Motorized valves](#)
8. Sensors: [Pr 75 50 76 47 Liquid temperature sensors](#); [Pr 75 50 76 71 Relative humidity sensors](#); [Pr 75 50 76 03 Air temperature sensors](#); [Pr 75 50 76 68 Pressure sensors](#)

9. Equipment interconnectivity: Wired.
10. Rewireable installations: Required.
11. Concealed installations: Required.
12. Control equipment power supply: Mains supply.
13. System completion: [Ss 75 70 52/810 Inspection and testing](#); [Ss 75 70 52/820 Start up and commissioning](#); [Ss 75 70 52/830 Commissioning of automatic control systems](#); [Ss 75 70 52/840 Spares](#); [Ss 75 70 52/850 Keys](#); [Ss 75 70 52/860 Documentation](#); [Ss 75 70 52/870 Servicing and maintenance](#)

System performance

Ss_60_40_17/220 Basic design temperatures for chilled water systems

1. Design temperatures: Refer to ventilation section of the specification

Ss_60_40_17/250 System operating parameters for chilled water systems

1. Design flow temperature: 6 / 12 deg C
2. Temperature difference across water circuit: 6K
3. Water velocity: Nominal 1 m/s. Maximum 1.5 m/s.
<200Pa/m pressure drop.

Ss_60_40_17/260 Cooling system capacity for chilled water systems

1. Output of total cooling surface area in a space: As near as practicable to, but not less than, the design heat gain for that space.
2. Chiller output: Existing
3. Calculation allowances: 10%.

Ss_60_40_17/270 Water treatment for chilled water systems

1. Closed circuit systems
 - 1.1. Standard: In accordance with [BSRIA BG 50/2013](#).
 - 1.2. Chemical treatment
 - 1.2.1. Corrosion inhibition: Submit proposals.
 - 1.2.2. Bacteria and biofouling inhibition: Submit proposals.
 - 1.2.3. Scale inhibition: Submit proposals.

Ss_75_70_52/201 Design

Shared by: [Ss 75 70 52 94 Ventilation control systems](#)

1. Design: Complete the design of the mechanical engineering services controls and monitoring system.
2. Submit including the following information: Operation statements, point schedules, control logic diagrams, network topology schematics, panel diagrams and fascia drawings, method statements for testing and commissioning, method statements for witness testing and graphics.

Ss_75_70_52/212 Time control

1. Time clock: Automatically change between GMT and British summer time and allow for leap years. Provide clock and calendar programmed with periods of normal operation.

Ss_75_70_52/296 Plant monitoring

1. Cooling plant

- 1.1. Input: Run time, load, alarms
2. Fan
 - 2.1. Input: Alarms.

Products

Pr_40_10_57_51 Mechanical plant and equipment identification labels

Shared by: [Ss_65_40_33_51 Mechanical ventilation systems](#)

1. Material: Face-engraved rigid plastic laminate.
2. Information to be included: Equipment reference number. Equipment name.
3. Execution: [Pr_40_10_57/611 Installing mechanical plant and equipment identification](#)

Pr_40_10_57_93 Valve charts and schematics

1. Material: Paper print, glazed frame.
2. Information to be included: Location and identification of pipework regulating, isolating and control valves.
3. Size: A1.
4. Execution: [Pr_40_10_57/620 Installing valve charts and schematics](#)

See [Pr_40_10_57_94 Valve identification labels](#) in [Ss_55_70_38_15 Water Services](#)

Pr_60_55_96_06 Bacteria and biofouling inhibitors

1. Non-oxidizing biocides: Submit proposals.

Pr_60_55_96_16 Corrosion inhibitor chemicals for closed circuits

1. Corrosion inhibitors: Submit proposals.

Pr_60_55_97_12 Chemical dosing pots

1. Standard: To [PD 5500](#).
2. Execution: [Pr_60_55_97/610 Installing dosing equipment](#)

Pr_60_65_37_12 Chilled water cooling coils

1. Standards: To [BS 5141-1](#) and [BS EN 1216](#).
2. Duty
 - 2.1. Air volume: Submit Proposals
3. Chilled water flow temperature: 6 deg C
4. Chilled water return temperature: 12 deg C
5. Access doors for maintenance: required
6. Execution: [Pr_60_65_37/610 Installing heating and cooling coils generally](#)

Pr_65_52_28_05 Axial expansion compensators

Shared by: [Ss_60_40_37_48 Low-temperature hot water heating systems](#)

1. Execution: Installing expansion compensators

Pr_65_52_28_46 Lateral expansion compensators

Shared by: [Ss_60_40_37_48 Low-temperature hot water heating systems](#)

1. Execution: Installing expansion compensators
- Etch Associates Ltd
17-03-2026

Pr_65_52_34_66 Pressure gauges

1. Standard: To [BS EN 837-1](#).
2. Diameter: 100 mm.
3. Scale subdivisions: 20 kPa (0.2 bar) for a maximum scale value of 1000 kPa (10 bar).
4. Execution: [Pr_65_52_34/630 Installing pressure gauges](#)

Pr_65_52_34_88 Temperature gauges

1. Standard: To [BS EN 13190](#).
2. Diameter: 100.

Pr_65_52_61_50 Masking plates

Shared by: [Ss_60_40_37_48 Low-temperature hot water heating systems](#)

1. Material
 - 1.1. All pipes except chromium-plated copper: Plastic.
 - 1.2. Chromium-plated copper pipes: Chromium-plated.
2. Format: Split.

See [Pr_65_52_61_63 Pipe sleeves](#) in [Ss_50_30_04_97 Above-ground internal stack wastewater drainage systems](#)

Pr_65_52_63_82 Steel pipes

Shared by: [Ss_60_40_37_48 Low-temperature hot water heating systems](#)

1. Description: To match existing system.
2. Manufacturer: Submit proposals
3. Material grade: LTHW and CHW Pipework to be heavy grade galvanised carbon steel to BS EN 10255. Screwed and socketed joints up to 50mm. Welded and flanged joints for 65mm and above. All welding to be in accordance with approved welding procedure specifications.

Pr_65_54_93_05 Automatic air vents

Shared by: [Ss_60_40_37_48 Low-temperature hot water heating systems](#)

1. Arrangement: Vertical inlet with integral lockshield isolating valve and check valve.

See [Pr_65_54_93_87 Test points](#) in [Ss_55_70_38_15 Water Services](#)

See [Pr_65_54_95_06 Ball valves](#) in [Ss_55_70_38_15 Water Services](#)

Pr_65_54_95_08 Butterfly valves

1. Manufacturer: Herz Valves Ltd, Crane Fluid Systems, Hattersley Valves, TA or Oventrop. Only one valve manufacturer shall be used for all valves and accessories.
2. Standard: To [BS EN 593](#) and [BS EN 16668](#).
3. Design: Concentric.
4. Arrangement: Double flanged.
5. Operation
 - 5.1. Manual: Lever.
6. Execution: [Pr_65_54_95/610 Installation of valves generally Type A](#)

See [Pr_65_54_95_27 Draining taps](#) in [Ss_55_70_38_15 Water Services](#)

Pr_65_54_95_53 Motorized valves

1. Standards: To [BS EN 60730-1](#) and [BS EN IEC 60730-2-8](#).
2. Arrangement: Three-port.
3. Valve authority
 - 3.1. Design: Submit proposals.
4. Actuator: Electric.
5. Execution: [Pr_65_54_95/641 Installing motorized valves](#)

Pr_65_54_95_63 Pressure-independent control valves

1. Manufacturer: Herz Valves Ltd, Crane Fluid Systems, Hattersley Valves, TA or Oventrop. Only one valve manufacturer shall be used for all valves and accessories.
2. Accessories: Drain. Flushing bypass. Isolating valve. Strainer.
3. Execution: [Pr_65_54_95/610 Installation of valves generally Type A](#)

Pr_65_54_95_82 Steel globe valves

1. Manufacturer: Herz Valves Ltd, Crane Fluid Systems, Hattersley Valves, TA or Oventrop. Only one valve manufacturer shall be used for all valves and accessories.
2. Standard: To [BS EN 13709](#) and [BS EN 16668](#).
3. Body ends: Flanged to [BS EN 1092-2](#). Threaded joints to [BS EN ISO 228-1](#).
4. Operation: Handwheel.
5. Body tappings: Required.
6. Execution: [Pr_65_54_95/610 Installation of valves generally Type A](#)

Pr_65_54_95_83 Steel globe stop and check valves

1. Manufacturer: Herz Valves Ltd, Crane Fluid Systems, Hattersley Valves, TA or Oventrop. Only one valve manufacturer shall be used for all valves and accessories.
2. Standard: To [BS EN 13709](#) and [BS EN 16668](#).
3. Body tappings: Required.
4. Execution: [Pr_65_54_95/610 Installation of valves generally Type A](#)

Pr_65_57_96_08 Basket water strainers

1. Manufacturer: Herz Valves Ltd, Crane Fluid Systems, Hattersley Valves, TA or Oventrop. Only one valve manufacturer shall be used for all valves and accessories.
2. Pattern: Simplex basket.
3. Integral accessories: Plugged connections for drain, air vent and differential pressure monitoring.
4. Execution: [Pr_65_57_96/650 Installing strainers](#)

Pr_75_50_76_03 Air temperature sensors

Shared by: [Ss_75_70_52_94 Ventilation control systems](#)

1. Standards: To [BS EN 60730-1](#) and [BS EN IEC 60730-2-9](#).
2. Application: Frost protection. Outside air. Room.
3. Accuracy: $\pm 0.5^{\circ}\text{C}$.
4. Equipment interconnectivity
 - 4.1. Wired: Wiring required.
5. Execution: Installing temperature sensors

Pr_75_50_76_47 Liquid temperature sensors

1. Standards: To [BS EN 60730-1](#) and [BS EN IEC 60730-2-9](#).
2. Application: Pipe-mounted immersion. Surface temperature.
3. Range: -10°C to 150°C.
4. Accuracy: $\pm 0.5^\circ\text{C}$.
5. Equipment interconnectivity
 - 5.1. Wired: Required.
6. Execution: [Pr_75_50_76/675 Installing temperature sensors](#)

Pr_75_50_76_68 Pressure sensors

Shared by: [Ss_75_70_52_94 Ventilation control systems](#)

1. Standards: To [BS EN 60730-1](#) and [BS EN 60730-2-6](#).
2. Application: Pressure operating.
3. Accuracy: $\pm 2\%$ measured value.
4. Equipment interconnectivity
 - 4.1. Wired: Required.

Pr_75_50_76_71 Relative humidity sensors

1. Standards: To [BS EN 60730-1](#) and [BS EN IEC 60730-2-13](#).
2. Sensor type: Capacitive sensor.
3. Application: Relative humidity (RH).
4. Range: 10% to 90% RH.
5. Accuracy: $\pm 2\%$ RH.
6. Equipment interconnectivity
 - 6.1. Wired: Required.
7. Execution: [Pr_75_50_76/665 Installing humidity sensors](#)

See [Pr_80_77_76_54 Mineral wool pipe section insulation Type A](#) in [Ss_55_70_38_15 Water Services](#)

See [Pr_80_77_76_64 Polyisobutylene insulation protection](#) in [Ss_55_70_38_15 Water Services](#)

Execution

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. Position: Plant room.

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_60_65_37/610 Installing heating and cooling coils generally

1. Equipment, controls and instruments positioned next to heating coils: Protect from thermal radiation.
2. Fixings:

Pr_65_52_34/630 Installing pressure gauges

1. Position: Refer to schematics.

See [Pr_65_54_95/610 Installation of valves generally](#) in [Ss_55_70_38_15 Water Services](#)

Pr_65_54_95/610 Installation of valves generally Type A

1. Installation: In accordance with [BS 6683](#).
2. Position: Refer to schematic drawings.
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_54_95/641 Installing motorized valves

1. General requirements: [Pr_75_50_20/606 Installing control components](#)
2. Spindles: Vertical.

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_75_50_20/606 Installing control components

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

Pr_75_50_76/665 Installing humidity sensors

1. General requirements: Installing sensors generally
2. Room sensors
 - 2.1. Height: 1.5 m above floor.
3. Duct sensors
 - 3.1. Position: Beyond the spray distance of humidifiers.
 - 3.2. Air velocity (maximum) at sensor: 10 m/s.
4. Interconnection: To central control panel.

Pr_75_50_76/675 Installing temperature sensors

1. General requirements: Installing sensors generally
2. Room sensors

- 2.1. Height: 1.5 m above floor.
- 2.2. Position: Away from corners and doors. Away from heat sources and draughts. Not on external walls. Away from direct solar radiation. In the area controlled.
3. Pipe-mounted immersion sensors: Immerse full length of sensor in water. Locate an adequate distance from bends or fittings.
4. Duct-mounted immersion sensors: Locate full length of sensor in the centre of the airflow. Shield against radiant heat transfer next to coils. Locate sensors in return air ducts as near as possible to the occupied space. Locate an adequate distance from bends or fittings.
5. Surface temperature sensors: Provide clean contact with surface and thermal conducting compound.
6. Outside air sensors: Fix to north-facing wall. Do not locate next to extract points, above windows or under eaves.
7. Frost protection sensors: Locate downstream of the first coil.
8. Interconnection: To central control panel.

See [Pr 80 77 76/780 Installing vapour barriers](#) in [Ss 55 70 38 15 Water Services](#)

Ss_60_40_17/615 Installing water based cooling systems

1. Standard: To [BS EN 1264-4](#).

Ss_60_40_17/620 Filling and pressure testing of chilled water systems

1. Testing: In accordance with [BSRIA BG 29/2012](#).
2. Notice (minimum): 1 week.
3. Pressure: 2 times working pressure.
4. Inspection and witnessing: In accordance with the procedure in [BSRIA BG 29/2012](#).
5. Duration of test: 1 h.

Ss_60_40_17/630 Flushing and pre-commission cleaning of chilled water systems

1. Preliminary checks: Thoroughly inspect pipework. Complete pressure tests before cleaning or chemical treatment.
2. Flushing: In accordance with [BSRIA BG 29/2012](#).
3. Cleaning: In accordance with [BSRIA BG 29/2012](#) and [BG 50/2013](#).
4. Waste products: Neutralize, and dispose of to drain. Preferably direct to manhole.

