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OVG Oak View Group

OVG Manchester

Mechanical & Public Health Services Specification

BRA-MEE-ZZ-ZZ-SP-ME-7002

Stage 4a

Revision: P02

OVG Manchester
Mechanical & Public Health Services Specification
Issue and Revision Record

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Mechanical & Public Health Specification

2020-10-06

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Ss_50_30_02_28
[P] External gravity rainwater drainage systems ADDED

Systems

Ss_50_30_02_28 [P] External gravity rainwater drainage systems ADDED

1. Description: The contractor shall supply, install, test, commission, demonstrate and set to work the gravity rainwater disposal systems as set out within this specification and as described on the layout drawings and equipment schedules, including the detailed requirements set out below:

   Level 05 plant areas, and level 04 external areas are to be provided with a gravity rainwater system.

   Level 05 Plant Areas:

   Level 05 plant areas will be drained with a point drainage system of Rainwater outlets discharging to a gravity rainwater pipe system.

   Drainage is provided both within and outside the external façade screen, with outlets distributed evenly throughout each zone.

   Level 05 gravity rainwater outlets will have 110mm vertical outlets, with pipes dropping and collecting into a suspended drainage system at Level 04 (high level). The suspended drainage runs to 4no. 300mm gravity rainwater stacks (RWPs 01 – 04) which are located in the 4 quadrant risers – where drop to Level 00 and join the below ground drainage system.

   Rainwater outlets shall be suitable to roof construction. On inverted roof areas outlets proposed are to be vari-level type draining at surface and membrane level - as Wade Vari-level or better and approved.

   Level 05 system based on rainfall intensity
   of 0.56 l/s/sq.m.

   For smaller buildings located on Level 05 (Boiler room, Electrical room, Stair Cores) external gutters and 2no. 110mm HDPE RWPs are to be provided to each. Run off to be discharged from these roofs onto the Level 05 surface via a shoe piece in convenient locations.

   Level 04 External Areas:

   Level 04 areas will be drained with a point drainage system of Rainwater outlets discharging to a gravity rainwater pipe system.

   Level 04 gravity rainwater outlets will have 110mm vertical outlets, with pipes dropping and collecting into a suspended drainage system at Level 03 (high level). The suspended drainage runs to the quadrant risers, where they connect to the 300mm RW stacks (RWPs 01 – 04) running from above to below.

Level 01 Podium Areas:

All drainage to Level 01 external and podium areas is by Buro Happold. All gullies, channels, outlets, filter drainage, permeable paving etc. in these areas are to be designed, detailed and specified by Buro Happold. Where pipework from these items drops into Level 00 internal spaces, they are picked up in M.E. package and are shown on M.E. design drawings. These runs will be routed to join below ground drainage system, via Level 00 slab drainpoint connections. Note this only applies to drains entering internal building areas, all drains outside of these areas shall enter the below ground drainage system directly.

The design of the underground drainage system(s) will be undertaken by the civil/structural engineer, and all details relating to this drainage will be provided by them. The above ground rainwater drainage will connect to the underground drainage system via connections/couplings. Any gullies, channels, outlets, pipework etc. at or below ground floor slab level, will be detailed and specified by the civil/structural engineer.

A rainwater harvesting system will be provided via a buried harvesting tank (for details refer to civils package). The rainwater harvesting system will supply WC and urinal cisterns, hose union wash down points, and the irrigation system in and around the Arena.
Above ground elements of this system are covered in ME package. Below ground elements of this system are covered in the civil engineer's package.

1.1. General Requirements:

Provide gravity rainwater disposal system for areas specified in this specification and the drawings, including overflows, discharging the surface water run-off to the below ground drainage system, inclusive of all pipework, fittings, gratings, supports, brackets, fixings, accesses and accessories.

Develop the 4A design to contractor information and install the rainwater pipework to meet the architectural and structural requirements of the building.

Provide on completion a rainwater system that is robust, resilient to vandalism and misuse, without leakage, noise and does not cause a nuisance.

All gravity rainwater pipework is to be HDPE.

Liaise with the structural engineer and architect to ensure that all builders work holes, drain point locations and pipe size requirements are fully coordinated.

The internal rainwater pipework systems shall be fully coordinated with all other M&E services, the structure and architects layouts.

Provide intumescent fire compound where metallic pipework passes through compartment walls and/or floors.

Provide and install protection of openings and fire stopping in accordance with The Building Regulations, Part B and to suit the architect's fire compartment drawings.

Provide and install an intumescent fire-sleeve on all plastic pipework exceeding 40 mm internal diameter passing through fire compartment floors or walls, to suit the architect's fire compartment drawings.

Ensure that the fire-sleeve has an appropriate British Board of Agrément certificate. Ensure that the fire-sleeve has a fire rating compatible with the wall, floor or cavity barrier to which it is fitted.

Provide acoustic insulation where pipework passes through occupied areas to meet the requirements of the acoustician's specification.

Install warning pipes from each of the rainwater stacks where rainwater pipes could experience a head of water greater than 6 m in the event of a blockage, as described in BS EN 12056-3. Discharge warning pipes in a conspicuous location and label them appropriately to indicate their source

Thermally insulate and vapour seal rainwater pipes where they are located immediately below roof soffits and located in ceiling voids for their whole length and until they connect to a vertical section of pipework.

Install access doors or caps on rainwater pipework to facilitate rodding and maintenance access to installed pipework. Coordinate access through architectural casings with pipe accessories.

Locate vertical access doors to all main rainwater pipes in accordance with The Building Regulations and BS EN 12056-3, as follows:

1. At all floor levels, as a minimum; all 1200 mm above finished floor level to the centreline of the access fitting.
2. At additional positions required to facilitate access for testing.
3. On vertical pipework above and below any offset
4. Where shown on the public health systems drawings.

Locate horizontal access doors/rodding eyes to all main rainwater pipes in accordance with The Building Regulations and BS EN 12056-3, as follows:

1. At all changes in direction and level.
2. Where shown on the public health systems drawings

Develop the 4A design to contractor information. Rainwater pipework is to run within designated service ducts or integrated ceiling voids where possible. Coordinate removable access panels with the drainage access points to enable maintenance to rainwater pipework. Where pipework is designed to be exposed, install to a high standard, true to line, with adequate support fixings, in accordance with the requirements of BS EN 12056 and the manufacturer's recommendations.

Liaise with architect and structural engineer in respect of agreed fixing strategy particularly where the pipework is fixed to cladding or primary and secondary steelwork.

Test all rainwater pipework using air at various stages and on completion of the installation to ensure compliance with the requirements of The Building Regulations and BS EN 12056-5.

Wastewater from sanitary appliances and contaminated discharges from mechanical plant and equipment are not permitted to be discharged to the rainwater system either directly or indirectly.

All pipework systems irrespective of service/fluid conveyed must be painted black or to a finish agreed by the architect.

Contractor must refer to architects ceiling plans to identify the extent of open ceilings and therefore, the extent of pipework to be painted black or to a finish agreed by the architect.

Carry out equipotential continuity bonding to all new metallic/cast iron rainwater drainage systems pipework in accordance with BS 7671 and this specification, Test to ensure earth continuity and provide a written full set of readings.

2. System performance: Ss_50_30_02/210 Design of gravity rainwater drainage system; Ss_50_30_02/290 Compliance with performance requirements
3. External rainwater pipework
   - 3.1. Rainwater downpipes
     - 3.1.1. Downpipe types: Ss_50_30_02/515 HDPE drainage pipeline assemblies
     - 3.1.2. Jointing: Pr_30_31_76_77 Silicone construction joint sealants

3.2. Supports

3.2.1. Brackets and clips: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)

3.2.2. Fixings: Pr_20_29_63_50 Masonry plugs

4. Execution: Ss_50_30_02/662 Access for testing and maintenance of rainwater drainage system; Ss_50_30_02/644 Fixing and jointing plastics external gravity rainwater drainage pipework; Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies; Ss_50_30_02/610 Installation of rainwater drainage generally; Ss_50_30_02/658 Installing rainwater pipe identification; Ss_50_30_02/646 Installing siphonic or pressure assisted full bore rainwater drainage pipework; Ss_50_30_02/602 Preparation
5. System completion: Ss_50_30_02/830 Documentation; Ss_50_30_02/818 Rainwater drainage gutter test; Ss_50_30_02/820 Rainwater drainage system maintenance instructions; Ss_50_30_02/822 Rainwater drainage system pre-handover checks; Ss_50_30_02/810 Testing rainwater drainage generally; Ss_50_30_02/890 Verification of performance

System performance

Ss_50_30_02/210 Design of gravity rainwater drainage system ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

1. Design: Develop the 4A design to contractor information.
2. Standards: In accordance with England Building Regulations Approved Document H3, section 1. To BS EN 12056-3, clauses 3–7, Annex A and National Annexes. To BS EN 12056-3, clauses 3–7, Annex A and National Annexes.
3. Design parameters
   3.1. Design life of building: 60 years (TBC). 90 year storm return period.
   3.2. Design rate category: Category 2 to BS EN 12056-3, NB.2.1. Category 3 to BS EN 12056-3, NB.2.1.
4. Requirements: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_50_30_02/290 Compliance with performance requirements ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

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

Products

Pr_20_29_63_50 Masonry plugs ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems , Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Format: To suit substrate, loads to be supported and conditions expected in use.