Ss_60_40_17/640 Installing water treatment for chilled water and condenser water systems

1. Treatment
 - 1.1. Closed circuit systems: In accordance with [BSRIA BG 50/2013](#).
 - 1.2. Open circuit systems: In accordance with [BSRIA AG 2/93](#).
2. Water sampling: In accordance with [BS 8552](#).

System completion

Ss_60_40_17/810 Commissioning chilled water systems

1. Pre-commissioning: In accordance with [BSRIA BG 2/2010](#) and [CIBSE Commissioning Code W](#).
2. Commissioning: In accordance with [BSRIA 2/2010](#) and [CIBSE Commissioning Code W](#).
3. Seasonal commissioning: In accordance with [BSRIA BG 44/2013](#).

4. Variable flow systems: In accordance with [CIBSE KS09 Commissioning variable flow pipework systems](#).
5. Notice (minimum): 1 week.

Ss_60_40_17/830 Performance testing chilled water systems

1. General: Demonstrate the performance of the installations.
2. Guaranteed efficiency: Tolerances defined in this specification.
3. Environmental tests: Carry out environmental testing. If necessary, use artificial loads to simulate operating conditions.
4. Recorders
 - 4.1. Type: Supply and maintain portable seven day space temperature and relative humidity recorders, complete with charts.
5. Reports: Submit on completion.

Ss_60_40_17/840 Inspection and test records for chilled water systems

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

Ss_60_40_17/850 Demonstrations

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

Ss_60_40_17/860 Documentation

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: Electronic and Paper copy.
 - 1.4. Number of copies: Two.
2. Record drawings
 - 2.1. Content: Location and arrangement of plant in plant rooms. Location, size and route of mechanical services. Location, route, size and depth of underground services. Location and identification of pipework regulating, isolation and control valves. Location and identification of regulating, fire and smoke dampers. Location of grilles, diffusers, terminal units, radiators and heat emitters.
 - 2.2. Format: A1 paper print drawing. Electronic drawing.
 - 2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_60_40_17/870 Operating tools

1. Tools: Supply tools for operation, maintenance and cleaning purposes.
2. Quantity: Two sets.

Ss_60_40_17/880 Servicing and maintenance

1. Requirement: Provide quotation to undertake for 12 months after completion.

Ss_75_70_52/810 Inspection and testing

Shared by: [Ss_75_70_52_94 Ventilation control systems](#)

1. Standard: In accordance with [BS 7671](#).
2. Notice before commencing tests (minimum): 1 week.
3. Certificates: Submit two.
4. Test equipment identity: Record on test certificates.
5. Certificates of calibration: Submit for each test instrument.
6. Control panel test certificates: Submit two.

Ss_75_70_52/820 Start up and commissioning

Shared by: [Ss_75_70_52_94 Ventilation control systems](#)

1. Standard: In accordance with [BCIA Start up and commissioning guide](#).

Ss_75_70_52/830 Commissioning of automatic control systems

Shared by: [Ss_75_70_52_94 Ventilation control systems](#)

1. Pre-commissioning: In accordance with [Commissioning Code C](#).
2. Commissioning: In accordance with [Commissioning Code C](#).
3. Notice (minimum): 1 week.

Ss_75_70_52/840 Spares

1. Spare fuses
 - 1.1. Position: Mount within each control panel.
 - 1.2. Number: Two of each type used.
2. Spare devices: Two of each type used.
3. Spare lamps
 - 3.1. Position: Mount within control panel.
 - 3.2. Number: Two of each type used.

Ss_75_70_52/850 Keys

Shared by: [Ss_75_70_52_94 Ventilation control systems](#)

1. Control panel door keys: Supply.
2. Number: Two of each type used.

Ss_75_70_52/860 Documentation

Shared by: [Ss_75_70_52_94 Ventilation control systems](#)

1. Operating and maintenance instructions
 - 1.1. Scope: Submit 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 and electronic copy.

- 1.4. Number of copies: Two.
2. Record drawings
 - 2.1. Content: 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. Location of control panels, equipment and repeater panels.
 - 2.2. Format: A1 paper print. Electronic.
 - 2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_75_70_52/870 Servicing and maintenance

1. Requirement: Provide quotation to undertake until 12 months after completion.

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: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order.

Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

The existing heating system is served by boilers located in plant rooms in the Museum basement.

The contractor shall modify LTHW pipework to enable the replacement of roof works as indicated on the Performance drawings. New radiators to be provided with Thermostatic radiator valves and lock shield valves.

The contractor shall extend existing LTHW system to serve the art gallery AHU heating coil with the required valves and accessories to provide a complete heating system to the art gallery.

LTHW pipework to be heavy grade galvanised carbon steel to bs en 10255. Screwed and socketed joints up to 50mm. Welded and flanged joints for 65mm and above. All welding to be in accordance with approved welding procedure specifications.

All distribution and concealed pipework to be insulated. Insulation to be carried through at pipe supports. Pipework insulation, brackets and supports are not shown for clarity. All necessary insulation, brackets supports and other ancillaries shall be included.

Insulation shall be continuous through supports to prevent thermal bridging. Insulation to be fitted after final inspection and testing.

The mechanical sub-contractor shall liaise with the appointed structural engineer prior to the forming of holes greater than 100mm dia. Or equivalent area, & prior to ordering & siting items of plant & equipment.

All pipework passing through fire walls/floors shall be sleeved and fire stopped as appropriate.

Draincocks shall be provided on all low points. Automatic air vents shall be provided on all high points.

All services to be identified in accordance with bs 1710.

All external LTHW pipework shall be trace heated with frost stat control and insulated with weatherproofed, UV resistant jacketing. Existing trace heating can be reinstated where operational.

All new pipework installations shall be pressure tested, test results documented and issued before system becomes operational.

All heating services pipework shall be flushed in accordance with the specification.

All pipework shall be hydrostatically pressure tested at 1.5 times design pressure for a minimum of 2 hours. Submit test certificate

The Contractor shall be responsible for the design and installation of all thermal expansion and contraction. Expansion shall be accommodated by natural changes in direction and the appropriate use of anchors and guides.

Upon completion, submit as built drawings, system schematics, commissioning records and all test certificates

2. System performance: [Ss_60_40_37/220 Basic design temperatures for heating systems](#); [Ss_60_40_37/250 System operating parameters for water-based heating systems](#); [Ss_60_40_37/260 Heating system capacity](#)
3. Arrangement: Two-pipe.
4. Distribution: Constant Temperature/ Variable temperature.
5. Heat source: Existing Boilers
6. Water treatment plant
 - 6.1. Chemicals: Flushing only - no chemical treatment is proposed.
7. Pipelines: [Pr_65_52_63_82 Steel pipes](#)
8. Pipeline ancillaries
 - 8.1. Venting devices: [Pr_65_54_93_05 Automatic air vents](#)
 - 8.2. Expansion devices: [Pr_65_52_28_05 Axial expansion compensators](#); [Pr_65_52_28_46 Lateral expansion compensators](#)
 - 8.3. Accessories: [Pr_65_52_61_50 Masking plates](#); [Pr_65_52_61_63 Pipe sleeves](#)
9. Fire stopping: Individual services penetrations fire stopping system.
10. Valves
 - 10.1. Isolating valves: [Pr_65_54_95_06 Ball valves](#)
 - 10.2. Regulating valves: [Pr_65_54_95_30 Flow-measuring valves](#); [Pr_65_54_95_26 Double regulating valves](#)
 - 10.3. Draining devices: [Pr_65_54_95_27 Draining taps](#)
 - 10.4. Accessories: [Pr_65_54_93_87 Test points](#)
11. Thermal insulation: [Pr_80_77_76_54 Mineral wool pipe section insulation Type A](#)
12. Heat emitters: Existing
13. Controls: Heating systems control.
14. Plant and equipment identification: [Pr_40_10_57_78 Self-adhesive colour pipe bands](#); [Pr_40_10_57_94 Valve identification labels](#)
15. Execution: [Ss_60_40_37/610 Removing heating systems](#); [Ss_60_40_37/620 Installing water based heating systems](#); [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](#)
16. System completion: [Ss_60_40_37/810 Commissioning water heating systems](#); [Ss_60_40_37/840 Performance testing](#); [Ss_60_40_37/845 Demonstrations](#); [Ss_60_40_37/850 Inspection and test records](#); [Ss_60_40_37/860 Documentation](#); [Ss_60_40_37/870 Operating tools](#)

System performance

[Ss_60_40_37/220 Basic design temperatures for heating systems](#)

1. Design temperatures: Art gallery - refer to ventilation section
- Etch Associates Ltd
17-03-2026

Ss_60_40_37/250 System operating parameters for water-based heating systems

1. Design flow temperature: 80°C. TBC
2. Temperature difference across primary heating circuit: 60°C. TBC
3. Water velocity: Maximum 1.5 m/s. Nominal 1 m/s.

Ss_60_40_37/260 Heating system capacity

1. Requirement: To match existing
2. Calculation allowances

Products

See [Pr_40_10_57_78 Self-adhesive colour pipe bands](#) in [Ss_50_30_04_97 Above-ground internal stack wastewater drainage systems](#)

See [Pr_40_10_57_94 Valve identification labels](#) in [Ss_55_70_38_15 Water Services](#)

See [Pr_65_52_28_05 Axial expansion compensators](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Pr_65_52_28_46 Lateral expansion compensators](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Pr_65_52_61_50 Masking plates](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Pr_65_52_61_63 Pipe sleeves](#) in [Ss_50_30_04_97 Above-ground internal stack wastewater drainage systems](#)

See [Pr_65_52_63_82 Steel pipes](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Pr_65_54_93_05 Automatic air vents](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Pr_65_54_93_87 Test points](#) in [Ss_55_70_38_15 Water Services](#)

See [Pr_65_54_95_06 Ball valves](#) in [Ss_55_70_38_15 Water Services](#)

See [Pr_65_54_95_26 Double regulating valves](#) in [Ss_55_70_38_15 Water Services](#)

See [Pr_65_54_95_27 Draining taps](#) in [Ss_55_70_38_15 Water Services](#)

Pr_65_54_95_30 Flow-measuring valves

1. General requirements: [Pr_65_54_93_87 Test points](#)
2. Manufacturer: Herz Valves Ltd, Crane Fluid Systems, Hattersley Valves, TA or Oventrop. Only one valve manufacturer shall be used for all valves and accessories.
3. Standard: To [BS 7350](#). To [BS EN ISO 5167-2](#).
4. Arrangement: 4.
5. Accessories: Position indicator. Drain plug facility.
6. Execution: [Pr_65_54_95/630 Installation of flow measurement devices](#)

See [Pr_80_77_76_54 Mineral wool pipe section insulation Type A](#) in [Ss_55_70_38_15 Water Services](#)

See [Pr_80_77_76_64 Polyisobutylene insulation protection](#) in [Ss_55_70_38_15 Water Services](#)

Execution

See [Pr_40_10_57/660 Installing identification on pipework](#) in [Ss_50_30_04_97 Above-ground internal stack wastewater drainage systems](#)

See [Pr_65_54_95/610 Installation of valves generally](#) in [Ss_55_70_38_15 Water Services](#)

Pr_65_54_95/610 Installation of valves generally Type B

1. Installation: In accordance with [BS 6683](#).
2. Position: Refer to schematic drawings.
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_54_95/630 Installation of flow measurement devices

1. General requirements: [Pr_65_54_95/610 Installation of valves generally Type B](#)
2. Position: Provide straight length of pipe upstream and downstream.
3. Straight length: Manufacturer's requirements.

See [Pr_80_77_76/780 Installing vapour barriers](#) in [Ss_55_70_38_15 Water Services](#)

Ss_60_40_37/610 Removing heating systems

1. Scope: As indicated on drawings

Ss_60_40_37/620 Installing water based heating systems

1. Standard: To [BS EN 14336](#).

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. Procedure for filling and pressure testing in accordance with BSRIA [BG 29/2012](#).
2. Notice (minimum): 1 week.
3. Pressure: 1.5 times working pressure.
4. Duration of test: 2 h.

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

1. Preliminary checks: Thoroughly inspect pipework. Complete pressure tests.
2. Flushing: In accordance with BSRIA [BG 29/2012](#).
3. Cleaning: Flushing only
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](#) and CIBSE [Commissioning Code W](#).
2. Commissioning: In accordance with BSRIA [BG 2/2010](#) 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): 1 week.

Ss_60_40_37/840 Performance testing

1. General: Demonstrate the performance of the installations.

Ss_60_40_37/845 Demonstrations

1. Running of plant
- Etch Associates Ltd
17-03-2026

- 1.1. Operation: Run, maintain and supervise the installations under normal working conditions.
- 1.2. Duration: Two weeks.
2. Instruction: Instruct and demonstrate the purpose, function and operation of the installations.

Ss_60_40_37/850 Inspection and test records

1. Construction phase reports: 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

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 and electronic copy.
 - 1.4. Number of copies: Two.
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: Two.
3. Submittal date: At handover.

Ss_60_40_37/870 Operating tools

1. Tools: Supply tools for operation, maintenance and cleaning purposes.
2. Keys: Supply keys for valves and vents.

Ω End of System

Ss_65_40_33_51 Mechanical ventilation systems

Systems

Ss_65_40_33_51 Mechanical ventilation systems

1. Description: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order.

Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

Art Gallery

The AHU for the Art Gallery provides space conditioning and is located on Roof 14. The AHU consists of the following:

- intake louvres mounted on the unit
- intake modulating damper
- G4 equivalent panel filters
- Carbon filters
- inverter driven Plug fans
- chilled water coil
- LTHW heating coil
- steam humidification unit
- exhaust air modulating damper
- intake and return air mixing box

Conditioned Air is then ducted from the underside of the unit to ceiling diffusers in the Art Gallery.

Fresh air intake is directly at the AHU.

A return air is drawn from the art gallery from ceiling mounted return air egg crate grilles in the ceiling.

Return air is ducted to a return air fan and modulated return air/exhaust air dampers.

Exhaust air to terminate via bird beak weather protection and bird mesh.

The AHU will filter and temper the incoming fresh air. The units will be variable volume system and will supply modulating proportion of fresh air to the occupied space.

Dedicated LTHW and Chilled water coils shall be provided to ensure the proposed supply air conditions can be met in the associated external design conditions.

The AHU will be mounted on steel frame support above the flat roof. Refer to structural engineers information.

The HVAC ventilation systems will be fitted with duct mounted attenuators to ensure noise

breakout is kept to an absolute minimum and internal noise levels within the development do not exceed the stated design criteria.

Supply and extract ductwork will route to the dedicated diffusers as indicated on the drawings.

Ensure sufficient access and maintenance is achieved via the accessible zones for all mechanical plant and system components.

Fan energy consumption will be minimised by careful design of the duct system, to meet the specified pressure drop.

Temperature sensors shall be provided in the supply air ductwork to control LTHW heating coil incorporated within the air handling unit.

Provide glass AHU condensate traps.

An inverter driven return air fan will be provided on the return air ductwork.

The inverter will be controlled to the same speed as the supply fan.

The return fan will be complete with antivibration mounts and secondary supports to be located in a position that will enable future plant installation for the museum.

The art gallery ventilation plant shall be VES or equal and approved.

Entomology Room

Provide 2 No plate axial extract fans (EF-02/EF-03) with builders work plenum onto dormer weather louvres in windows. Each extract fan is to have dedicated proprietary controllers to be installed in the room to provide redundancy (50%+50%).

Generally

All ductwork to be installed in accordance with BESA DW/144.

All exposed insulated ductwork to be clad in Isogenopac sheeting or equal and approved in black.

Access openings to be provided for inspection, cleaning and maintenance as per manufacturer's requirements and the access and maintenance strategy.

Volume control damper to be provided on every ductwork branch. VCDs shall be opposed blade type.

Allowance for grilles and diffusers within the art gallery to be removed, stored and reinstated.

Flexible ductwork shall only be used for final connections to grilles and shall be max 200mm long, bends shall not be formed using flexible ductwork and misalignment of greater than 15° shall not be accepted.

Design Criteria

Refer also to mechanical performance schedule.

Art Gallery

Air Supply Temperatures

Summer - 23°C (+2K)
 Winter - 21°C (+2K)
 Humidity (Supply air) - RH 53% (+5%)
 External Design Conditions
 Summer: 32°C dry bulb / 22.5°C wet bulb
 Winter: -5°C dry bulb / 100% saturated

Occupancy: 40 people to maintain 45-60%RH in space
 Air change rate: to meet RH target

Occupancy: 120 people for 1 hour to maintain 1000PPM average through the day.
 Air change rate: to meet air quality target

Entomology Room

Air change rate:
 6ACH

Completion

During commissioning stages a number of adverse temperature conditions shall be generated inside the close control room and adjacent teaching space, using portable electric heaters and air conditioning units to demonstrate the ability to maintain stability in both heating and cooling modes.

On completion provide a comprehensive set of record information and as-built drawings as per the University's O&M Manual Philosophy Document v01, BSRIA BG/79 Model Format and Specification for O&M Manuals, and the University's standard e-documents format.

2. System performance: [Ss 65 40 33/210 Design of ventilation systems](#); [Ss 65 40 33/230 Design parameters for ventilation systems](#); [Ss 65 40 33/240 Ductwork design](#); [Ss 65 40 33/250 Fan performance](#); [Ss 65 40 33/260 Attenuator performance](#)
3. Type of system: Single-duct, variable volume.
4. Supply fans: [Pr 60 65 03 86 Supply air-handling units](#)
5. Acoustic treatment: [Pr 65 67 78 72 Rectangular attenuators](#); [Pr 65 67 78 02 Acoustic duct linings](#)
6. Air ductwork and accessories
 - 6.1. Ductwork: [Pr 65 65 25 72 Rectangular sheet metal ductwork and fittings](#); [Pr 65 65 25 14 Circular sheet metal ductwork and fittings](#)
 - 6.2. Accessories: [Pr 65 65 23 20 Duct access panels](#); [Pr 65 65 25 32 Flexible ductwork](#)
7. Thermal insulation on supply air ductwork: [Pr 80 77 76 53 Mineral wool duct slab insulation](#)
8. Room supply air terminal devices: [Pr 70 65 04 02 Air diffusers](#); [Pr 70 65 04 03 Air grilles](#)
9. Controls: [Ss 75 70 52 94 Ventilation control systems](#)
10. Identification of ductwork and equipment: [Pr 40 10 57 79 Self-adhesive plastics ductwork labels and transfers](#); [Pr 40 10 57 51 Mechanical plant and equipment identification labels](#)
11. Execution: [Ss 65 40 33/630 Installing ductwork to fans and air-handling units](#); [Ss 65 40 33/610 Removing ventilation systems](#)
12. System completion: [Ss 65 40 33/805 Cleaning of ductwork systems](#); [Ss 65 40 33/810 Commissioning of air distribution systems](#); [Ss 65 40 33/830 Inspection and test records for ventilation systems](#); [Ss 65 40 33/840 Training for ventilation systems operation](#); [Ss 65 40 33/850 Record documentation for ventilation systems](#); [Ss 65 40 33/860 Spares and consumables for ventilation systems](#); [Ss 65 40 33/870 Maintenance of ventilation systems](#)

Ss_75_70_52_94 Ventilation control systems

1. Description:

An automatic controls specialist shall be appointed to design, supply, install, commission, set-to-work and commission (including seasonal commissioning) the new BMS works.

Art Gallery

The art gallery ventilation plant will be interfaced via BACnet to a new building management system motor control panel (BMS), this shall be extended and updated to incorporate the new services being installed within the zone.

The control panel shall, as a minimum, have the following control and monitoring capabilities for the ventilation plant:

- Weekly and Annual scheduling
- Night set back
- Automatic set point adjustment
- Receival of hard wired enable, fault and temperature set point signal from BMS
- Remote monitoring
- On/Off
- Fan speed
- Mode
- Filter sign
- LTHW Heating Coil motor control
- CHW coil motor control
- Humidifyer motor control
- Permit/Prohibit
- Fault codes

A VFC shall be provided to the Controller to enable shut down of the Ventilation plant on activation of the fire alarm.

Entomology Room

Entomology Room will have its own wall mounted proprietary controller.

Generally

The BMS will comprise of a network of intelligent DDC controllers that will control and monitor the mechanical services plant and associated electrical equipment. Both power & control electrical wiring from each control panel shall be carried out by the control Specialist using an NIC/EIC approved Electrical Contractor. All electrical containment (conduit, trunking, cable tray) within plant rooms and on the roof shall be supplied and installed by the Controls Specialist. Containment to all other areas will be provided by the electrical contractor, the requirements must be coordinated by the controls contractor.

The installation shall be carried out using LSF single core cables in galvanized steel conduit in accordance with the IEE Regulations BS 7671. Cables shall be sized with a maximum volt drop between the control panel and remote equipment of 2%.

In general, the controls specialist is to ensure that the controls system is designed to minimise energy consumption. The controls must also prioritise selected plant to ensure the performance of this plant is achieved.

The local controllers must be able to operate independently of the network. On failure of the network, devices should default to sensible default values. Each controller is to be able to boot up

and run correctly without the network.

In the event of a power failure affected plant is to shut down safely. On restoration of mains power the plant is to restart sequentially.

All sensors must be monitored. If sensors go out of the calibrated range a sensible default is to used. In the situation of multiple sensors, the sensor values should be compared with each other and any sensor value outside of a specified range should be discarded.

The appearance of any controls which will be in non-plant room areas are to be approved by the project manager prior to manufacture. Exposed wiring routes will not be acceptable other than in plant room areas.

A common VFC input shall be connected to the BMS Controller to alarm when any switch is put into the hand position. A facia common BMS fault indicator lamp is to be provided. This is to be connected to a common controller output and will alarm when a software alarm is current. A facia mounted fault reset switch is to be included.

The controls specialist is to include for 1 full days of on-site training in the operation of the system for the Client.

2. System performance: [Ss 75 70 52/201 Design](#)
3. Start and stop control: [Ss 75 70 52/205 Hand off auto switch](#); [Ss 75 70 52/204 Fan overrun](#); [Ss 75 70 52/210 Optimum start and stop heating](#); [Pr 75 51 17 89 Time switches](#)
4. Heating coils control strategies: [Ss 75 70 52/252 Low-temperature hot water heating coil – control strategy](#)
5. Filter control strategies: [Ss 75 70 52/284 Air filter with pressure sensor control strategy](#)
6. Equipment: [Pr 75 50 18 51 Mechanical services control panels](#)
7. Sensors: [Pr 75 50 76 68 Pressure sensors](#); [Pr 75 50 76 03 Air temperature sensors](#)
8. Equipment interconnectivity: Wired.
9. Rewireable installations: Required.
10. Concealed installations: Required.
11. Control equipment power supply: Mains supply.
12. System completion: [Ss 75 70 52/810 Inspection and testing](#); [Ss 75 70 52/820 Start up and commissioning](#); [Ss 75 70 52/830 Commissioning of automatic control systems](#); [Ss 75 70 52/840 Spares](#); [Ss 75 70 52/850 Keys](#); [Ss 75 70 52/860 Documentation](#)

System performance

Ss_65_40_33/210 Design of ventilation systems

1. Design: Complete the design of the ventilation systems.
2. Method: In accordance with [CIBSE Applications Manual AM 11](#).
3. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
4. Computer calculations
 - 4.1. Submittals: Fan sizing calculations. Duct sizing calculations.

Ss_65_40_33/230 Design parameters for ventilation systems

1. External climatic data
 - 1.1. Winter
 - 1.1.1. Outside temperature: Winter: -5°C dry bulb / 100% saturated
 - 1.2. Summer

- 1.2.1. Outside temperature: Summer: 32°C dry bulb / 22.5°C wet bulb
2. Internal data
 - 2.1. Human occupancy: Art Gallery :40 People
 - 2.2. Heat gains
 - 2.2.1. Convective sensible gains: 80W
 - 2.2.2. Latent gains: 60W
3. Internal parameters
 - 3.1. Room: Summer - 23°C (+2K)
Winter - 21°C (+2K)
 - 3.2. Relative humidity: RH 45%-60%
 - 3.3. Air change rates: Art gallery - To meet RH target
Entomology Room - 6ACH
 - 3.4. Noise levels: Art Gallery: NR 30
Museum Galleries: NR 35
Storage Rooms: NR35
Plant room NR 50

Ss_65_40_33/240 Ductwork design

1. Air velocity
 - 1.1. Standard: As [CIBSE Guide B2](#).
 - 1.2. Main ducts: 5 m/s.
 - 1.3. Branch ducts: 3.5 m/s.
 - 1.4. Run-outs: <2 m/s.
2. Ductwork cleaning
 - 2.1. Standard: In accordance with [BESA TR/19](#).
 - 2.2. Level of protection: Intermediate PDI.
 - 2.3. Cleanliness quality class: Medium.

Ss_65_40_33/250 Fan performance

1. Standard: In accordance with [BS 6583](#). In accordance with [BS EN 16798-3](#).
2. Flow rate: Refer to schedules.
3. System pressure: Refer to schedules.
4. Operation: Variable volume
5. Specific fan power: In accordance with current Non-Domestic Building Services Compliance Guide.

Ss_65_40_33/260 Attenuator performance

1. Performance requirements
 - 1.1. Standards: To [BS EN ISO 7235](#) and [BS EN ISO 11691](#).
 - 1.2. Insertion loss: To meet room requirements.

See [Ss_75_70_52/201 Design](#) in [Ss_60_40_17_12 Chilled water systems](#)

Ss_75_70_52/204 Fan overrun

1. Operation: Activate when mechanical ventilation plant has been operated with an electric heater battery.
2. Period: 5 minutes.

Ss_75_70_52/205 Hand off auto switch

1. Operation
 - 1.1. Hand: Plant operates as normal, regardless of sensors and controllers, but satisfying safety features and interlocks.
 - 1.2. Off: Plant prevented from operating regardless of sensors and controllers. Position plant for shutdown.
 - 1.3. Auto: Plant dependent on sensors and controllers.

Ss_75_70_52/210 Optimum start and stop heating

1. Start
 - 1.1. Optimum start time: From timeclock
 - 1.2. Maximum preheat time: 4 hours.
2. Stop
 - 2.1. Optimum stop time: Following learning period, achieve minimum temperature within +/- 15 minutes of end of occupancy. Take account of day of week and holidays.
 - 2.2. Minimum acceptable temperature during occupied period: Set point -2°C.
 - 2.3. Maximum period between stop and end of occupied period: 2 hours.

Ss_75_70_52/252 Low-temperature hot water heating coil – control strategy

1. Equipment to be controlled: Low-temperature hot water (LTHW) heating coil and three-port valve.
2. Normal operation: Prove fan operation and, after heating from heat recovery has been utilized, modulate three-port valve under PI control to maintain required condition.
3. Low zone temperature condition: Prove fan operation and modulate three-port valve under PI control to maintain zone heating temperature set point.
4. Boost, optimum start heating, low return temperature and low outside temperature: Prove fan operation and fully open three-port valve.

Ss_75_70_52/284 Air filter with pressure sensor control strategy

1. Air filters: Monitor cleanliness by measuring differential pressure across filters using sensors.
2. Dirty filter warning signal: When pressure switch is made.

Products

See [Pr_40_10_57_51 Mechanical plant and equipment identification labels](#) in [Ss_60_40_17_12 Chilled water systems](#)

Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers

1. Standard: To [BS 1710](#). To [BS EN 16798-3](#).
2. Identification type: Self-adhesive plastics or transfers.
3. Execution: [Pr_40_10_57/650 Installing ductwork identification](#)

Pr_60_65_03_86 Supply air-handling units

1. Description: Refer to equipment schedules
2. Manufacturer: Submit proposals
3. Standard: To [BS EN 13053](#).
4. Duty
 - 4.1. Air volume: Refer to schedule
 - 4.2. External resistance: Refer to schedule

- 4.3. Sound power level: Refer to schedule
5. Environment: Internal.
6. Casing construction
 - 6.1. Standard: To [BS EN 1886](#).
 - 6.2. Details: Submit shop drawings and details of dimensions and weight.
 - 6.3. Casing class: Refer to schedule
 - 6.4. Leakage class of casing: Refer to schedule
 - 6.5. Filter bypass leakage: To [BS EN 1886](#), section 7.
 - 6.6. Acoustic insulation of casing: To [BS EN 1886](#), section 9.
 - 6.7. Mechanical safety: To [BS EN 1886](#), section 11.
7. Components
 - 7.1. Filters: Refer to schedule
 - 7.2. Attenuators: Refer to schedule
8. Flexible connections: To [BESA DW/144](#).
9. Access
 - 9.1. General: Provide access openings and covers complete, including opening devices.
 - 9.2. Seal: To prevent excessive air leakage.
 - 9.3. Seal durability: For normal maintenance operations over at least 10 years.