Pr_20_85_09_01 Above-ground drainage pipe brackets (external) ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Pipe location: External
2. Arrangement: Vertical

3. Form: Stand off pipe clips.
4. Material: Cast iron. HDPE. Plastics or as manufacturers recommendations.
5. Finish: Self-finished and weather resistant.

Pr_30_31_76_77 Silicone construction joint sealants ADDED

1. Standard: To BS EN ISO 11600.
2. Material: Acetoxy cure. Neutral cure.
3. Class: To suit anticipated moisture and thermal movement.
4. Colour: To be confirmed by the Architect
5. Fire resistance: Required where specified. Submit relevant third party certified BS 476-20 test results.
6. Fungicide: Required.
7. Execution: Pr_30_31_76/610 Suitability of joints for sealant application; Pr_30_31_76/620 Joint preparation for sealant application; Pr_30_31_76/630 Applying joint sealants

Ss_50_30_02/515 HDPE drainage pipeline assemblies ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems , Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Standard: To BS EN 1519-1.
2. Design and fabrication: To BS EN 12056-1, BS EN 12056-3 and BS EN 12056-5.
3. Shop drawings: Submit.
4. Accessories: Expansion sockets.

Execution

Pr_30_31_76/610 Suitability of joints for sealant application ADDED

1. Joint dimensions: Within limits specified for the sealant.
2. Substrate quality: Surfaces regular, undamaged and stable.
3. Joints not fit to receive sealant: Submit proposals for rectification.

Pr_30_31_76/620 Joint preparation for sealant application ADDED

1. Surfaces to which sealant must adhere: Remove temporary coatings, tapes, loosely adhering material, dust, oil, grease, surface water and contaminants that may affect bond.
2. Cleaning: Use materials and methods recommended by sealant manufacturer.
3. Vulnerable surfaces adjacent to joints: Mask. Do not stain or smear with primer or sealant.

Pr_30_31_76/630 Applying joint sealants ADDED

1. Substrate: As recommended by sealant manufacturer. Dry and unaffected by frost, ice or snow.
2. Environmental conditions: Do not dry or raise temperature of joints by heating.
3. Sealant application: Completely and neatly fill joints. Provide firm adhesion to substrates.
4. Sealant profiles
   4.1. Butt and lap joints: Slightly concave.
5. Protection: Do not contaminate or damage finished joints.

Ss_50_30_02/602 Preparation ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

1. Below ground drainage: Complete before commencing rainwater installation or make temporary arrangements for dispersal of rainwater without damage or disfigurement of the building fabric and surroundings.

Ss_50_30_02/610 Installation of rainwater drainage generally ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Collection and distribution of rainwater: Complete, and without leakage or noise nuisance.
2. Electrolytic corrosion: Avoid contact between dissimilar metals where corrosion may occur.
3. Plastics and galvanized steel pipes: Do not bend. Plumb and/ or true to line.
4. Allowance for thermal and building movement: Provide and maintain clearance as fixing and jointing proceeds.
5. Protection: Fit purpose-made temporary caps to prevent ingress of debris. Fit access covers, cleaning eyes and blanking plates as the work proceeds.

Ss_50_30_02/644 Fixing and jointing plastics external gravity rainwater drainage pipework ADDED

1. Fixing
    1.1. Supports
        1.1.1. Stability: Fix securely.
        1.1.2. Fixing centres (nominal): 1.8 m. At least at every storey level. Tighten fixings as work proceeds so that every storey is self-supporting.
    1.2. Pipework
        1.2.1. Alignment: Plumb and/ or true to line.
        1.2.2. Externally socketed pipes and fittings: Fix with sockets facing upstream.
2. Jointing
    2.1. Method: Push fit.
    2.2. Jointing differing pipework systems: Use adaptors intended for the purpose.
    2.3. Cut ends of pipes: Clean and square. Remove burrs and swarf. Chamfer pipe ends before inserting into ring seal sockets.
    2.4. Jointing or mating surfaces: Clean and, where necessary, lubricate immediately before assembly.

Ss_50_30_02/646 Installing siphonic or pressure assisted full bore rainwater drainage pipework ADDED

Shared by: Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Fixing: Secure. Prevent movement during extreme operating conditions including oscillating pressure and cavitation. Provide for thermal movement.
2. Number of joints, bends and offsets: Minimize.
3. Condition on completion: Smooth, consistent bore, clean and free from distortion, wrinkling, cracks and other defects.

Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems , Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Fixing
   1.1. Supports
      1.1.1. Stability: Fix securely.
      1.1.2. Fixing centres (nominal): 1.8 m. At least at every storey level. Tighten fixings as work proceeds so that every storey is self-supporting.
   1.2. Pipework
      1.2.1. Alignment: Plumb and/ or true to line.
      1.2.2. Jointing differing pipework systems: Use adaptors intended for the purpose.
2. Wall and floor penetrations
   2.1. Requirement: Isolate pipework from structure.
   2.2. Masking plates: Fix at penetrations if visible in the finished work.

Ss_50_30_02/658 Installing rainwater pipe identification ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Position: Junctions, both sides of slabs, bulkheads and wall penetrations. Labelling to BS 1710.

Ss_50_30_02/662 Access for testing and maintenance of rainwater drainage system ADDED

Shared by: Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Requirement: Install pipework and gutters with adequate clearance to permit testing, cleaning and maintenance, including painting where necessary.
2. Access fittings and rodding eyes: Position so that they are not obstructed.

System completion

Ss_50_30_02/810 Testing rainwater drainage generally ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Dates for testing: Give notice.
2. Period of notice (minimum): 5 working days
3. Pipework: Complete, and fix securely. Make free from defects, obstruction and debris before testing.
4. Testing
   4.1. Clean water: Provide.
   4.2. Testing apparatus: Provide.
   4.3. Smoke testing: Do not use.

Ss_50_30_02/818 Rainwater drainage gutter test ADDED

1. Preparation: Temporarily block all outlets.
2. Testing: Fill gutters to overflow level and after 5 minutes closely inspect for leakage.

3. Records of tests: Submit.

Ss_50_30_02/820 Rainwater drainage system maintenance instructions ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Printed instructions: Submit at completion.
2. Contents: Recommended procedures for maintenance of the rainwater installation, including full details of recommended inspection, cleaning and repair procedures.

Ss_50_30_02/822 Rainwater drainage system pre-handover checks ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Construction rubbish, debris, swarf, temporary caps and fine dust which may enter the rainwater system: Remove. Do not sweep or flush into the rainwater system.
2. Access covers, rodding eyes, outlet gratings and the like: Secure complete with fixings.

Ss_50_30_02/830 Documentation ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage 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.
    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 drainage services. Location of outlets.
    2.2. Format: Electronic. A1 paper print.
    2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_50_30_02/890 Verification of performance ADDED

Shared by: Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems and Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

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 rainwater system work. At project completion.

Ω End of System

Ss_50_30_02_40
[P] Internal gravity rainwater drainage systems ADDED

Systems

Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems ADDED

1. Description:

The contractor shall supply, install, test, commission, demonstrate and set to work the gravity rainwater disposal systems as set out within this specification and as described on the layout drawings and equipment schedules, including the detailed requirements set out below:

Level 05 plant areas, and level 04 external areas are to be provided with a gravity rainwater system.

Level 05 Plant Areas:

Level 05 plant areas will be drained with a point drainage system of Rainwater outlets discharging to a gravity rainwater pipe system.