Pr_65_65_23_20 Duct access panels

1. Material: Galvanized sheet steel.

Pr_65_65_25_14 Circular sheet metal ductwork and fittings

1. Standards: To [BESA DW/144](#), [BS EN 1506](#) and [BS EN 12237](#).
2. Classification: Class A.
3. Material: Zinc-coated steel to [BS EN 10346](#) grade DX51D+Z140.
4. Construction: Spirally wound.
5. Regulating dampers
 - 5.1. Standard: As [BESA DW/144](#).
 - 5.2. Regulating function: Balancing.
 - 5.3. Damper type: Opposed blade. Iris.
 - 5.4. Operation: Manual.
 - 5.5. Material: To match ductwork.
6. Access openings
 - 6.1. Purpose: Inspection. Cleaning. Maintenance.
 - 6.2. Sizes: To [BS EN 12097](#).
7. Execution: [Pr_65_65_25/610 Air ductwork generally](#); [Pr_65_65_25/640 Installing sheet metal ductwork](#); [Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork](#); [Pr_65_65_25/670 Ductwork support for vapour seal continuity](#); [Pr_65_65_25/690 Drainage of ductwork](#); [Pr_65_65_25/700 Test holes in ductwork](#); [Pr_65_65_25/720 Weatherproofing ductwork penetrations](#); [Pr_65_65_25/795 Air leakage testing of low-pressure ductwork](#)

Pr_65_65_25_32 Flexible ductwork

1. Description: Max. 500mm, max. change in direction of 15°.
2. Standard: To [BESA DW/144](#).
3. Flexible ductwork: Acoustic.

Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings

1. Standards: To [BESA DW/144](#), [BS EN 1505](#) and [BS EN 1507](#).
2. Classification: Class A.
3. Material: Zinc-coated steel to [BS EN 10346](#) grade DX51D+Z140.
4. Regulating dampers
 - 4.1. Standard: To [BESA DW/144](#).
 - 4.2. Regulating function: Balancing.
 - 4.3. Damper type: Opposed blade.
 - 4.4. Operation: Manual.
 - 4.5. Material: To match ductwork.
5. Access openings
 - 5.1. Purpose: Inspection. Cleaning. Maintenance.
 - 5.2. Sizes: To [BS EN 12097](#).
6. Execution: [Pr_65_65_25/610 Air ductwork generally](#); [Pr_65_65_25/640 Installing sheet metal ductwork](#); [Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork](#); [Pr_65_65_25/670 Ductwork support for vapour seal continuity](#); [Pr_65_65_25/690 Drainage of ductwork](#); [Pr_65_65_25/700 Test holes in ductwork](#); [Pr_65_65_25/720 Weatherproofing ductwork penetrations](#); [Pr_65_65_25/795 Air leakage testing of low-pressure ductwork](#)

Pr_65_67_78_02 Acoustic duct linings

1. Standard: To [BESA DW/144](#).
2. Lining material: Inert, fire proof, inorganic and non hygroscopic.
3. Protective lining: Protect acoustic lining against product migration and erosion.
4. Execution: [Pr_65_67_78/610 Protection of acoustic linings](#)

Pr_65_67_78_72 Rectangular attenuators

1. Application: Intake, supply, extract and discharge.
2. Performance standards: To [BS EN ISO 7235](#) and [BS EN ISO 11691](#).
3. Duty
 - 3.1. Insertion loss: Submit proposals.
 - 3.2. Air volume: Submit proposals.
 - 3.3. Permissible pressure loss: 25Pa.
4. Lining material: Inert, fire proof, inorganic and non-hygroscopic.
5. Markings: Show direction of air flow on silencer.

Pr_70_65_04_02 Air diffusers

1. Standards
 - 1.1. Mixed flow applications: To [BS EN 12238](#).
 - 1.2. Sound power levels: To [BS EN ISO 5135](#).
2. Application: Supply.
3. Duty
 - 3.1. Air volume: Refer to schedule.
 - 3.2. Size: Refer to schedule.
 - 3.3. Sound power level: Refer to schedule.
4. Core velocity (maximum): 3 m/s.
5. Diffuser: Perforated face.

6. Shape: Rectangular.
7. Arrangement: Adjustable.
8. Position: Ceiling.
9. Finish: Easy clean finish.
10. Accessories: [Pr_70_65_04_04 Air plenum boxes](#)
11. Execution: [Pr_70_65_04/620 Installing circular and rectangular diffusers](#)

Pr_70_65_04_03 Air grilles

1. Standards
 - 1.1. Mixed flow applications: To [BS EN 12238](#).
 - 1.2. Displacement flow applications: To [BS EN 12239](#).
 - 1.3. Sound power levels: To [BS EN ISO 5135](#).
2. Application: Extract.
3. Grille type: Air valve and to match supply diffusers.
4. Position: Ceiling.
5. Material: Refer to schedule
6. Finish: Refer to schedule
7. Execution: [Pr_70_65_04/650 Installing grilles](#)

Pr_70_65_04_04 Air plenum boxes

1. Duty
 - 1.1. Air volume: Submit proposals.
 - 1.2. Spigot size: Submit proposals.
 - 1.3. Spigot position: Submit proposals.
2. Configuration: Single plenum box.
3. Construction: Sturdy and rigid with circular inlet spigots of 65 mm minimum length.
4. Fixing: Incorporate means for fixing to, or suspending from, building or other construction.

Pr_75_50_18_51 Mechanical services control panels

1. Enclosure
 - 1.1. Ingress protection (minimum): To [BS EN 60529](#), IP54.
 - 1.2. Material: Polycarbonate.
 - 1.3. Finish: Internal partitions, zinc-coated.
 - 1.4. Doors and panels
 - 1.4.1. Form: Right-angle return construction with rounded edges and corners, concealed hinges and internal gaskets.
 - 1.4.2. Swing: 180°.
 - 1.4.3. Hardware: Corrosion-resistant lever type handles with latching mechanism.
 - 1.4.4. Locks: Cylinder, with standardized key type.
2. Isolator
 - 2.1. Type: Switch-disconnector to [BS EN IEC 60947-3:2021](#).
 - 2.2. Mechanical interlocking: Door-interlocked operating handles. Rotary handle.
3. Gland plate gaskets: Match the assembly's degree of ingress protection.
4. Internal cable zones: Sufficient to allow cabling to be neatly routed and terminated.
5. Interconnecting cable: Single-core, PVC-insulated cables to [BS 6231](#).

6. Terminals

6.1. Mounting: Suitable for mounting to 35 mm DIN rail.

6.2. Identification

6.2.1. Neutral and earth bar terminals: Label with the outgoing circuit reference.

6.2.2. Cable terminations: Label with circuit reference, with push-on plastics markers.

7. Trunking

7.1. Standard: To [BS EN 50085-2-3](#).

7.2. Material: PVC-U.

8. Execution: [Pr 75 50 18/630 Installing control panels](#)

See [Pr 75 50 76 03 Air temperature sensors](#) in [Ss 60 40 17 12 Chilled water systems](#)

See [Pr 75 50 76 68 Pressure sensors](#) in [Ss 60 40 17 12 Chilled water systems](#)

[Pr_75_51_17_89 Time switches](#)

1. Standards: To [BS EN 60730-1](#) and [BS EN 60730-2-7](#).
2. Equipment interconnectivity: Wired.
3. Format: Electronic digital.
4. Programme capability: 7 day with each day offering different settings.
5. Programme selection: Touchscreen.
6. Programming method: Remotely via a separate device, handheld or PC.
7. Programme access: Fully available from the programme interface. Password protected.
8. GMT/BST daylight saving: Automatic.
9. Integral thermostat: To [BS EN 60730-2-9](#)
10. Execution: [Pr 75 51 17/620 Installing time switches](#)

[Pr_80_77_76_53 Mineral wool duct slab insulation](#)

1. Standard: To [BS 3958-5](#). To [BS EN 14303](#).
2. Recycled content: 50% (minimum) to [BS EN ISO 14021](#).
3. Thermal conductivity: 0.032 W/m·K at 0°C.
0.034 W/m·K at 10°C.
0.037 W/m·K at 50°C.
0.040 W/m·K at 75°C.
0.044 W/m·K at 100°C.
4. Finish: Aluminium foil-faced.
5. Insulation thickness (minimum): To [BS 5422](#).
6. Vapour barrier
 - 6.1. Material: Foil faced
 - 6.2. Vapour permeability: To [BS 5422](#), clause 5.6.
7. Protection: [Pr 80 77 76 64 Polyisobutylene insulation protection Type A](#)
8. Execution: [Pr 80 77 76/660 Installing foil-faced mineral wool insulation on ductwork](#)

[Pr_80_77_76_64 Polyisobutylene insulation protection Type A](#)

1. Material: Polyisobutylene.

2. Colour: Self-finish.
3. Execution: [Pr 80 77 76/710 Installing polyisobutylene \(PIB\) protection](#)

Execution

See [Pr 40 10 57/611 Installing mechanical plant and equipment identification](#) in [Ss 60 40 17 12 Chilled water systems](#)

Pr_40_10_57/650 Installing ductwork identification

1. Standard: In accordance with [BESA, DW/144](#).
2. Position: Locate where visible.
3. Direction of flow: One apex of the triangle pointing in the direction of flow.
4. Information: Air being conveyed, direction of flow, destination of the air.

Pr_65_65_25/610 Air ductwork generally

1. Cut edges on ductwork, flanges and supports: Smooth and burr-free.

Pr_65_65_25/640 Installing sheet metal ductwork

1. Standard: To [BESA DW/144](#).
2. Hangers and supports: Install in accordance with [BSRIA BG 10/2010](#). Strength requirements to [BS EN 12236](#).
3. Installing flexible joint connections: Install fully stretched to minimize pressure drop.

Pr_65_65_25/670 Ductwork support for vapour seal continuity

1. Method of support: *Ensure that vapour seal is maintained throughout.*

Pr_65_65_25/690 Drainage of ductwork

1. Ductwork: Install to drain entrained moisture.
2. Joints: Lap to minimize moisture leakage.

Pr_65_65_25/700 Test holes in ductwork

1. Position: In accordance with [CIBSE Commissioning Code Series A](#) and [BESA DW/144](#).

Pr_65_65_25/720 Weatherproofing ductwork penetrations

1. Roof penetrations: Submit proposals.
2. Wall penetrations: Submit proposals.

Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork

1. General: Fit sensors, damper motors and other control equipment.
2. Connections: Connect control equipment and instruments.

Pr_65_65_25/795 Air leakage testing of low-pressure ductwork

1. Standard: To [BESA DW/144](#) and [DW/143](#).
2. Extent: Random testing of 10% maximum of the ductwork system.

Carry out tests as work proceeds before thermal insulation is installed.

Where a test fails, select two further sections for testing.

Carry out remedial work where tests fail.

3. Test pressure: To [BESA DW/144](#), Table 22.
4. Documentation: Air leakage test sheet.
5. Report
 - 5.1. Format: Electronic.
 - 5.2. Submit: On completion.
 - 5.3. Number of copies: Two.

Pr_65_67_78/610 Protection of acoustic linings

1. Access: Where personnel access is provided, protect acoustic linings to prevent damage.

Pr_70_65_04/610 Installing air terminal devices

1. General: Do not distort air terminal devices. Fix securely.
2. Air leakage: Prevent. Seal joints with self adhesive foam strip or equivalent.
3. Appearance: Finish visible edge joints neatly. Do not leave sharp edges and protruding screws.
4. Operation: Fit so that moving parts operate correctly and removable cores can be taken out and replaced.
5. High level and ceiling applications: On removable cores, provide safety wires with quick release ends.

Pr_70_65_04/620 Installing circular and rectangular diffusers

1. General requirements: [Pr_70_65_04/610 Installing air terminal devices](#)

Pr_70_65_04/650 Installing grilles

1. General requirements: [Pr_70_65_04/610 Installing air terminal devices](#)

Pr_75_50_18/630 Installing control panels

1. Clearance (minimum): 1000 mm in front of control panel.
2. Fixing equipment: Fix independently of wiring installation with zinc electroplated fasteners.
3. Orientation: Accurate and square to vertical and horizontal axes. Align adjacent items of switchgear on the same horizontal axis.
4. Identification
 - 4.1. Neutral and earth bar terminals: Label with the outgoing circuit reference.
 - 4.2. Cable terminations: Label with circuit reference, with push-on plastics markers.

Pr_75_51_17/620 Installing time switches

See [Pr_80_77_76/610 Installing insulation and protection products generally](#) in [Ss_50_30_04_97 Above-ground internal stack wastewater drainage systems](#)

Pr_80_77_76/660 Installing foil-faced mineral wool insulation on ductwork

1. General requirements: [Pr_80_77_76/610 Installing insulation and protection products generally](#)
2. Fixing to underside of ducting: [BS 5970](#).
3. Seals: [BS 5970](#).

Pr_80_77_76/710 Installing polyisobutylene (PIB) protection

1. Application: [BS 5970](#).

2. Finish: [BS 5970](#).

Ss_65_40_33/610 Removing ventilation systems

1. Scope: As detailed on the strip out drawings.

Ss_65_40_33/630 Installing ductwork to fans and air-handling units

1. Air discharge: Ensure that any backdraft shutters are freely operable prior to making connections. Connect ductwork to allow air to straighten as it leaves the fan or air-handling unit. Check fan direction arrows when installing.

System completion

Ss_65_40_33/805 Cleaning of ductwork systems

1. Standards: In accordance with [BESA TR/19](#) and to [BS EN 15780](#).
2. Verification
 - 2.1. Method: Visual inspection.
 - 2.2. Completion report
 - 2.2.1.Information: System cleaned. Cleaning method used. Verification tests. Pre- and post-clean photographic records. Additional works carried out.
 - 2.2.2.Format: Electronic.
 - 2.2.3.Submit: On completion.
 - 2.2.4.Copies: Two.