Drainage is provided both within and outside the external façade screen, with outlets distributed evenly throughout each zone.

Level 05 gravity rainwater outlets will have 110mm vertical outlets, with pipes dropping and collecting into a suspended drainage system at Level 04 (high level). The suspended drainage runs to 4no. 300mm gravity rainwater stacks (RWPs 01 – 04) which are located in the 4 quadrant risers – where drop to Level 00 and join the below ground drainage system.

Rainwater outlets shall be suitable to roof construction. On inverted roof areas outlets proposed are to be vari-level type draining at surface and membrane level - as Wade Vari-level or better and approved.

Level 05 system based on rainfall intensity
of 0.56 l/s/sq.m.

For smaller buildings located on Level 05 (Boiler room, Electrical room, Stair Cores) external gutters and 2no. 110mm HDPE RWPs are to be provided to each. Run off to be discharged from these roofs onto the Level 05 surface via a shoe piece in convenient locations.

Level 04 External Areas:

Level 04 areas will be drained with a point drainage system of Rainwater outlets discharging to a gravity rainwater pipe system.

Level 04 gravity rainwater outlets will have 110mm vertical outlets, with pipes dropping and collecting into a suspended drainage system at Level 03 (high level). The suspended drainage

runs to the quadrant risers, where they connect to the 300mm RW stacks (RWPs 01 – 04) running from above to below.

Level 01 Podium Areas:

All drainage to Level 01 external and podium areas is by Buro Happold. All gullies, channels, outlets, filter drainage, permeable paving etc. in these areas are to be designed, detailed and specified by Buro Happold. Where pipework from these items drops into Level 00 internal spaces, they are picked up in M.E. package and are shown on M.E. design drawings. These runs will be routed to join below ground drainage system, via Level 00 slab drainpoint connections. Note this only applies to drains entering internal building areas, all drains outside of these areas shall enter the below ground drainage system directly.

The design of the underground drainage system(s) will be undertaken by the civil/structural engineer, and all details relating to this drainage will be provided by them. The above ground rainwater drainage will connect to the underground drainage system via connections/couplings. Any gullies, channels, outlets, pipework etc. at or below ground floor slab level, will be detailed and specified by the civil/structural engineer.

A rainwater harvesting system will be provided via a buried harvesting tank (for details refer to civils package). The rainwater harvesting system will supply WC and urinal cisterns, hose union wash down points, and the irrigation system in and around the Arena.
Above ground elements of this system are covered in ME package. Below ground elements of this system are covered in the civil engineer's package.

1.1. General Requirements:

Provide gravity rainwater disposal system for areas specified in this specification and the drawings, including overflows, discharging the surface water run-off to the below ground drainage system, inclusive of all pipework, fittings, gratings, supports, brackets, fixings, accesses and accessories.

Develop the 4A design to contractor information and install the rainwater pipework to meet the architectural and structural requirements of the building.

Provide on completion a rainwater system that is robust, resilient to vandalism and misuse, without leakage, noise and does not cause a nuisance.

All gravity rainwater pipework is to be HDPE.

Liaise with the structural engineer and architect to ensure that all builders work holes, drain point locations and pipe size requirements are fully coordinated.

The internal rainwater pipework systems shall be fully coordinated with all other M&E services, the structure and architects layouts.

Provide intumescent fire compound where metallic pipework passes through compartment walls and/or floors.

Provide and install protection of openings and fire stopping in accordance with The Building Regulations, Part B and to suit the architect's fire compartment drawings.

Provide and install an intumescent fire-sleeve on all plastic pipework exceeding 40 mm internal diameter passing through fire compartment floors or walls, to suit the architect's fire compartment drawings.

Ensure that the fire-sleeve has an appropriate British Board of Agrément certificate. Ensure that the fire-sleeve has a fire rating compatible with the wall, floor or cavity barrier to which it is fitted.

Provide acoustic insulation where pipework passes through occupied areas to meet the requirements of the acoustician's specification.

Install warning pipes from each of the rainwater stacks where rainwater pipes could experience a head of water greater than 6 m in the event of a blockage, as described in BS EN 12056-3. Discharge warning pipes in a conspicuous location and label them appropriately to indicate their source

Thermally insulate and vapour seal rainwater pipes where they are located immediately below roof soffits and located in ceiling voids for their whole length and until they connect to a vertical section of pipework.

Install access doors or caps on rainwater pipework to facilitate rodding and maintenance access to installed pipework. Coordinate access through architectural casings with pipe accessories.

Locate vertical access doors to all main rainwater pipes in accordance with The Building Regulations and BS EN 12056-3, as follows:

1. At all floor levels, as a minimum; all 1200 mm above finished floor level to the centreline of the access fitting.
2. At additional positions required to facilitate access for testing.
3. On vertical pipework above and below any offset
4. Where shown on the public health systems drawings.

Locate horizontal access doors/rodding eyes to all main rainwater pipes in accordance with The Building Regulations and BS EN 12056-3, as follows:

1. At all changes in direction and level.
2. Where shown on the public health systems drawings

Develop the 4A design to contractor information. Rainwater pipework is to run within designated service ducts or integrated ceiling voids where possible. Coordinate removable access panels with the drainage access points to enable maintenance to rainwater pipework. Where pipework is designed to be exposed, install to a high standard, true to line, with adequate support fixings, in accordance with the requirements of BS EN 12056 and the manufacturer's recommendations.

Liaise with architect and structural engineer in respect of agreed fixing strategy particularly where the pipework is fixed to cladding or primary and secondary steelwork.

Test all rainwater pipework using air at various stages and on completion of the installation to ensure compliance with the requirements of The Building Regulations and BS EN 12056-5.

Wastewater from sanitary appliances and contaminated discharges from mechanical plant and equipment are not permitted to be discharged to the rainwater system either directly or indirectly.

All pipework systems irrespective of service/fluid conveyed must be painted black or to a finish agreed by the architect.

Contractor must refer to architects ceiling plans to identify the extent of open ceilings and therefore, the extent of pipework to be painted black or to a finish agreed by the architect.

Carry out equipotential continuity bonding to all new metallic/cast iron rainwater drainage systems pipework in accordance with BS 7671 and this specification, Test to ensure earth continuity and provide a written full set of readings.

2. System performance: Ss_50_30_02/210 Design of gravity rainwater drainage system; Ss_50_30_02/290 Compliance with performance requirements
3. Rainwater outlets: Pr_65_50_35_37 Gravity rainwater outlets
4. Internal rainwater pipework
   4.1. Rainwater downpipes

4.1.1. Downpipe types: Ss_50_30_02/515 HDPE drainage pipeline assemblies

Refer to equipment schedule for project specific pipework material requirements.

4.1.2. Jointing: Jointing to be in accordance with manufacturers instructions and/or training.

4.1.2.1. HDPE: Electrofusion butt weld or Electrofusion sleeve weld in accordance with manufacturers instructions/training

4.2. Supports

4.2.1. Brackets and clips: Pr_20_85_09_01 Above-ground drainage pipe brackets (internal)

4.2.2. Fixings: Pr_20_29_63_50 Masonry plugs

4.3. Insulation: Pr_80_77_76_54 Mineral wool pipe section insulation

4.4. Warning pipes: Required.

5. System accessories: Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_65_52_61_50 Masking plates; Pr_65_52_61_63 Pipe sleeves
6. Execution: Ss_50_30_02/654 Fixing insulation to internal rainwater drainage pipework and gutters; Ss_50_30_02/610 Installation of rainwater drainage generally; Ss_50_30_02/658 Installing rainwater pipe identification; Ss_50_30_02/602 Preparation; Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies
7. System completion: Ss_50_30_02/830 Documentation; Ss_50_30_02/812 Rainwater drainage internal pipework test – England, Wales, Ireland and Northern Ireland; Ss_50_30_02/820 Rainwater drainage system maintenance instructions; Ss_50_30_02/822 Rainwater drainage system pre-handover checks; Ss_50_30_02/810 Testing rainwater drainage generally; Ss_50_30_02/890 Verification of performance

System performance

See Ss_50_30_02/210 Design of gravity rainwater drainage system in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/290 Compliance with performance requirements in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Products

See Pr_20_29_63_50 Masonry plugs in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Pr_20_85_09_01 Above-ground drainage pipe brackets (internal) ADDED

1. Pipe location: Internal.
2. Arrangement: Vertical.
3. Form: Hanging rail system. Stand off pipe clips.
4. Material: Cast iron. HDPE. Plastics or as manufacturers recommendations.
5. Finish: Self-finished.

Pr_40_10_57_78 Self-adhesive colour pipe bands ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems , Ss_55_20_34_57 [M] Natural gas supply systems , Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX) , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems , Ss_55_70_97_70 [P] Rainwater reclamation systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standards: To BS 1710.
2. Identification type: Adhesive colour bands.

3. Execution: Pr_40_10_57/660 Installing identification on pipework

Pr_65_50_35_37 Gravity rainwater outlets ADDED

1. Description: Outlets to suit roof construction. On inverted roof areas outlet proposed to be vari-level taking run-off at surface and membrane level.
2. Grating: Domed. Flat.
3. Spigots: Type and direction to suit pipelines with suitable adaptors and connections.
4. Integral accessories: Flange and clamping collar for roof membrane. Gravel guards. Raising pieces to suit insulation thicknesses. Sediment buckets. Support plates. Underdeck clamps.
5. Execution: Pr_65_50_35/610 Installing rainwater drainage outlets

Pr_65_52_61_50 Masking plates ADDED

Shared by: Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] 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.

Pr_65_52_61_63 Pipe sleeves ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Description: To be provided where internal Foul, waste, Rainwater, and domestic water pipework passes through walls, structural openings and all fire compartment walls.

Pr_80_77_76_54 Mineral wool pipe section insulation ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standard: To BS 3958-4. To BS EN 14303.
2. Thermal conductivity: 0.032 W/m·K at 0°C.
3. Finish: Aluminium foil faced. Class O
4. Reaction to fire classification: as required by the fire consultant
5. Insulation thickness (minimum): To BS 5422.
6. Vapour barrier
   6.1. Vapour permeability: To BS 5422, clause 5.6.
7. Insulation Around Pipework Supports:: Insulated pipe support inserts shall be used on all piped services and where the pipe support bracket is fixed over the load bearing insulation of the same material (or compatible with) the insulation on the pipe.

   The primary function of an insulated pipe support insert is to isolate the pipework from the pipe support to limit heat transfer to and from the pipework system, limit thermal bridging and to allow for a continuous vapour barrier to be carried through the support system.

Where pipework is located externally, the use of insulated pipe support inserts also allows for cladding to be carried continually through the support system, enhancing the weather protection of the overall pipework system.

Wooden blocks are not permitted on any pipe system.

Rubber lined clips must not be used.

For general pipework runs on all piped services (CHW, LTHW, BCWS, MCWS, DHWS) Kingspan* insulated pipe support inserts must be used as the 'preferred option' figure 12 of BS 5970:2012.

The only exception is either side of expansion bellows on the primary and secondary guides where pipe supports are normally installed in conjunction with slide guides to aid axial movement. In this scenario, pipe brackets clipped direct to the pipe should still be used with insulation applied as the 'non-preferred option' figure 13 of BS 5970:2012.

Insulated pipe supports must be used on all external piped services.

* Kingspan insulated pipe support inserts or approved and better should be used in preference to other manufacturers as they
have a CE marking and achieve a minimum European fire classification of BL-s1,d0 to BS EN 13501-1.

8. Execution: Pr_80_77_76/780 Installing vapour barriers; Pr_80_77_76/625 Installing foil faced mineral wool insulation on pipelines

See Ss_50_30_02/515 HDPE drainage pipeline assemblies in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Execution

Pr_40_10_57/660 Installing identification on pipework ADDED

1. Application of basic identification colour: Coloured bands as BS 1710. Over the whole length of the pipe.
2. Information: Abbreviation of name. Colour bands as BS 1710.
3. Direction of flow: Indication arrow and the word FLOW or the letter F. Indication arrow and the word RETURN or the letter R.

Pr_65_50_35/610 Installing rainwater drainage outlets ADDED

1. Fixing: Secure. Fix before connecting pipework.
2. Method: Installation undertaken by |Main Contractor/Roofing Specialist
3. Junctions between outlets and pipework: Watertight. Accommodate movement in structure and pipework.

Pr_80_77_76/610 Installing insulation and protection products generally

Shared by: Pr_80_77_76_62 Phenolic foam insulation , Pr_80_77_76_53 Mineral wool duct slab insulation and Pr_80_77_76_58 Nitrile rubber 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.

Pr_80_77_76/625 Installing foil faced mineral wool insulation on pipelines

ADDED

1. General requirements: Pr_80_77_76/610 Installing insulation and protection products generally
2. Joints: Close butt; seal with 50 mm wide class 0 foil tape on both longitudinal and circumferential joints.
3. At fittings: Mitre. Secure with tape.
4. Vapour seal: Tape exposed insulation membrane. Seal vapour barrier at pipe support with class 0 foil tape.

Pr_80_77_76/780 Installing vapour barriers

Shared by: Pr_80_77_76_52 Mineral wool duct metal mesh faced mattress insulation , Pr_80_77_76_53 Mineral wool duct slab insulation , Pr_80_77_76_58 Nitrile rubber insulation and Pr_80_77_76_62 Phenolic foam insulation

1. Integrity: Seal to maintain throughout.

See Ss_50_30_02/602 Preparation in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/610 Installation of rainwater drainage generally in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Ss_50_30_02/654 Fixing insulation to internal rainwater drainage pipework and gutters ADDED

Shared by: Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

1. Fixing: Secure and neat. Provide continuity at supports and leave no gaps. Fix split pipe insulation with the split on ‘blind’ side of pipework.
2. Timing: Do not fit insulation until completion of pipe airtightness or leakage testing.

See Ss_50_30_02/658 Installing rainwater pipe identification in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

System completion

See Ss_50_30_02/810 Testing rainwater drainage generally in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Ss_50_30_02/812 Rainwater drainage internal pipework test – England, Wales, Ireland and Northern Ireland ADDED

1. Preparation: Temporarily seal open ends of pipework with plugs.
2. Test apparatus: Connect a ‘U’ tube water gauge and air pump to pipework via a plug.
3. Testing: Pump air into pipework until gauge registers 38 mm.
4. Required performance: After a period for temperature stabilization, maintain the pressure of 38 mm without loss for at least 3 minutes.

See Ss_50_30_02/820 Rainwater drainage system maintenance instructions in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/822 Rainwater drainage system pre-handover checks in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/830 Documentation in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/890 Verification of performance in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Ω End of System

Ss_50_30_02_80
[P] Siphonic full bore rainwater drainage systems ADDED

Systems

Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems ADDED

1. Description:

The contractor shall design, supply, install, test, commission, demonstrate and set to work the siphonic rainwater disposal systems as set out within this specification and as described on the layout drawings and equipment schedules, including the detailed requirements set out below:

Main Auditorium Roof:
The main auditorium roof will drain via a siphonic system. Run-off will drain to perimeter gutters on the north and south sides, to suit the roof gradient falls from a central longitudinal high point as shown in the drawings. (Gutter refs 6A, 6B, 6L & 6M).
Gutters to be 600mm (W) and 400mm (D).
(For Gutter and overflow details refer to Architectural package).

Gutters 6A & 6B each contain 16no. siphonic rainwater outlets.

Gutters 6L & 6M each contain 4no. siphonic rainwater outlets. Outlets in gutters 6L & 6M are to be in dropped box receivers due to gradient on gutter.

Each Siphonic outlets will have a 110mm vertical tail pipe, dropping into 4no. 250mm horizontal collector pipes (SRWPs 01 – 04) beneath the gutters.

For design and details of all roof gutters refer to architectural package.

Collector pipes run to the 4 main quadrant risers and drop to Level 00 where they join the below ground drainage system. The siphons are broken in manhole chambers at the base of the risers and they return to gravity flow (refer to Civil package for chamber details).

Ventilation is provided to the below ground chambers via vent stacks rising in each riser from below ground to atmosphere at Level 05 (SRWVPs 01 – 04).

Main roof system based on rainfall intensity
of 0.56 l/s/sq.m.

Design to include allowance for vertical surface run-off.

Level 03 (West side external area):

Level 03 external area will be drained via a siphonic system. Run-off which discharge to evenly distributed siphonic rainwater outlets as shown on the drawings. Each siphonic outlet will have 110mm vertical tail pipe, dropping into 2no. 160mm horizontal collector pipes (SRWPs 05 – 06)

suspended at Level 02. These collector pipes run to the North West and South West risers and drop to Level 00 where they join the below ground drainage system. The siphons are broken in manhole chambers at the base of the risers and they return to gravity flow (refer to Civil package for chamber details).