Ss_65_40_33/810 Commissioning of air distribution systems

1. Pre-commissioning: In accordance with [BSRIA BG 49/2015](#) and [CIBSE Commissioning code A](#).
2. Commissioning: In accordance with [BSRIA BG 49/2015](#) and [CIBSE Commissioning code A](#).
3. Notice (minimum): 1 week.

Ss_65_40_33/830 Inspection and test records for ventilation systems

1. Construction phase reports: System commissionable.
2. Records for air systems: In accordance with [BSRIA BG 49/2015](#).
3. Record sheets
 - 3.1. Submission: On completion.
 - 3.2. Number of copies: Three.

Ss_65_40_33/840 Training for ventilation systems operation

1. Running of plant
 - 1.1. Operation: Run, maintain and supervise the installations under normal working conditions.
 - 1.2. Duration: Two weeks.
2. Instruction
 - 2.1. Training: Instruct and demonstrate the purpose, function and operation of the installations. Identify safety features and system resets. Demonstrate remote monitoring and controls of ventilation systems at BEMS front end computer. Familiarisation with the major plant and equipment. Advice on future maintenance of the systems.
 - 2.2. Notice period (minimum): Four weeks.
 - 2.3. Record: Signed record of training sheets

Ss_65_40_33/850 Record documentation for ventilation systems

1. Operating and maintenance instructions
 - 1.1. Scope: Submit for the system as a whole giving optimum settings for controls.
 - 1.2. Product information: Product description. Date of purchase. Performance characteristics. Application (suitability for use). Method of operation and control. Cleaning and maintenance requirements.
 - 1.3. Contact details: Include.
 - 1.4. Warranty for system: Include.
 - 1.5. Format: Paper copy. Electronic.
 - 1.6. Number of copies: Two.
2. Record drawings
 - 2.1. Content: Location and arrangement of plant in plant rooms. Location, size and route of ductwork. Location and identification of regulating dampers and fire dampers. Location of outlets. Schematics. Sections. 3D Models.
 - 2.2. Format: A1 paper print. Electronic.
 - 2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_65_40_33/860 Spares and consumables for ventilation systems

1. Filters
 - 1.1. Filter media: Supply one complete replacement for every filter.
2. Keys: Ventilation plant access keys.
3. Air terminal device keys: Supply a set for adjusting each size and type of grille and diffuser.

Ss_65_40_33/870 Maintenance of ventilation systems

1. Servicing and maintenance: Provide quotation to undertake for 12 months after practical completion.

See [Ss_75_70_52/810 Inspection and testing](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Ss_75_70_52/820 Start up and commissioning](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Ss_75_70_52/830 Commissioning of automatic control systems](#) in [Ss_60_40_17_12 Chilled water systems](#)

Ss_75_70_52/840 Spares

1. Spare fuses
 - 1.1. Position: Mount within each control panel.
 - 1.2. Number: Two of each type used.
2. Spare devices: Two of each type used.
3. Spare lamps
 - 3.1. Position: Mount within control panel.
 - 3.2. Number: Two of each type used.

See [Ss_75_70_52/850 Keys](#) in [Ss_60_40_17_12 Chilled water systems](#)

See [Ss_75_70_52/860 Documentation](#) in [Ss_60_40_17_12 Chilled water systems](#)

Ω End of System

Ss_70_30_25_25 Earthing and bonding systems

Systems

Ss_70_30_25_25 Earthing and bonding systems

1. Description: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order.

Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

Modifications to the existing earthing and bonding system shall be provided as in accordance with BS7671 with latest amendments & BS7430 to suit the new electrical supply. In summary, the systems requiring main protective bonding conductors include but are not limited to the following:-

- Reinstatement of main chiller plant to roof 20.
- New air handling plant to roof 14 & 15.

Each final circuit shall have its own earth conductor that shall generally be in the form of separate LSOH insulated copper cable or the copper conductor integral to the cable.

It is assumed that the earthing arrangement for the incoming supply to the building is TN-C-S system at the main incoming service head.

All items of metallic equipment shall be bonded together using 6491B Green/Yellow copper conductor or equivalent copper tape as required by BS7671 Wiring Regulations.

All bonding conductors shall be terminated using crimped lugs.

The electrical contractor shall test and commission the new earthing and bonding system as in accordance with BS7671 with latest amendments.

2. System performance: [Ss_70_30_25/210 Design of earthing and bonding systems](#)
3. Main incoming earth: Establish with the Electricity Distributor.
4. Main protective bonding conductors: [Pr_65_70_48_75 Single-core non-sheathed low smoke halogen free \(LSHF\) insulated cables](#)
5. Supplementary bonding conductors: [Pr_65_70_48_75 Single-core non-sheathed low smoke halogen free \(LSHF\) insulated cables](#)
6. Circuit protective conductors: Core of cable. Cable armour and auxiliary. and Separate
7. Earth terminal type: Distribution Network Operators earth terminal block
8. Execution: [Ss_70_30_25/630 General installation](#); [Ss_70_30_25/640 Installing earth conductor joints and connections](#)
9. System completion: [Ss_70_30_25/810 Inspection and testing](#); [Ss_70_30_25/820 Documentation](#)

System performance

Ss_70_30_25/210 Design of earthing and bonding systems

1. Standards: In accordance with [BS 7671](#) and [BS 7430](#).
2. Design: Complete the design of the earthing and bonding systems.
3. Earthing conductor: Size in accordance with [BS 7671](#), Regulation 543.1.3.
4. Main protective bonding conductors
 - 4.1. Connect the following to the main earthing terminal: Connection should be made between the main earthing terminal and extraneous-conductive parts of an installation including, but not limited to, water service pipes, gas installation pipes, other service pipes and ducting, central heating and air conditioning systems, exposed metallic structural parts of the building, and the lightning protection system. Note that some LPS are required to be separated from the building structure and therefore a protective bonding connection to the LPS will be subject to the agreement of the lightning protection specialist
 - 4.2. Size (minimum): In accordance with [BS 7671](#), Regulation 544.1.1.
5. Supplementary bonding conductors
 - 5.1. Bond the following: In accordance with [BS 7671](#)
 - 5.2. Size (minimum): Minimum of 2.5 mm² if sheathed or where mechanical protection is provided, otherwise 4 mm².
6. Circuit protective conductors: Size in accordance with [BS 7671](#), Regulation 543.1.3.
7. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Products

Pr_65_70_48_75 Single-core non-sheathed low smoke halogen free (LSHF) insulated cables

1. Description: Supply and install single core cables as required to provide a complete installation.
2. Manufacturer: Contractors Choice
3. Standards: To [BS EN 50525-1](#) and [BS EN 50525-3-41](#).
4. Third-party certification: British Approvals Service for Cables ([BASEC](#))-certified.
5. Cable type: H07Z-R.
6. Size: Contractors Choice
7. Reaction to fire class
 - 7.1. Fire behaviour: B2_{ca}.
 - 7.2. Additional classification for smoke production: s1b.
 - 7.3. Additional classification for flaming droplets and/ or particles: d1.
 - 7.4. Additional classification for acidity: a2.
8. Execution: [Pr 65 70 48/635 Installing low-voltage cables](#)

Execution

Pr_65_70_48/635 Installing low-voltage cables

Shared by: [Pr 65 70 48 29 Fire-resistant screened \(LSHF\) cables](#)

1. Standard: In accordance with [BS 7671](#).
2. Timing: Do not start internal cabling until building enclosure provides permanently dry conditions.

3. Preparation: Store cables above 5°C for 24 hours before installation.

Clear cable path of debris.

4. Installation temperature (minimum): 5°C.
5. Cables: Install in one length. Dress cables flat, free from twists, kinks and strain.
6. Cable pulling: Do not overstress. Prevent kinks and twisting of the cable.
7. Cable protection: Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
8. Concealed cable runs to wall accessories: Run vertically from the accessory.
9. Exposed cable runs: Direct to surface.
10. Distance from other services running parallel (minimum): 150 mm. Position cables below heating pipes.
11. Jointing and termination
 - 11.1. Final circuit cables: At electrical accessories only.
 - 11.2. Core connections: Using compression lugs to equipment without integral clamping terminals.
 - 11.3. Terminating cables when not using glands: Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

Ss_70_30_25/630 General installation

1. Standards: In accordance with [BS 7430](#) and [BS 7671](#).

Ss_70_30_25/640 Installing earth conductor joints and connections

1. Number of joints: Minimize.
2. Contact surfaces: Clean. Coat with corrosion inhibitor.
3. Bimetallic joints: Do not cross-contaminate.
4. Protection to joints and connections: Apply oxide inhibiting compound.
5. Connections to test points: Clamp.
6. Protective cable terminations: Compression lugs with phosphor bronze nuts, bolts and washers.

System completion

Ss_70_30_25/810 Inspection and testing

1. Standards: In accordance with [BS 7430](#) and [BS 7671](#).
2. Notice before commencing tests (minimum): 24 h.
3. Continuity of protective conductors
 - 3.1. Parallel earth paths: Isolate before testing.
 - 3.2. Equipment: Continuity tester with short circuit current not less than 200 mA, and a no load d.c. or a.c. voltage between 4 V and 24 V.
4. External earth fault loop impedance (Z_e): Direct measurement.
5. Earth fault loop impedance (Z_s): Direct measurement.

Ss_70_30_25/820 Documentation

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: Electronic. Paper copy.
- 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 earth electrodes. Location of earth terminals.
 - 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_70_30_80_35

Hardwired low-voltage small power systems

Systems

Ss_70_30_80_35 Hardwired low-voltage small power systems

1. Description: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order.

Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

Within areas where the roofing is to be completely removed / replaced, the Contractor shall allow for the careful removal, storage, and reinstatement once the roof works are complete. The Contractor shall ensure that all cabling is removed out of the way and that all other systems in the building are to remain operational and not be affected by the temporary works.

The Contractor shall ensure they survey the site fully to understand the routes, accessibility and coordination with other services.

Setting Out

The electrical contractor shall be responsible for all co-ordination and installation details for setting out allowing liaison with all specialist systems and the architect.

2. System performance: [Ss_70_30_80/210 Design of low-voltage small power systems](#)
3. Connection to low-voltage supply: Distribution Boards
4. Final circuit cabling: [Pr_65_70_48_48 Light-duty mineral-insulated cables](#)
5. Cable accessories: [Pr_65_70_11_13 Cable cleats](#); [Pr_65_70_11_15 Cable ties](#)
6. Containment: [Pr_65_70_11_12 Cable baskets](#); [Pr_65_70_11_17 Cable trays](#)
7. Containment accessories: [Pr_65_70_11_20 Conduit fittings Type A](#); [Pr_20_29_76_15 Coach screws](#); [Pr_20_29_03_28 Expansion anchors](#)
8. Rewireable installation: Required.
9. Electrical identification: [Pr_40_10_57_29 Equipment labels and warning notices Dyno \(A\)](#)
10. Execution: [Ss_70_30_80/620 Small power installation](#); [Ss_70_30_80/630 Installing cabling to socket outlets](#)
11. System completion: [Ss_70_30_80/820 Documentation for low-voltage small power systems](#); [Ss_70_30_80/840 Maintenance of low-voltage small power systems](#)

System performance

Ss_70_30_80/210 Design of low-voltage small power systems

1. Provision of small power: For fixed and portable equipment requiring power.
2. Design: Complete for the low-voltage small power systems.

3. Standards: In accordance with [BS 7671](#), as amended by [BS 7671 Corrigendum](#) and [BS 7671 Amendment 3](#).
4. Diversity: In accordance with [IET Guidance Note 1](#).
5. Spare capacity throughout the small power system: 20%.
6. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Products

Pr_20_29_03_28 Expansion anchors

Shared by: [Ss_75_50_28_29 Fire detection and alarm systems](#)

1. Description: Supply and Install as required to provide a complete installation.
2. Manufacturer: Contractors Choice
3. Certification: Where a European Assessment Document (EAD) or European Technical Assessment Guideline (ETAG) is available, provide a European Technical Assessment (ETA) with CE marking and a Declaration of Performance (DoP). Otherwise, provide third-party certification by a [United Kingdom Accreditation Service](#) (UKAS)-approved independent laboratory.
4. Format: Internally threaded anchor.
5. Material: Carbon steel, Property Class 8.8 to [BS EN ISO 898-1](#).
6. Finish: Galvanized.
7. Head arrangement: Contractors Choice
8. Anchor length: Contractors Choice
9. Accessories: Contractors Choice
10. Thread diameter: Contractors Choice
11. Execution: Fixing with anchors

Pr_20_29_76_15 Coach screws

1. Description: Supply and Install as required to provide a complete installation.
2. Manufacturer: Contractors Choice
3. Standard: To [DIN 571](#).
4. Head arrangement: Round, with square neck.
5. Material: Carbon steel.
6. Finish: Galvanized to [BS 7371-6](#).
7. Thread diameter: Contractors Choice
8. Length: Contractors Choice
9. Execution: [Pr_20_29_76/620 Fixing with screws](#)

Pr_40_10_57_29 Equipment labels and warning notices Dyno (A)

1. Description: Supply and install labelling systems to small power accessories for circuit identification and equipment/load identification
2. Manufacturer: Contractors Choice
3. Material: Screen-printed plastic.
4. Label size: Contractors Choice
5. Colour
 - 5.1. Background: White.
 - 5.2. Lettering: Black.
6. Typography

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- 6.1. Font: Contractors Choice
- 6.2. Size: Contractors Choice
7. Notice wording: Submit Proposals

Pr_65_70_11_12 Cable baskets

Shared by: [Ss_75_70_54_10 Building monitoring and management systems](#)

1. Standard: To [BS EN 61537](#).
2. Execution: [Pr_65_70_11/630 Installing cable basket](#); [Pr_65_70_11/650 Multiple cable runs](#); [Pr_65_70_11/661 Cable support zones](#)

Pr_65_70_11_13 Cable cleats

1. Description: Supply and install cable cleats as required.
2. Manufacturer: Contractors Choice
3. Standard: To [BS EN 61914](#).
4. Format: Contractors Choice
5. Material: Metallic.
6. Resistance to impact: Medium.
7. Environmental influences
 - 7.1. Non-metallic and composite components: Resistant to ultraviolet light.
 - 7.2. Metallic and composite components: High resistance to corrosion.

Pr_65_70_11_15 Cable ties

1. Description: Supply and install cable ties as required
2. Manufacturer: Contractors Choice
3. Standard: To [BS EN IEC 62275](#).
4. Format: Wrap around self-locking releasable.
5. Material: Metal. Nylon.
6. Contribution to fire : Non-flame-propagating.
7. Environmental influences
 - 7.1. Non-metallic and composite components: Resistant to ultraviolet light.
 - 7.2. Metallic and composite components: Resistant to corrosion.

Pr_65_70_11_17 Cable trays

Shared by: [Ss_75_70_54_10 Building monitoring and management systems](#)

1. Standard: To [BS EN 61537](#).
2. Electrical properties
 - 2.1. Continuity characteristics: With electrical continuity. Without electrical continuity.
 - 2.2. Conductivity characteristics: With electrical conductive system component. Without electrical conductive system component.
3. Execution: [Pr_65_70_11/621 Installing cable tray and cable ladder](#); [Pr_65_70_11/650 Multiple cable runs](#); [Pr_65_70_11/661 Cable support zones](#)

Pr_65_70_11_20 Conduit fittings Type A

1. Description: Supply and install conduit fittings as required to provide a complete installation.
2. Manufacturer: Match conduit.

3. Standards: To [BS EN 61386-1](#) and to [BS EN 61386-21](#), [BS EN 61386-22](#), or [BS EN 61386-23](#) as appropriate.
4. Material
 - 4.1. Type: Malleable iron.
 - 4.2. Finish: Match conduit.
5. Conduit boxes: Fit covers of same material and finish as boxes. Include brass earthing terminals in PVC-U boxes.
6. Plugs
 - 6.1. For metallic boxes: Hexagonal malleable iron.
 - 6.2. For non-metallic boxes: Hexagon screwed PVC-U.
7. Locknuts
 - 7.1. For metallic boxes: Hexagonal malleable iron.
 - 7.2. For non-metallic boxes: Hexagonal PVC-U.
8. Execution: [Pr 65 70 11/700 Installing conduit, trunking and ducting Type C](#)

Pr 65 70 48 48 Light-duty mineral-insulated cables

1. Manufacturer: Submit proposals
2. Standard: To [BS EN 60702-1](#).
3. Third-party certification: British Approvals Service for Cables ([BASEC](#))-certified.
4. Metallic sheath: Copper.
5. Outer covering
 - 5.1. Material: LSHF.
 - 5.2. Colour: White.
6. Execution: [Pr 65 70 48/675 Installing mineral-insulated copper-sheathed cables](#)

Execution

Pr 20 29 76/620 Fixing with screws

1. Fastener spacing: 100 mm.
2. Finished level of screw heads
 - 2.1. Exposed: Flush with surface.
 - 2.2. Concealed (holes filled or stopped): Sink minimum 2 mm below surface.

Pr 65 70 11/621 Installing cable tray and cable ladder

1. Standards: In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
2. Preparation
 - 2.1. Burrs and sharp edges: Make smooth.
 - 2.2. Cutting: Minimize and make good edges. Cuts to cable tray to be square along an unperforated line.
 - 2.3. Treatment of cut surface: Extend 25 mm beyond the cut. Match finish of cable supports.
3. Access: Provide space around cable ladder and tray to permit access for installing and maintaining cables.
4. Joints and expansion couplers
 - 4.1. Position: Locate between the bracket support and the quarter point.
 - 4.2. Number of joints: Minimize.
 - 4.3. Lengths of cable ladder and tray: Maximize.

- 4.4. Ends: Blank with end plates.
5. Changes of size and direction: Manufacturer's accessories of the same material type, pattern, finish and thickness as cable supports.
6. Fire barriers: Provide where required to maintain fire performance of fabric.
7. Protective covers: Provide to cables requiring mechanical protection.
8. Support
 - 8.1. Fixing arrangement: Independently fix and support from building structure using threaded rod fixed to channel cable support with shake proof washers and hex nuts.
 - 8.2. Clearance from building fabric (minimum): 20 mm.
9. Components: Avoid contact between dissimilar metals.
10. Routing of cable ladder and tray: Submit drawings showing the proposed routes of cable ladder and cable tray.

Pr_65_70_11/630 Installing cable basket

1. Standards: In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
2. Joints: Cut adjacent cross basket wires. Make smooth any burrs or edges.
3. Accessories: Form on site and connect with basket manufacturer's coupling components.
4. Fire barriers: Provide where required to maintain fire performance of fabric.
5. Support
 - 5.1. Fixing arrangement: Independently fix and support from building structure using threaded rod fixed to channel cable support with shake proof washers and hex nuts.
 - 5.2. Clearance from building fabric (minimum): 20 mm.
6. Components: Avoid contact between dissimilar metals.
7. Routing of cable basket: Submit drawings showing the proposed routes.

Pr_65_70_11/650 Multiple cable runs

1. Requirement: Use cable basket when three or more cables are run in parallel.

Pr_65_70_11/661 Cable support zones

1. Ceiling voids: Provide clear distance of 150 mm (minimum) between underside of any cable supports and brackets and the topside of ceiling.

Pr_65_70_11/700 Installing conduit, trunking and ducting Type C

1. Standards: In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
2. Preparation: Cut square. Remove burrs and sharp edges to make smooth.
3. Protection of metallic conduit, trunking and ducting
 - 3.1. Joints and ends: Remove grease, oil, dirt and rust before applying protective paint. Paint immediately following installation.
 - 3.2. Protective paint
 - 3.2.1. Generally: Compatible with conduit, trunking and ducting finish.
 - 3.2.2. Type: Match factory finish.
4. Cross-sectional area: Maintain throughout the conduit, trunking and ducting length.
5. Arrangement: Position vertically and horizontally in line with equipment served, and parallel with building lines.
6. Draw wires: Install galvanized soft iron wires within spare conduit, trunking and ducting.
7. Distance from other services running parallel (minimum)
 - 7.1. Generally: 150 mm.

- 7.2. Above radiators: 1000 mm.
8. Drainage of conduit, trunking and ducting: Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
9. Fire barriers: Provide to maintain integrity of fire compartments.
10. Rewireable installations: Enable rewiring from accessible boxes or accessories only.
11. Support: Independently fix and support conduit, trunking and ducting from building structure.
12. Cleaning: Clean insides of conduit, trunking and ducting before installing cables.
13. Cabling: Install when conduit, trunking and ducting enclosure is complete.
14. Submittals: Submit manufacturer's technical information. Submit drawings showing the proposed routes of conduit, trunking and ducting and the location of service outlets.

Pr_65_70_48/675 Installing mineral-insulated copper-sheathed cables

1. General requirements: [Pr_65_70_48/700 Mineral-insulated cable joints](#)
2. Installation: In accordance with [BS EN 60702-3](#).
3. Bending: Do not corrugate sheath. Straighten and dress cables neatly.
4. Moisture damage to the insulation: Prevent.
5. Temporary seals: Provide for cables when cut.
6. Fastening to fabric
 - 6.1. Bare cables: Bare copper P-clips.
 - 6.2. Sheathed cables: Copper P-clips with covering material to match that of cable sheath.
7. Testing: Test each length immediately after fastening. Repeat test 24–48 hours later.

Pr_65_70_48/700 Mineral-insulated cable joints

1. Cable terminations: In externally threaded glands with seals. Indicate temperature rating.
2. Joints: Crimped connectors.
3. Connectors: Insulate and seal connectors with insulating tape to conductor sleeving. Terminate glands into internally threaded brass sleeve.
4. Brass sleeve protection: Heat shrink sleeve.

Ss_70_30_80/620 Small power installation

1. Standard: In accordance with [BS 7671](#).

Ss_70_30_80/630 Installing cabling to socket outlets

1. General: Wire socket outlets in ring final circuits without spurs where hard wiring is employed.

System completion

Ss_70_30_80/820 Documentation for low-voltage small power 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 & Electronic
 - 1.4. Number of copies: Three.
2. Record drawings

- 2.1. Content: For all low-voltage final circuits, the cable origin, circuit designation, route, loading, conductor material and c.s.a, insulation type and colour, number of cores per cable, number of cables in trunking and conduit. Whether cables are run on surface, concealed in walls, floors, above suspended ceilings or within roof spaces. Location, route and depth of underground cables. Location of LV switchgear including distribution boards. Routes of trunking, conduit, cable tray and cable ladders. Location of all electrical outlets, including isolators, starters, control equipment and electrical accessories Schematic drawings showing all low-voltage final circuits, the cable origin, circuit designation, cable type, size, number of cores, size and type of overcurrent protective device.
- 2.2. Format: A1 paper print drawing. Electronic drawing.
- 2.3. Number of copies: Three.
3. Submittal date: At handover.

Ss_70_30_80/840 Maintenance of low-voltage small power systems

1. Servicing and maintenance: Undertake.
2. Duration: Until 12 months after practical completion.

Ω End of System

Ss_70_80_33_35 Hardwired general lighting systems

Systems

Ss_70_80_33_35 Hardwired general lighting systems

1. Description: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order.

Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

Within areas where the roofing is to be completely removed / replaced, the Contractor shall allow for the careful removal, storage, and reinstatement once the roof works are complete. The Contractor shall ensure that all cabling is removed out of the way and that all other systems in the building are to remain operational and not be affected by the temporary works.

Within the plant room beneath roof RF14, the Contractor shall allow for replacing the existing fluorescent luminaires with new LED linear surface fittings. 2 of the luminaires as a minimum shall be complete with integral self test emergency battery back-up supplies.

Setting Out

The electrical contractor shall be responsible for all co-ordination and installation details for setting out allowing liaison with all specialist systems and the architect.

2. System performance: [Ss_70_80_33/270 Lighting cables generally](#)
3. Final circuit cabling: MICC
4. Containment: As existing
5. Rewireable installation: Required.
6. Concealed installation: Required.
7. Luminaire types: Refer to drawings
8. Lighting controls: [Pr_65_72_97_63 Plate switches](#)
9. Execution: [Ss_70_80_33/640 Installing emergency lighting systems](#); [Ss_70_80_33/630 Installing general lighting systems](#); [Ss_70_80_33/620 Modifying existing lighting systems](#)
10. System completion: [Ss_70_80_33/810 Testing and commissioning of general lighting systems](#); [Ss_70_80_33/812 Testing and commissioning emergency lighting systems](#); [Ss_70_80_33/820 Documentation relating to general lighting](#); [Ss_70_80_33/822 Documentation relating to emergency lighting](#); [Ss_70_80_33/840 Maintenance](#)

System performance

Ss_70_80_33/270 Lighting cables generally

1. Standard: In accordance with [BS 7671](#).
2. Requirement: Submit proposals, including detailed design drawings, technical information, calculations and manufacturers' literature.

3. Conductor sizes (minimum)
 - 3.1. Lighting circuits: 1.5 mm².
 - 3.2. Final connection: 1.0 mm².
4. Cable sizes not stated: Submit.
5. Format: Amtech.

Products

Pr_65_72_97_63 Plate switches

1. Manufacturer: Submit proposals
2. Standard: To [BS EN 60669-1](#).
3. Current rating: 20 A.
4. Actuating method: Rocker.
5. Poles: Single-pole.
6. Mounting: Surface.
7. Ingress protection (minimum): To [BS EN 60529](#), IP20.
8. Cable termination: Screwed.
9. Plate
 - 9.1. Material: Stainless steel.
10. Execution: [Pr_65_72_97/640 Installing light switches](#)

Execution

Pr_65_72_97/640 Installing light switches

1. Multigang switches: Connect so that there is a logical relationship with luminaire positions.
2. Unused switch spaces: Fit with blanks.
3. Segregation: Internally segregate each phase with phase barriers. Include warning plates.

Ss_70_80_33/620 Modifying existing lighting systems

1. Existing luminaires: Luminaires within car park area to be modified to suit new construction of rooms.
2. Existing lamps: Replace.

Ss_70_80_33/630 Installing general lighting systems

1. Standard: In accordance with [BS 7671](#) and [CIBSE Commissioning Code L](#).
2. Commissioning method statement: Submit prior to commissioning.
3. Luminaire layout: Contractor to develop with Architect as part of the detailed design.
4. Connection of luminaire supporting couplers
 - 4.1. General luminaires: White plug with white cover.
 - 4.2. Flex length (maximum): 2 m.
5. Switches and controls
 - 5.1. Location: Contractor to set as part of the design development and co-ordinate with architect.
 - 5.2. Staircases: Two-way switching at top and bottom landings with intermediate at full landings.
6. Rooms smaller than 4 m²: Restrict lighting circuits to one electrical phase.

Ss_70_80_33/640 Installing emergency lighting systems

1. Standards: In accordance with [BS 5266-1](#) and [BS 7671](#).
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17-03-2026

2. Connection of luminaire supporting couplers
 - 2.1. Emergency luminaires: Red plug with red cover.
 - 2.2. Flex length (maximum): 2 m.
3. Permanent electrical supplies to self-contained emergency luminaires: Derive from the closest general lighting circuit.

System completion

Ss_70_80_33/810 Testing and commissioning of general lighting systems

1. Standards: In accordance with [BS 7671](#) and [CIBSE Commissioning Code L](#).
2. Test results: Submit two copies of system commissioning completion certificate.
3. Certificates of calibration for meters and instruments: Submit.

Ss_70_80_33/812 Testing and commissioning emergency lighting systems

1. Commissioning: In accordance with [BS 5266-1](#), Annex H.
2. Results: Submit two copies of emergency lighting completion certificates, in accordance with [BS 5266-1](#), Annex H, Figures H.1, H.2, H.3, and H.4.
3. Certificates of calibration for meters and instruments: Submit.