Design to include allowance for vertical surface run-off.

Note:
Siphonic pipework sizes and outlet design shown are provisional. The design, procurement and installation of the entire siphonic rainwater drainage system (including expansion fittings and rail fixing system) to be by the contractor's siphonic specialist (As Polypipe Hydromax or better and approved), with sizing and configuration to be confirmed using specialist, simulation software.

1.1. General Requirements:

Design and provide siphonic rainwater disposal system for all specified roof areas, including overflows, discharging the surface water run-off to the below ground drainage system, inclusive of all pipework, fittings, gratings, supports, brackets, fixings, accesses and accessories.

Design the rainwater pipework to meet the architectural and structural requirements of the building.

Provide on completion a siphonic rainwater system that is robust, resilient to vandalism and misuse, without leakage, noise and does not cause a nuisance.

Liaise with the structural engineer and architect to ensure that all builders work holes, drain point locations and pipe size requirements are fully coordinated.

All siphonic rainwater pipework is to be HDPE.

The internal rainwater pipework systems shall be fully coordinated with all other M&E services.

Provide intumescent fire compound where metallic pipework passes through compartment walls and/or floors.

Provide intumescent fire sleeves where non-metallic pipework passes through compartment walls and/or floors - and to suit architectural fire compartment drawings.

Provide acoustic insulation where pipework passes through occupied areas to meet the requirements of the acoustician's specification.

Provide thermal insulation to all internal rainwater pipework under roof areas, to prevent condensation.

2. System performance: Ss_50_30_02/220 Design of siphonic or pressure assisted full bore rainwater drainage system; Ss_50_30_02/290 Compliance with performance requirements
3. System manufacturer: Polypipe "Hydromax" or better and approved.

4. Rainwater outlets: Pr_65_50_35_81 Siphonic rainwater outlets
5. Rainwater pipework
   5.1. Rainwater downpipes
      5.1.1. Downpipe types: Pr_65_52_63_61 Polyethylene (PE) drainage pipe and fittings; Ss_50_30_02/515 HDPE drainage pipeline assemblies
      5.1.2. Jointing: Electrofusion butt weld. Electrofusion sleeve weld.
   5.2. Supports
      5.2.1. Brackets and clips: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)
      5.2.2. Fixings: Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves
   5.3. Insulation: Pr_80_77_76_54 Mineral wool pipe section insulation
6. System accessories: Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_65_52_61_50 Masking plates
7. Execution: Ss_50_30_02/662 Access for testing and maintenance of rainwater drainage system; Ss_50_30_02/654 Fixing insulation to internal rainwater drainage pipework and gutters; Ss_50_30_02/610 Installation of rainwater drainage generally; Ss_50_30_02/658 Installing rainwater pipe identification; Ss_50_30_02/646 Installing siphonic or pressure assisted full bore rainwater drainage pipework; Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies
8. System completion: Ss_50_30_02/816 Commissioning siphonic or pressure assisted full bore rainwater drainage systems; Ss_50_30_02/830 Documentation; Ss_50_30_02/820 Rainwater drainage system maintenance instructions; Ss_50_30_02/822 Rainwater drainage system pre-handover checks; Ss_50_30_02/810 Testing rainwater drainage generally; Ss_50_30_02/890 Verification of performance

System performance

Ss_50_30_02/220 Design of siphonic or pressure assisted full bore rainwater drainage system ADDED

1. Design: Complete the design of the rainwater drainage system to operate on siphonic principles so as to be regularly self cleansing in normal use.
2. Standards: To BS EN 12056-3, clauses 3–7 and National Annexes, and in accordance with BS 8490.
3. Design parameters
   3.1. Roof and gutter construction and finish: To architect's details.
   3.2. Design life of building: 60 years (TBC). 90 year storm return period.
   3.3. Design rate category: Category 2 to BS EN 12056-3.
   Rainfall Intensity 0.056 l/s/sq.m used in 4A design.
   Design to include allowance for vertical surface run-off.
   3.4. Pipework
      3.4.1. Joints: Airtight at maximum and minimum operating pressures.
      3.4.2. Thermal movement: Accommodate without damage to fixings and joints or excess stress, abrasion or noise.
   3.5. Design water depth
      3.5.1. Design peak rainfall duration (maximum): 3 minutes.
   3.6. Overflow arrangements: Refer to drawings
   3.7. Siphonic flow velocity (minimum): 1 m/s
4. Requirements: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

See Ss_50_30_02/290 Compliance with performance requirements in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Products

Pr_20_29_29_84 Spacer sleeves ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems

1. Material: Polyethylene.
2. Colour: Black.
3. Size: For 6 mm hole.

See Pr_20_29_63_50 Masonry plugs in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Pr_20_85_09_01 Above-ground drainage pipe brackets (external) in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_65_50_35_81 Siphonic rainwater outlets ADDED

1. Manufacturer: Polypipe "Hydromax" system or better and approved.
2. Spigots: Type and direction to suit pipelines with suitable adaptors and connections.
3. Integral accessories: Flange and clamping collar for roof membrane. Gravel guards. Insulation jackets. Raising pieces to suit insulation thicknesses. Sediment buckets. Support plates. Underdeck clamps.
4. Execution: Pr_65_50_35/615 Installing siphonic rainwater drainage outlets

See Pr_65_52_61_50 Masking plates in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_65_52_63_61 Polyethylene (PE) drainage pipe and fittings ADDED

Shared by: Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems

1. Standard: To BS EN 1519-1.
2. Third party product certification: BBA Agrément certificate.
3. Colour: Black.
4. Size (nominal): DN32-300 or as indicated on schematic drawings.
5. Integral accessories: Access fittings.
6. Execution: Pr_65_52_63/630 Fixing and jointing rainwater and above ground drainage pipes

See Pr_80_77_76_54 Mineral wool pipe section insulation in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_50_30_02/515 HDPE drainage pipeline assemblies in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Execution

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_65_50_35/615 Installing siphonic rainwater drainage outlets ADDED

1. Fixing: Secure. Fix before connecting pipework.
2. Method: Grout into preformed holes. Support plates and clamps.
3. Junctions between outlets and pipework: Accommodate movement in structure and pipework.

Pr_65_52_63/630 Fixing and jointing rainwater and above ground drainage pipes ADDED

Shared by: Pr_65_52_63_87 Unplasticized polyvinyl chloride (PVC-U) drainage pipe and fittings

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

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/625 Installing foil faced mineral wool insulation on pipelines in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_50_30_02/610 Installation of rainwater drainage generally in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/646 Installing siphonic or pressure assisted full bore rainwater drainage pipework in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/654 Fixing insulation to internal rainwater drainage pipework and gutters in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_50_30_02/658 Installing rainwater pipe identification in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/662 Access for testing and maintenance of rainwater drainage system in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

System completion

See Ss_50_30_02/810 Testing rainwater drainage generally in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Ss_50_30_02/816 Commissioning siphonic or pressure assisted full bore rainwater drainage systems ADDED

1. Testing
   1.1. Standard: To BS EN 12056-3, National Annex NE.4.2.
   1.2. Method: Air pressure test.
2. Required performance
   2.1. Design operating pressure (maximum): Pipework to withstand maximum design operating pressure for 3 minutes.
   2.2. Design operating pressure (minimum): Pipework to withstand minimum design operating pressure for 3 minutes.

See Ss_50_30_02/820 Rainwater drainage system maintenance instructions in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/822 Rainwater drainage system pre-handover checks in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/830 Documentation in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

See Ss_50_30_02/890 Verification of performance in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Ω End of System

Ss_50_30_04_97
[P] Above ground internal wastewater drainage systems

ADDED

Systems

Ss_50_30_04_97 [P] Above ground internal wastewater drainage systems

ADDED

1. Description:

The contractor shall develop the OVG Manchester Stage 4A design to contractor information, supply, install, test, commission, demonstrate and set to work the disposal systems as set out within this specification and as described on the layout drawings, equipment schedules and the detailed requirements set out below.

The Arena will be provided with a fully ventilated soil and waste system to BS EN 12056-2 comprising vertical stacks, anti siphon pipework, and horizontal run outs to serve all sanitary fittings.

An internal soil, waste and vent installation shall serve all new sanitaryware WC Pans, Wash Hand Basins, Sinks, Showers, Cleaners Sinks, Catering Fittings, Floor Drainage, and all other appliances as indicated on the architects drawings.

All effluent from sanitary appliances is to be conveyed by gravity – to the underground drainage system. The design of the underground drainage system(s) will be undertaken by the civil/structural engineer, and all details relating to this drainage will be provided by them. The above ground foul drainage will connect to the underground drainage via connections/couplings. Any gullies, channels, outlets, pipework etc. at or below ground floor slab level, will be detailed and specified by the civil/structural engineer.

Foul and waste drainage from sanitary fittings and drainage outlets will be provided by branch pipe runs, ventilated as appropriate, discharging to soil vent pipes, ventilated stub stacks and suspended drain runs.

An array of 160mm and 110mm soil vent pipes are provided across the floors, which take foul and waste discharge from fittings and drain points. SVPs set at high level as necessary, and discharge to atmosphere at Level 05 plant areas.

Branch pipework and Stub stacks on Levels 01 to 04 are vented with a network of anti-siphon runs, which connect to dedicated vent pipes running with SVPs or to the dry sections of the SVPs as indicated on the drawings.

Level 00 fittings are all drained to dedicated stacks for this floor – and no connections are made at Level 00 to SVPs from floors above.

Level 00 drainpoints are ventilated by a dedicated ventilation pipework system – which collect to 4no. 160mm vent stacks – one in each of the quadrant pipework risers.

1.1. General: The internal soil, waste and vent pipework systems shall be fully coordinated with all other M&E services, the building structure, architects finishes, and shall be installed to gradients stated in this specification.

Provide intumescent fire sleeves where non-metallic pipework passes through compartment walls and/or floors. Fire stopping to be compliant with Approved Document Part B and be in alignment with the architect's fire compartment drawings. Ensure that the fire sleeve has an appropriate Agrément Certificate. Ensure that the fire sleeve / collar has a fire rating compatible with the wall, floor or cavity barrier to which it is fitted.

New above ground drainage will be installed inside the building and located within service voids and/or service risers. suspended horizontal drainage from sanitary appliances on the floors directly above shall be installed within the ceiling voids where applicable.

Stacks and vent pipes which discharge to atmosphere at Level 05 shall have a suitable weathering detail and termination fitting (refer to Part 2 Clause 2.16 of this Specification). Vents from fitting ranges shall connect to SVPs at locations indicated on the drawings.

Offsets in the wet portion of the soil and waste stacks shall be fitted with large radius bends.

Suspended suspended drainage is to be provided with acoustic insulation to suit acoustic report requirements.

Full bore rodding access shall be provided to each stack (1,200mm above FFL) prior to connection to the drain point, and on each floor level. Rodding access shall be provided to suspended drainage at all changes of direction and level. A rodding eye shall be provided at the end of each waste pipe and as detailed on the drawings.

The installation of the foul drainage system to meet the performance objectives stated in BS EN 12056, the Building Regulations and all other technical manuals and guides applicable, including, but not restricted to, the documents listed in this specification. Install the system using the minimum pipework and fittings necessary to carry away all foul discharges from the building to the below ground drainage system, quickly, quietly and with freedom from nuisance or risk of injury to health. Prevent air from the discharge pipes from entering the building. Clearly identify all pipelines in accordance with BS 1710.

Install all drainage pipework to convey discharges without crossflow, backfall, leakage or blockage. Adequately test, clean and maintain the system at all times throughout the construction process.

Ensure allowance is made in installation for pipe expansion – in accordance with manufacturers' requirements.

Install WC outlets to the main discharge pipes utilising a uPVC manifold system. Ensure that the main floats have a minimum fall of 1 degree (18mm/metre) and connect to the horizontal outlet of the WC's via purpose made and angled WC connectors. Ensure that the angle of each connector is specific to suit the location of the WC to the float height. Terminate access provision to the ends of WC floats above the spill over level of connected WC appliances on that floor. Installation to be in full accordance with bathroom system

manufacturer's requirements.

All WC ranges are to have upturned rodding eye c/w vent connection. Vent connection is not to obstruct rodding access.

All branches to horizontal discharge pipework are to be made using 45° branches swept in the direction of flow where possible.

1.2. Pipework Materials: Vertical stacks Soil and Vent: HDPE
Lateral floats up to 50mm MuPVC, HDPE
Lateral floats 75mm and above UPVC
Suspended Horizontal Drainage including vent pipework: HDPE.
Refer to Equipment schedules pipeline section for further information.

1.3. Pipework Finish:

All pipework systems irrespective of service/fluid conveyed must be painted black or to a finish agreed by the architect.

Contractor must refer to architects ceiling plans to identify the extent of open ceilings and therefore, the extent of pipework to be painted black or to a finish agreed by the architect.

1.4. General Areas:

The foul drainage pipework, from Level 05 complete with weathering shield and balloon guard runs to ground floor and will discharge to the below ground drainage system.

Discharges from mechanical equipment condense drains and temperature relief drains will generally discharge to gullies within plantroom areas or where a gully is not adjacent, into a foul soil stack via a tundish and self-sealing trap.

Note: Final locations of stacks which drop on columns in public concourse areas are to be agreed. Allowance is to be made for re-routing some of these stacks to alternative drop locations.

1.5. Kitchens, Concessions & Bars: 'Shell and core'

These areas are provided with drainage via SVPs and/or stub stacks within the spaces. Stub stacks are to terminate 1100mm above FFL. Stubs and SVPs in these areas are to have double low level 50mm capped connections on each for extension to serve catering equipment in future fit-out. A 50mm capped vent connection is to be provided to each stub stack at high level for future connection to drainage ventilation system. A capped high level vent pipe is also provided into each catering space for future connection. Floor drainage is also provided as shown.

The requirement for grease management within each area will be the responsibility of the specialist sub-contractor to design/detail as defined with the catering consultants specification.

For full details of drainage requirements in these areas, including drainpoint locations, setting out, grease interception measures, and builderswork details – refer to Catering Specialist's package.

The contractor must confirm final locations of all floor channels, gullies and SVPs with the catering consultant prior to installation to ensure alignment with the latest fit-out proposals.

2. System performance: Ss_50_30_04/210 Design of above ground wastewater drainage systems
3. Sanitary pipework
   - 3.1. Small diameter branch discharge pipework
     - 3.1.1. Traps: Pr_65_52_25_75 Sanitary appliance traps
     - 3.1.2. Pipelines and fittings: Pr_65_52_63_87 Unplasticized polyvinyl chloride (PVC-U) drainage pipe and fittings; Pr_65_52_63_52 Modified unplasticized polyvinyl chloride (MUPVC) pipes and fittings

       Refer to equipment schedule for project specific pipework material requirements.
     - 3.1.3. Accessories for jointing: Refer to clause 4.3.2 below.
     - 3.1.4. Supports: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)
     - 3.1.5. Fixings: Pr_20_29_76_98 Wood screws; Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves; Pr_20_29_60_96 Washers
   - 3.2. Large diameter branch discharge pipework
     - 3.2.1. Pipelines and fittings: Pr_65_52_63_87 Unplasticized polyvinyl chloride (PVC-U) drainage pipe and fittings; Pr_65_52_63_61 Polyethylene (PE) drainage pipe and fittings; Ss_50_30_02/515 HDPE drainage pipeline assemblies

       Refer to equipment schedule for project specific pipework material requirements.
     - 3.2.2. Accessories for jointing: Refer to clause 4.3.2 below.
     - 3.2.3. Supports: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)
     - 3.2.4. Fixings: Pr_20_29_76_98 Wood screws; Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves; Pr_20_29_60_96 Washers
     - 3.2.5. Insulation: Pr_80_77_76_54 Mineral wool pipe section insulation
   - 3.3. Discharge stack pipework
     - 3.3.1. Pipelines and fittings: Ss_50_30_02/515 HDPE drainage pipeline assemblies
     - 3.3.2. Accessories for jointing: Jointing to be in accordance with manufacturers instructions and/or training.
       - 3.3.2.1. HDPE: Electrofusion butt weld or Electrofusion sleeve weld in accordance with manufacturers instructions/training
     - 3.3.3. Supports: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)
     - 3.3.4. Fixings: Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves; Pr_20_29_76_98 Wood screws; Pr_20_29_60_96 Washers
     - 3.3.5. Insulation: Pr_80_77_76_54 Mineral wool pipe section insulation
4. Ventilating pipework
   - 4.1. Ventilating branch pipework
     - 4.1.1. Pipelines and fittings: Pr_65_52_63_87 Unplasticized polyvinyl chloride (PVC-U) drainage pipe and fittings

4.1.2. Accessories for jointing: Refer to clause 4.3.2 above.

4.1.3. Supports: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)

4.1.4. Fixings: Pr_20_29_76_98 Wood screws; Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves; Pr_20_29_60_96 Washers

4.2. Ventilating stack pipework

4.2.1. Pipelines and fittings: Pr_65_52_63_87 Unplasticized polyvinyl chloride (PVC-U) drainage pipe and fittings; Ss_50_30_02/515 HDPE drainage pipeline assemblies

Refer to equipment schedule for project specific pipework material requirements.