Ss_70_80_33/820 Documentation relating to general lighting

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. & Electronic
 - 1.4. Number of copies: Three.
2. Record drawings
 - 2.1. Content: General arrangement drawings showing the location of luminaires, lighting circuit distribution boxes, master and slave distribution boxes, switch modules, manual and automatic switches and controls including timeswitches, passive infrared detectors, and daylight sensors . Schematic diagram showing all final circuit cabling, the cable origin, device addresses for automated controls, route from controls to luminaires, and the location of all joints and tees. Include conductor material and c.s.a., insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder.
 - 2.2. Format: A1 paper print drawing. Electronic drawing.
 - 2.3. Number of copies: Three.
3. Submittal date: At handover

Ss_70_80_33/822 Documentation relating to emergency lighting

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 & Electronic
 - 1.4. Number of copies: Three.
2. Record drawings

- 2.1. Content: General arrangement drawings showing the location of emergency luminaires, lighting circuit distribution boxes, master and slave distribution boxes, switch modules, manual and automatic emergency lighting test panels . Schematic diagram showing all final circuit cabling, the cable origin, device addresses for automated controls, route from controls to luminaires, and the location of all joints and tees. Include conductor material and c.s.a., insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder.
- 2.2. Format: Electronic drawing. A1 paper print drawing.
- 2.3. Number of copies: Three.
3. Submittal date: At handover.
4. Certification for re-engineered luminaires: Submit completed [ICEL 1004](#) model test record certificate.
5. Logbook: Submit, including the following information: date of commissioning of the system, including any certificate relating to alterations;

Date of each periodic inspection and test;

Date and brief details of each service, inspection or test carried out;

Dates and brief details of any defects and of remedial action taken;

Date and brief details of any alteration to the emergency lighting installation;

If any automatic testing device is employed, a description of the main characteristic and the mode of operation;

Details of replacement components

of luminaires such as lamp type, battery and fuses.

Ss_70_80_33/840 Maintenance

1. Servicing and maintenance: Undertake.
2. Duration: Until 12 months after completion.

Ω End of System

Ss_75_50_28_29 Fire detection and alarm systems

Systems

Ss_75_50_28_29 Fire detection and alarm systems

1. Description: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order.

Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

The Contractor shall allow for the removal of fire alarm devices from roof areas that are being removed and replaced, the devices shall be positioned and arranged such that the buildings system is maintained and operational.

Once the roof works are complete the Contractor shall allow for reinstatement of the fire alarm devices and re-testing of the system to ensure no devices have been damaged.

The Contractor shall allow for the installation of a new fire alarm interface unit for the new air handling plant, this shall be installed within the plant room and linked to the new mechanical control panel being installed.

The electrical contractor shall employ a Fire alarm specialist to complete the design and supply, install and commission the new fire alarm system as indicated on the drawings.

2. System performance: [Ss_75_50_28/210 Design of fire detection and alarm systems in non-domestic premises](#); [Ss_75_50_28/265 Interface with ancillary systems and equipment](#)
3. System manufacturer: As existing
4. System type: Addressable.
5. Detection devices
 - 5.1. Atmosphere: Normal.
 - 5.2. Types: [Pr_75_80_30_82 Smoke and heat multi-sensor detectors](#); [Pr_75_80_30_65 Point smoke detectors](#); [Pr_75_80_30_64 Point heat detectors](#); [Pr_75_80_30_50 Manual call points](#)
6. Equipment interconnectivity: [Pr_65_70_48_29 Fire-resistant screened \(LSHF\) cables](#)
7. Cable containment: As existing
8. Containment accessories: [Pr_20_29_03_28 Expansion anchors](#)
9. Rewireable installation: Required.
10. Concealed installation: Required.
11. Execution: [Ss_75_50_28/620 Working in areas protected by fire detection and alarm systems in non-domestic premises](#); [Ss_75_50_28/615 Modifying existing fire detection and alarm systems](#)
12. System completion: [Ss_75_50_28/805 System information](#); [Ss_75_50_28/806 Device identification and testing](#); [Ss_75_50_28/810 Testing and commissioning fire detection and alarm systems in non-domestic premises](#); [Ss_75_50_28/819 Testing and commissioning interfaces to](#)

[ancillary systems and equipment; Ss 75 50 28/845 Modifications to existing fire detection and alarm systems in non-domestic premises; Ss 75 50 28/820 Documentation for fire detection and alarm systems in non-domestic premises; Ss 75 50 28/828 Documentation for electrical equipment for actuation of release mechanisms for doors; Ss 75 50 28/830 Spares and consumables; Ss 75 50 28/840 Maintenance; Ss 75 50 28/850 Verification certificate for fire detection and alarm systems in non-domestic premises; Ss 75 50 28/860 Acceptance certificate for fire detection and alarm systems in non-domestic premises](#)

System performance

Ss_75_50_28/210 Design of fire detection and alarm systems in non-domestic premises

1. System designer: System Installer
2. Standards: Complete the design of the fire detection and alarm system in accordance with [BS 5839-1](#).
3. Category: L1.
4. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
5. System design certificate: Submit with design proposals.

Ss_75_50_28/265 Interface with ancillary systems and equipment

1. System designer: Fire alarm specialist
2. Standard: In accordance with [BS 7273-6](#).
3. Interfaces to equipment not forming part of the fire detection and alarm system: Design system to interact with the equipment in the event of a fire or fault signal.
4. Equipment and mode of operation: Mechanical Control Panel
5. System monitoring: In accordance with BS 7273-6

Products

See [Pr 20 29 03 28 Expansion anchors](#) in [Ss 70 30 80 35 Hardwired low-voltage small power systems](#)

Pr_65_70_48_29 Fire-resistant screened (LSHF) cables

1. Description: Supply and Install fire alarm loop cabling as required to provide a complete system.
2. Manufacturer: Submit proposals
3. Standard: To [BS 7629-1](#).
4. Third-party certification: Loss Prevention Certification Board ([LPCB](#))-certified.
5. Size: 1.5mm minimum
6. Insulation: EI 5.
7. Fire resistance category: STANDARD 30.
8. Screen: Manufacturers standard
9. Execution: [Pr 65 70 48/635 Installing low-voltage cables](#); [Pr 65 70 48/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket](#)

Pr_75_80_30_50 Manual call points

1. Description: Supply and install manual call points as required to provide a complete installation.
2. Manufacturer: Match existing
3. Standard: To [BS EN 54-11](#).
4. Third-party certification: [LPCB](#)-approved.

5. Designation: Type A.
6. Frangible element: Non-resettable.
7. Integral red visual indicator: Required.
8. Environmental category: Indoor.
9. Mounting: Semi-recessed.
10. Protective covers: Not required.
11. Execution: [Pr 75 80 30/630 Installing manual call points](#)

Pr_75_80_30_64 Point heat detectors

1. Description: Supply and install heat detectors as required to provide a complete installation.
2. Manufacturer: Match existing
3. Standard: To [BS EN 54-5](#).
4. Third-party certification: [LPCB](#)-approved.
5. Classification: A1. A2.
6. Suffix: R.
7. Power source: Loop powered
8. Execution: [Pr 75 50 76/620 Installing point detectors](#)

Pr_75_80_30_65 Point smoke detectors

1. Description: Supply and install smoke detectors as required to provide a complete installation.
2. Manufacturer: Match existing
3. Standard: To [BS EN 54-7](#).
4. Third-party certification: [LPCB](#)-approved.
5. Detector type: Optical.
6. Power source: Loop powered
7. Execution: [Pr 75 50 76/620 Installing point detectors](#)

Pr_75_80_30_82 Smoke and heat multi-sensor detectors

1. Description: Supply and install multi sensor detectors as required to provide a complete installation.
2. Manufacturer: Match existing
3. Standard: To [BS EN 54-29](#).
4. Third-party certification: [LPCB](#)-approved.

Execution

See [Pr 65 70 48/635 Installing low-voltage cables](#) in [Ss 70 30 25 25 Earthing and bonding systems](#)

Pr_65_70_48/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket

1. Cabling: Install when cable supports are complete.
2. Position: Place single and multicore cables side by side.
3. Fastening
 - 3.1. Fastenings generally: Secure cables, do not indent sheaths. Position to enable any submain cable to be individually removed.
 - 3.2. Submain cables <95 mm²: Cable bands at 350 mm (maximum) horizontal spacing and 450 mm (maximum) vertical spacing.

- 3.3. Submain cables >95 mm²: Cable bands at 900 mm (maximum) horizontal spacing and 1100 mm (maximum) vertical spacing.
- 3.4. Final circuit cabling: Cable ties at 250 mm (maximum) spacing.
- 3.5. Extra-low-voltage, communications and fibre-optic cabling: Cable ties at 250 mm (maximum) spacing.

Pr_75_50_76/620 Installing point detectors

1. Protective cage: Not required

Pr_75_80_30/630 Installing manual call points

1. Position: As indicated on the design intent drawings.
2. Mounting height: 1.4 m.
3. Test key: Locate to allow easy test operation.
4. Labelling
 - 4.1. Type: Face-engraved rigid plastic laminate.
 - 4.2. Background: White.
 - 4.3. Lettering: Red, identifying the manual call point address.

Ss_75_50_28/615 Modifying existing fire detection and alarm systems

1. Existing fire detection and alarm system
 - 1.1. Short circuit isolators: Identify and label.
 - 1.2. End of line devices: Identify and label.
 - 1.3. Sounders: Identify cabling route and label.
 - 1.4. Detection devices: Identify cabling route and label.
 - 1.5. Interfaces with other equipment: Identify and label.
2. Connections to external and remote signalling devices: Isolate.
3. Circuits and cabling that are to remain: Make good and update record drawings.
4. Method: Submit proposals.

Ss_75_50_28/620 Working in areas protected by fire detection and alarm systems in non-domestic premises

1. Minimize false alarms: Inform staff of the presence of automatic fire detectors and of the precautions to be adopted when working.
2. Method: Submit proposals.

System completion

Ss_75_50_28/805 System information

1. Device list: Before commissioning, submit proposals, including proposed device, zone and group names.
2. Zone diagram: Before commissioning submit proposals. Allow for new Zone Plans in CAD format to replace existing. Zone plans shall be for whole site/system and not just the areas modified.

Ss_75_50_28/806 Device identification and testing

1. Device identification: Label devices with a unique address corresponding to that used by the CIE. Label non-addressable devices with a unique reference corresponding to that shown on the record drawings.

2. Device testing: Verify the operation of each device. Submit a schedule of devices, including the device test methods and results.

Ss_75_50_28/810 Testing and commissioning fire detection and alarm systems in non-domestic premises

1. System commissioning agent: System installer
2. Standard: In accordance with [BS 5839-1](#).
3. Notice before commencing tests (minimum): Two weeks.

Ss_75_50_28/819 Testing and commissioning interfaces to ancillary systems and equipment

1. System commissioning agent: System installer
2. Standard: In accordance with [BS 7273-6](#).
3. Notice before commencing tests (minimum): Two weeks.
4. Connections with other systems and equipment: Verify and demonstrate operation of the systems and equipment under fire and fault conditions.

Ss_75_50_28/820 Documentation for fire detection and alarm systems in non-domestic premises

1. Standard: In accordance with [BS 5839-1](#).
2. Operating and maintenance instructions
 - 2.1. Scope: Submit for the system giving optimum settings for controls.
 - 2.2. Product information: Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
 - 2.3. Format: Electronic
3. Logbook: Submit one copy in accordance with [BS 5839-1](#), Annex F.
4. Record drawings
 - 4.1. Content: General arrangement drawings showing the location of all control and indicating equipment, manual call points, detectors, radio transmitters and aerials, sounders, visual alarm signal devices, short circuit isolators, end of line devices, remote indicators, interface units connecting to other equipment, and automatic door hold open devices. Schematic diagram showing all control cabling, the cable origin, device addresses, route from control and indicating equipment to manual call points, detectors, radio transmitters and aerials, sounders, visual alarm signal devices, short circuit isolators, end of line devices, remote indicators, interface units connecting to other equipment, and automatic door hold open devices. Include conductor material and c.s.a, insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder.
 - 4.2. Drawing format: A1 paper print drawing. Electronic drawing.
 - 4.3. Number of copies: Three.
 - 4.4. Submittal date: At handover.
5. Fire evacuation plan: Submit electronic colour CAD layout.
6. Certification
 - 6.1. Design certificate: Submit two copies in accordance with [BS 5839-1](#), Annex G.1.
 - 6.2. Installation certificate: Submit two copies in accordance with [BS 5839-1](#), Annex G.2.
 - 6.3. Commissioning certificate: Submit two copies in accordance with [BS 5839-1](#), Annex G.3.

Ss_75_50_28/828 Documentation for electrical equipment for actuation of release mechanisms for doors

1. Certification: Submit in accordance with [BS 7273-4](#), Annex G.

Ss_75_50_28/830 Spares and consumables

1. Supply the following spares
 - 1.1. Frangible elements for manual call points: Six.
 - 1.2. Detectors: Two of each type.
2. Printer ink and paper roll: Replace immediately before handover.

Ss_75_50_28/840 Maintenance

1. Standard: In accordance with [BS 5839-1](#). In accordance with [BS 7273-4](#).
2. Duration: Until 12 months after practical completion.

Ss_75_50_28/845 Modifications to existing fire detection and alarm systems in non-domestic premises

1. Modification certificate: Submit two copies in accordance with [BS 5839-1](#), Annex G.7.
2. Existing operation and maintenance manuals and record drawings: Update.

Ss_75_50_28/850 Verification certificate for fire detection and alarm systems in non-domestic premises

1. System verification agent: System installer
2. Verification certificate: Submit two copies in accordance with [BS 5839-1](#), Annex G.5.

Ss_75_50_28/860 Acceptance certificate for fire detection and alarm systems in non-domestic premises

1. Acceptance certificate: Submit two copies in accordance with [BS 5839-1](#), Annex G.4.

Ω End of System

Ss_75_50_45_45 Lightning protection systems

Systems

Ss_75_50_45_45 Lightning protection systems

1. Description:

This specification has been developed to RIBA Stage 3 Design, however it shall be clearly understood that the appointed services contractor shall be fully responsible for the final site coordination, supply, installation, testing, demonstrating, documentation, leaving in a satisfactory working order of the systems.

Design drawings have been prepared by Etch to indicate the Client's brief set out by the design team appointed to RIBA Stage 3. The contract drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the Electrical Contractor to develop these into fully coordinated set of construction and working drawings.

The installation is to be compliant with BS7671 latest edition.

A specialist shall be employed to complete the design and supply, install and test/commission adaptations and modifications to the existing lightning protection system.