4.2.2. Accessories for jointing: Refer to clause 4.3.2 above.

4.2.3. Supports: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)

4.2.4. Fixings: Pr_20_29_76_98 Wood screws; Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves; Pr_20_29_60_96 Washers

5. Prefabricated branch and stack pipework
   5.1. Pipelines and fittings: Ss_50_30_02/515 HDPE drainage pipeline assemblies
   5.2. Supports: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)
   5.3. Fixings: Pr_20_29_76_98 Wood screws; Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves; Pr_20_29_60_96 Washers
   5.4. Insulation: Pr_80_77_76_54 Mineral wool pipe section insulation
6. Overflow pipework
   6.1. Pipelines and fittings: Pr_65_52_63_87 Unplasticized polyvinyl chloride (PVC-U) drainage pipe and fittings
   6.2. Accessories for jointing: Solvent welding cement.
   6.3. Supports: Pr_20_85_09_01 Above-ground drainage pipe brackets (external)
   6.4. Fixings: Pr_20_29_76_98 Wood screws; Pr_20_29_63_50 Masonry plugs; Pr_20_29_29_84 Spacer sleeves; Pr_20_29_60_96 Washers
7. Pipework identification: Pr_40_10_57_78 Self-adhesive colour pipe bands
8. Fire stopping
   8.1. Floor penetrations: Pr_25_80_81_29 Flexible intumescent gap seals; Pr_65_52_61_63 Pipe sleeves; Pr_65_52_61_64 Pipe sleeve seals
   8.2. Wall penetrations: Pr_25_80_81_29 Flexible intumescent gap seals; Pr_65_52_61_63 Pipe sleeves
9. System accessories: Pr_65_54_24_02 Air admittance valves; Pr_65_52_61_23 Discharge and ventilating stack terminations
10. 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; Ss_50_30_04/620 Electrical continuity of above ground wastewater drainage pipework; Ss_50_30_04/614 Installing above ground wastewater drainage discharge branch pipework; Ss_50_30_04/616 Installing above ground wastewater drainage discharge stack pipework generally; Ss_50_30_04/618 Installing above ground wastewater drainage prefabricated discharge pipework assemblies; Ss_50_30_04/610 Installing above ground wastewater drainage systems; Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies
11. System completion: Ss_50_30_04/820 Above ground wastewater drainage system pipework airtightness test; Ss_50_30_04/840 Above ground wastewater drainage system pre-handover checks; Ss_50_30_04/830 Above ground wastewater drainage system siphonage and back pressure tests; Ss_50_30_04/850 Above ground wastewater drainage system submittals; Ss_50_30_04/860 Documentation; Ss_50_30_04/810 Testing above ground wastewater drainage systems

System performance

Ss_50_30_04/210 Design of above ground wastewater drainage systems

ADDED

1. Design: Develop the OVG Manchester Stage 4A design of the above ground Foul and Waste water drainage system to contractor information.
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. BS 8525.
3. System configuration
   3.1. Form: System III, single discharge stack system with full bore discharge branch pipes.
   3.2. Configuration: Secondary ventilated stack system with Ventilated discharge branches.
4. Design discharges
   4.1. Design discharge content: Foul and waste discharge.
5. Requirements: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Products

See Pr_20_29_29_84 Spacer sleeves in Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

Pr_20_29_60_96 Washers

ADDED

1. Washers
   1.1. Type: Plain to BS EN ISO 7089. Plain chamfered to BS EN ISO 7090. Spring washer type B - Single coil rectangular section to BS 4464. Spring washer type D - Double coil rectangular section to BS 4464. To BS 4320.

See Pr_20_29_63_50 Masonry plugs in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Pr_20_29_76_98 Wood screws

ADDED

1. Standard: To BS 1210. To BS EN 14592.
2. Finish: Galvanized.
3. Screw details
   3.1. Head option: Countersunk head.
4. Screw cups: Required.
5. Screw head protection
   5.1. Types: Plastics cap.

See Pr_20_85_09_01 Above-ground drainage pipe brackets (external) in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Pr_25_80_81_29 Flexible intumescent gap seals

ADDED

1. Description: To seal all openings between the structure and pipework.
2. Fire performance: To suit fire compartmentation requirements

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_65_52_25_75 Sanitary appliance traps

ADDED

1. Standard: To BS EN 274-1.
2. Third party product certification: BSI Kitemark certified.

3. Trap: Anti-siphon bottle traps. Resealing bottle traps. Shower traps. Tubular P traps, Tubular S traps. Traps to be suitable type for relevant sanitary appliance.
4. Jointing: The connection between trap and discharge pipe shall be a compression fitting joint. Jointing in the pipeline itself shall be solvent welded with expansion joints in accordance with manufacturers recommendations.
5. Material: MUPVC to BS 5255, Pipework to be chrome plated in exposed areas.
6. Colour: As branch discharge pipework.
7. Size: Refer to schematics for details
8. Depth of water seal (minimum): 50mm for Wc Pans, 75mm for all other appliances.

Pr_65_52_61_23 Discharge and ventilating stack terminations ADDED

1. Arrangement: Perforated cover or cage that does not restrict airflow and to discharge to atmosphere.
2. Material: Material as discharge stack and same manufacturer.

See Pr_65_52_61_63 Pipe sleeves in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_65_52_61_64 Pipe sleeve seals ADDED

1. Description: To be provided where internal Foul, waste, Rainwater, and domestic water pipework passes through walls, structural openings and all fire compartment walls.

Pr_65_52_63_52 Modified unplasticized polyvinyl chloride (MUPVC) pipes and fittings ADDED

See Pr_65_52_63_61 Polyethylene (PE) drainage pipe and fittings in Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

Pr_65_52_63_87 Unplasticized polyvinyl chloride (PVC-U) drainage pipe and fittings ADDED

1. Standard: To BS 4514. To BS EN 1329-1. To BS EN 1329-1 and the weathering resistance requirements of BS 4514. and the requirements of BS 5255.
2. Third party product certification: BSI Kitemark or Agrément certified.
3. Nominal sizes: DN 32-100. or as noted on the GA plans and schematics
4. Colour: Grey.
5. Integral accessories: Access fittings. Branches, Air admittance valves, Brackets, Weathering collars. Plastics cages. Fire Sleeves, Expansion Joints.
6. Execution: Pr_65_52_63/630 Fixing and jointing rainwater and above ground drainage pipes

Pr_65_54_24_02 Air admittance valves ADDED

1. Execution: Reference to missing clause Installation of discharge connections

See Pr_80_77_76_54 Mineral wool pipe section insulation in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_50_30_02/515 HDPE drainage pipeline assemblies in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Execution

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_63/630 Fixing and jointing rainwater and above ground drainage pipes in Ss_50_30_02_80 [P] Siphonic full bore rainwater drainage systems

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/625 Installing foil faced mineral wool insulation on pipelines in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_50_30_02/652 Fixing HDPE drainage pipework assemblies in Ss_50_30_02_28 [P] External gravity rainwater drainage systems

Ss_50_30_04/610 Installing above ground wastewater drainage systems ADDED

1. Standards: To BS EN 12056-2 and BS EN 12056-5.
2. Collection and distribution of wastewater
   - 2.1. General: Quick, quiet and complete; self-cleansing in normal use, without blockage, crossflow, backfall, leakage, odours, noise nuisance or risk to health.
   - 2.2. Pressure fluctuations in pipework (maximum): ±38 mm water gauge.
   - 2.3. Water seal retained in traps (minimum): As Approved Document Part H.
3. Pipelines
   - 3.1. Routes
     - 3.1.1. Routes generally: The shortest practical, with as few bends as possible.
     - 3.1.2. Routes not shown on drawings: Submit proposals.
   - 3.2. Jointing: Joint with materials, fittings and techniques intended for the purpose and that will make effective and durable connections. Expansion provision to be installed in strict accordance with manufacturers recommendations.
4. Allowance for thermal and building movement: Provide and maintain clearance as fixing and jointing proceeds, all expansion provision in accordance with manufacturers instructions.
5. Concealed or inaccessible surfaces: Decorate before starting work specified in clauses from this section.
6. Electrolytic corrosion: Avoid contact between dissimilar metals where corrosion may occur.
7. Protection
   - 7.1. Purpose made temporary caps: Fit to prevent ingress of debris as work proceeds.
   - 7.2. Access covers, cleaning eyes and blanking plates: Fit as the work proceeds.