The contractor shall allow for the adaptations to the system to facilitate the following works:-

- Removal and reinstatement of roof mounted chiller.
- Removal and new air handling plant installation.
- Reinstatement of lightning protection system to suit remedial works to the roof areas.

Allow for the removal of redundant lightning bonds/ tape to existing plant and the installation new from the existing roof mounted conductors to the new roof mounted plant.

The final routing and positioning of any lightning protection tape etc. shall be co-ordinated with existing site constraints.

All details of the lightning protection proposals shall be submitted on drawing for review and comment by the design team.

Ensure that every surge protection device installed complies with BS EN 62305 and BS EN 61643-11:2012 and is suitably selected for the proposed location and application.

2. System performance: [Ss_75_50_45/210 Design of lightning protection systems](#)
3. System manufacturer: A member of the [Association of Technical Lightning and Access Specialists](#).
4. Air-termination system: [Pr_65_70_46_03 Aluminium earth tapes](#)
5. Electrical identification: [Pr_40_10_57_29 Equipment labels and warning notices Dyno](#)
6. Execution: [Ss_75_50_45/630 Installing lightning protection systems](#)
7. System completion: [Ss_75_50_45/810 Inspection and testing of lightning protection systems](#); [Ss_75_50_45/820 Documentation](#)

System performance

Ss_75_50_45/210 Design of lightning protection systems

1. Design: Complete the design of the lightning protection system.
2. System designer: A member of the [Association of Technical Lightning and Access Specialists](#).

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Lightning protection systems
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3. Standards: To [BS EN 62305-1](#), [BS EN 62305-2](#), [BS EN 62305-3](#) and [BS EN 62305-4](#).
4. Class of LPS: To match existing
5. External LPS type: Attached to the structure (non-isolated).
6. Internal LPS type: Lightning equipotential bonding by direct connections, surge protective devices, and electrical insulation.
7. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Products

Pr_40_10_57_29 Equipment labels and warning notices Dyno

1. Description: Supply and install labelling systems to small power accessories for circuit identification and equipment/load identification
2. Manufacturer: Contractors Choice
3. Material: Screen-printed plastic.
4. Label size: Contractors Choice
5. Colour
 - 5.1. Background: White.
 - 5.2. Lettering: Black.
6. Typography
 - 6.1. Font: Contractors Choice
 - 6.2. Size: Contractors Choice
7. Notice wording: Submit Proposals

Pr_65_70_46_03 Aluminium earth tapes

1. Manufacturer: Contractor to submit
2. Standards: To [BS EN IEC 62561-2](#) and [BS EN 755-5](#).
3. Size: 25 x 3 mm.
4. Cover: To match existing
5. Execution: [Pr_65_70_46/660 Installing earth conductor tapes](#)

Execution

Pr_65_70_46/660 Installing earth conductor tapes

1. Position: Exposed.
2. Number of joints: Minimize.
3. Contact surfaces: Clean. Coat with corrosion inhibitor.
4. Bimetallic joints: Do not cross-contaminate.
5. Conductors passing through roofs: Provide puddle flanges.
6. Fasteners: Spaced at a maximum of 600 mm apart.

Ss_75_50_45/630 Installing lightning protection systems

1. Standards: To [BS EN 62305-3](#) and [BS EN 62305-4](#).
2. Position
3. Substructure: When used as the earth terminal network measure its resistance to earth during the construction period.
4. Results: Submit.

System completion

Ss_75_50_45/810 Inspection and testing of lightning protection systems

1. Standards: To [BS EN 62305-3](#) and [BS EN 62305-4](#).
2. Results: Include within inspection guide.

Ss_75_50_45/820 Documentation

1. Standards: To [BS EN 62305-3](#) and [BS EN 62305-4](#).
2. Inspection guide
 - 2.1. Submit including the following information: The general status of the LPS including conditions of air termination components, down-conductors and earth system components. Levels of corrosion and condition of corrosion protection. Presence and condition of fixings of LPS components to the structural fabric. Earth resistance measurements of the earth-termination system. Any deviation from the technical documentation. Evidence of any modification carried out to the LPS or the structure since the last inspection. The result of any measurements performed.
 - 2.2. Format: Electronic.
3. Record drawings
 - 3.1. Content: General arrangement drawings showing the location of all air terminals, tapes, earth rods, plates and electrodes, test joints, and plates, route of protective bonding conductors from the lightning protection system to other services and to the main earthing terminal.
 - 3.2. Format: Electronic drawing.
 - 3.3. Number of copies: Two.
4. 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: This specification has been developed to RIBA Stage 3 level of design; it shall be clearly understood that the contractor shall be responsible for taking responsibility for the design and the production of Technical Design and coordinated working drawings, supply, installation, testing, demonstration, documentation, and leaving the systems in satisfactory working order. Design drawings have been prepared by etch Associates to indicate the Client's brief. The tender drawings are generally diagrammatic and intended to indicate intent rather than detail. It will be the responsibility of the contractor to develop these into coordinated working drawings in conjunction with their specialist contractors.

At completion record information shall be produced that clearly captures the scope of works that were undertaken as part of the project.

Outline Requirements

The contractor will appoint a specialist building management system (BMS) contractor to complete the design, installation and commissioning of the works required to provide a fully functional system.

The existing Mechanical Control Panel will remain to serve plant/areas outside of the scope of the works. But all controls associated with art gallery plant are to be removed blanked off on the fascia.

An entire new and independent BMS Mechanical Control Panel shall be provided to support the new ventilation plant serving the art gallery. The new panel will be fully interfaced with the existing panel as required.

General control panels must be form 2 type 2, with separate control and power sections. Power supplies for new ventilation plant are to be provided by the controls specialist.

Control panels must be provided with at least 25% spare capacity. 'Spare capacity' refers to both physical space and to hardware to support the spare I/O channels. All spare I/O must be wired within the MCP up to the field terminal rail.

The specific system requirements are described in their respective specification sections. The BMS works shall comprise of the following. Refer to the system specifications for further details:

The new BMS panel to serve the art gallery plant:

- New ventilation supply AHU
- Return fan
- LTHW/Chilled water coil control

The existing chiller's new proprietary proprietary controls are to be interfaced with the existing MCCP in the chilled water system plant room.

The controls specialist is to investigate the control of the existing system.

General

BEMS equipment (including, but not limited to, all outstations and loose controls) must be designed to suit the requirements of the particular building services that are (or will be) in place,

and must always incorporate sufficient features to operate the plant safely with the minimum of energy use.

All plant control must be via conventional hard-wired BEMS inputs and outputs.

Contractor to submit design proposals for client team review prior to commencement.

2. System performance: [Ss_75_70_54/210 Design](#)
3. Cables: As Specialist's recommendations.
4. Containment: [Pr_65_70_11_12 Cable baskets](#); [Pr_65_70_11_17 Cable trays](#); [Pr_65_70_11_71 Rigid conduit](#)
5. Containment accessories: [Pr_65_70_11_20 Conduit fittings](#)
6. Rewireable installations: Required.
7. Concealed installations: Required.
8. Control equipment power supply: Mains supply.
9. Execution: [Ss_75_70_54/610 Removing building monitoring and management systems](#); [Ss_75_70_54/620 Installation of building monitoring and management systems](#); [Ss_75_70_54/630 Installation of field controllers](#); [Ss_75_70_54/640 Installation of cables](#)
10. System completion: [Ss_75_70_54/810 Inspection and testing](#); [Ss_75_70_54/820 Commissioning](#); [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.

Products

See [Pr_65_70_11_12 Cable baskets](#) in [Ss_70_30_80_35 Hardwired low-voltage small power systems](#)

See [Pr_65_70_11_17 Cable trays](#) in [Ss_70_30_80_35 Hardwired low-voltage small power systems](#)

Pr_65_70_11_20 Conduit fittings

1. Standards: To [BS EN 61386-1](#) and to [BS EN 61386-21](#), [BS EN 61386-22](#), or [BS EN 61386-23](#) as appropriate.
2. Conduit boxes: Fit covers of same material and finish as boxes. Include brass earthing terminals in PVC-U boxes.
3. Execution: [Pr_65_70_11/700 Installing conduit, trunking and ducting](#)

Pr_65_70_11_71 Rigid conduit

1. Standards: To [BS EN 61386-1](#) and [BS EN 61386-21](#).
2. Resistance to bending: Rigid.
3. Electrical characteristics:
4. Execution: [Pr_65_70_11/721 Installing rigid metallic conduit](#); [Pr_65_70_11/765 Conduit, trunking and ducting zones](#)

Execution

See [Pr 65 70 11/621 Installing cable tray and cable ladder](#) in [Ss 70 30 80 35 Hardwired low-voltage small power systems](#)

See [Pr 65 70 11/630 Installing cable basket](#) in [Ss 70 30 80 35 Hardwired low-voltage small power systems](#)

See [Pr 65 70 11/650 Multiple cable runs](#) in [Ss 70 30 80 35 Hardwired low-voltage small power systems](#)

See [Pr 65 70 11/661 Cable support zones](#) in [Ss 70 30 80 35 Hardwired low-voltage small power systems](#)

Pr_65_70_11/700 Installing conduit, trunking and ducting

1. Standards: In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
2. Preparation: Cut square. Remove burrs and sharp edges to make smooth.
3. Protection of metallic conduit, trunking and ducting
 - 3.1. Joints and ends: Remove grease, oil, dirt and rust before applying protective paint. Paint immediately following installation.
 - 3.2. Protective paint
 - 3.2.1. Generally: Compatible with conduit, trunking and ducting finish.
 - 3.2.2. Type: Galvanizing zinc rich paint, two coats.
4. Cross-sectional area: Maintain throughout the conduit, trunking and ducting length.
5. Arrangement: Position vertically and horizontally in line with equipment served, and parallel with building lines.
6. Draw wires: Install galvanized soft iron wires within spare conduit, trunking and ducting.
7. Drainage of conduit, trunking and ducting: Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
8. Fire barriers: Provide to maintain integrity of fire compartments.
9. Rewireable installations: Enable rewiring from accessible boxes or accessories only.
10. Support: Independently fix and support conduit, trunking and ducting from building structure.
11. Cleaning: Clean insides of conduit, trunking and ducting before installing cables.
12. Cabling: Install when conduit, trunking and ducting enclosure is complete.
13. Submittals: Submit manufacturer's technical information. Submit drawings showing the proposed routes of conduit, trunking and ducting and the location of service outlets.

Pr_65_70_11/710 Installing conduit generally

1. Fixing: Fix securely. Fix boxes independently of conduit.
2. Changes of direction: Conduit boxes or bends site formed by machine. Do not use elbows, tees or inspection bends.
3. Joints
 - 3.1. Generally: Manufacturer's jointing fittings.
 - 3.2. Number of joints: Minimize.
 - 3.3. Lengths of conduit: Maximize.
 - 3.4. Open ends: Plug.
 - 3.5. At movement joints in structure: Manufactured expansion coupling. Install adaptable boxes on both sides of joint at a maximum distance of 300 mm.
4. Connections to boxes, trunking, equipment and accessories: Screwed couplings with rubber bushes at open ends.

5. Conduit boxes
 - 5.1. Generally: Install flush with finished surfaces. Provide extension rings if required.
 - 5.2. Fixing screws: Countersunk, or round-headed screws.
 - 5.3. Number of fixings (minimum): Two.
 - 5.4. Lids: Fasten with brass slot pan head screws.
6. Rear outlet boxes: Locate where surface conduits pass through walls to external equipment.
7. Draw-in boxes
 - 7.1. Spacing (maximum): 10 m.
 - 7.2. Number of bends between draw-in boxes (maximum): Two.
 - 7.3. Floors: Do not install draw-in boxes in floors.
8. Suspended ceiling installations: Fasten outlet boxes to structure above ceiling.

Pr_65_70_11/721 Installing rigid metallic conduit

1. General requirements: [Pr_65_70_11/710 Installing conduit generally](#); [Pr_65_70_11/700 Installing conduit, trunking and ducting](#)
2. Threaded conduits: Tightly screw to ensure electrical continuity, with no thread showing.
3. Conduit connections to boxes and items of equipment, other than those with threaded entries: Earthing coupling with male brass bush and protective conductor.

Pr_65_70_11/765 Conduit, trunking and ducting zones

1. General requirements: [Pr_65_70_11/700 Installing conduit, trunking and ducting](#)
2. Ceiling voids: Provide clear distance of 150 mm (minimum) between underside of any conduit, trunking or trunking and the topside of ceiling.

Ss_75_70_54/610 Removing building monitoring and management systems

1. Scope: Existing redundant controls associated with fan coil units, dehumidifier plant, plate heat exchanger identified on strip out drawings.

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. Fixing equipment: Fix independently of wiring installation, with zinc electroplated fasteners.

Ss_75_70_54/640 Installation of cables

1. Timing: Do not start internal cabling until building enclosure provides permanently dry conditions.
2. Cables: Install in one uninterrupted run.
3. Arrangement: Position vertically and horizontally in line with equipment served, and parallel with building lines. Provide drip loop to prevent water entering equipment.
4. Orientation: Dress cables flat, free from twists, kinks and strain.
5. Cable pulling
 - 5.1. Cable: Do not overstress.
 - 5.2. Installation method: Submit proposals.
6. Jointing: At equipment and terminal fittings only.
7. Cables from other systems
 - 7.1. Segregation: Segregate and cross at right angles.

- 7.2. Distance from steam and low temperature hot water systems running parallel: 500 mm minimum.
8. Cable terminations: Support cable within 150 mm of termination.
9. Balanced twisted-pair cabling
 - 9.1. Maximum untwist at terminations: 12 mm.

System completion

Ss_75_70_54/810 Inspection and testing

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

Ss_75_70_54/820 Commissioning

1. General: Commission in accordance with [BSRIA AG 9/2001](#) and [BCIA Start up and commissioning guide](#).

Ss_75_70_54/830 Documentation

1. Operation and maintenance instructions
 - 1.1. Scope: Submit 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.
 - 1.4. Number of copies: Three.
2. Record drawings
 - 2.1. Content: 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. Location of control panels, equipment and repeater panels.
 - 2.2. Format: A1 paper print. Electronic.
 - 2.3. Number of copies: Three.
3. Submittal date: At handover.

Ω End of System



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