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

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 foul and wastewater from sanitary appliances other than Blackwater.
     - 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. Greywater 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_04/614 Installing above ground wastewater drainage discharge branch pipework ADDED

1. Pipework
   1.1. Alignment: Fix securely plumb and inline.
   1.2. Branches and low gradient sections: Fix with uniform and adequate falls to drain efficiently.
   1.3. Socketed pipes and fittings: Fix with sockets facing upstream.
   1.4. Additional supports: Provide as necessary to support junctions and changes in direction, and in accordance with manufacturers recommendations.
2. Wall and floor penetrations
   2.1. Isolating pipework: Isolate pipework from structure, e.g. with pipe sleeves.
   2.2. Masking plates: Fix at penetrations if visible.

Ss_50_30_04/616 Installing above ground wastewater drainage discharge stack pipework generally ADDED

1. Pipework
   1.1. Alignment: Fix securely plumb and true to line.
   1.2. Externally socketed pipes and fittings: Fix with sockets facing upstream.
   1.3. Vertical pipes: Vertical soil, waste, ventilation and rainwater pipework shall be supported with load bearing brackets fitted to the building structure at each floor level to carry the weight of the pipework by means of steel angle or channel iron either bolted and secured to the structural floor slab or bolted into a supporting structural wall or beam, intermediate support shall be provided at each level between floor slabs. Stack support pipes shall be provided at the base of each stack.
   1.4. Additional supports: Where fittings, ie. Branch’s and bends etc., are installed on horizontal pipe runs, additional brackets shall be installed adjacent to each fitting to ensure the adjacent pipework is self-supporting, alleviating any stress upon the pipe fitting joint.
2. Wall and floor penetrations
   2.1. Isolating pipework: Isolate pipework from structure, e.g. with pipe sleeves.
   2.2. Masking plates: Fix at penetrations if visible in the finished work.
3. Expansion joint sockets: Fix rigidly to the building.
4. Fixings: Allow the pipe to slide.

Ss_50_30_04/618 Installing above ground wastewater drainage prefabricated discharge pipework assemblies ADDED

1. Jointing on site
   1.1. Protection: Make good damaged coatings as recommended by pipework manufacturer. Do not damage coatings.
   1.2. Expansion joints (minimum provision): At every floor level.
   1.3. Waste pipes: Installed in accordance with the requirements of BS 4514. To BS EN 1329-1. To BS EN 1329-1 and the weathering resistance requirements of BS 4514. BS 5255.

Ss_50_30_04/620 Electrical continuity of above ground wastewater drainage pipework ADDED

1. Joints in metal pipes with flexible couplings: Make with clips (or suitable standard pipe couplings) supplied for earth bonding by pipework manufacturer to ensure electrical continuity.

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

1. General: Install pipework with adequate clearance to permit testing, cleaning and maintenance, including painting where necessary.
2. Access fittings and rodding eyes: Rodding Eyes to be Positioned to avoid obstruction and to be in permanently accessible locations. Access doors on vertical pipework to be installed 1200mm above FFL to centre line of door, all access doors and rodding eyes to be permanently accessible.

System completion

Ss_50_30_04/810 Testing above ground wastewater drainage systems ADDED

1. Dates for testing
    1.1. Notice: Required.
    1.2. Period of notice (minimum): 5 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 all signed test sheets, and copies of schematic drawings.

Ss_50_30_04/820 Above ground wastewater drainage system pipework airtightness test ADDED

1. Preparation
    1.1. Open ends of pipework: Temporarily seal using plugs.
    1.2. Test apparatus: Connect a 'U' tube water gauge and air pump to pipework via a plug or through trap of an appliance.
2. Testing: Pump air into pipework until gauge registers 38 mm.
3. Required performance: Maintain pressure of 38 mm without loss for at least 3 minutes.

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

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.Performance tests to be undertaken in accordance with the requirements of BS EN 10256-2 Annex NG 3.2.1
4. Induced siphonage and back pressure testing

4.1. WCs: Performance tests to be undertaken in accordance with the requirements of BS EN 10256-2 Annex NG 3.2.1, 3.2.2, and 3.2.3.

4.2. Washbasins: Performance tests to be undertaken in accordance with the requirements of BS EN 10256-2 Annex NG 3.2.1, 3.2.2, and 3.2.3.

4.3. Sinks: Performance tests to be undertaken in accordance with the requirements of BS EN 10256-2 Annex NG 3.2.1, 3.2.2, and 3.2.3.

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

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 ADDED

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 ADDED

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.
   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 above ground services. Location of outlets.
   2.2. Format: A1 paper print. Electronic.
   2.3. Number of copies: Two.
3. Submittal date: At handover.

Ω End of System

Ss_55_20_33_56
[M] Natural gas distribution network systems ADDED

Systems

Ss_55_20_33_56 [M] Natural gas distribution network systems ADDED

1. Description:

   A new incoming commercial mains gas meter will be provided from the network terminating in the North East loading bay meter cupboard. The meter cupboard will be permanently vented to ambient via louvred doors and louvres to satisfy the requirements of the Regulations.

   The commercial incoming gas pipework will enter the building at ground level.

   The gas meter shall be interfaced with the main BMS in order to record and monitor consumption.

   A gas booster within the gas meter room shall ensure that the minimum pressure requirements of the natural gas fired boilers are maintained at all times, irrespective of the pressure available from the utility provider. The contractor is to verify the gas system pressure losses and confirm the appropriate gas booster prior to ordering any plant.

   The gas booster shall be provided a connection to the BMS to monitor plant status and raise an appropriate alarm under a fault condition.

   The contractor is to include for the setting out and detailing of all incoming service sleeves required for the incoming gas installation.

   Upon appointment, the mechanical contractor shall take over the negotiations and placing of orders with the gas shipper. A provisional sum allowance for the new gas supply has been made within the Contract Documentation. The Sub-Contractor in association with the Main Contractor shall manage the works to be undertaken in accordance with the Contract Programme and to co-ordinate the works with other services and building elements.

   Supply gas pressure at outlet of National Grid or IGT meter: 19-21 mBar
2. Gas transporter: Cadent or better and approved.
3. Gas supplier: Cadent or better and approved.
4. Position of meter: Refer to GA plans / schematic

Ω End of System

Ss_55_20_34_57
[M] Natural gas supply systems ADDED

Systems

Ss_55_20_34_57 [M] Natural gas supply systems ADDED

1. Description:

The installation generally comprises / includes for the following:

1. Gas service from the main incoming utility meter to serve the Level 05 boiler plantroom
2. Gas booster set
3. Black-out finish on all gas pipework routed above open ceilings
4. All fittings, bracketry, supports, gas cocks as necessary to make a complete and working installation

Internal gas pipework is to be routed in steel and painted (Yellow Ochre) for identification accordingly except where pipework is routed above open ceilings where finish will be black finish.

The contractor shall utilise 'Trac-pipe' or better and approved to provide a seamless pipe from gas solenoid valve to appliance.

Automatic shut-off facilities shall be provided as specified to isolate the commercial gas supply in the event of an emergency / fire alarm signal.

Individual plant items will provided with a means of isolation via a gas cock.

A main gas solenoid valve (automatically reset version - manual not permitted) is to be provided and located adjacent to the gas meter which is to be interfaced with the fire alarm installation. All pipework / fittings from the discharge of the meter will be part of the mechanical contractors scope of works. 2no. knock off buttons are to be provided at each exit of the boiler room.

The contractor is to supply, install, test, commission, demonstrate and set to work the entire complete system as set out within this specification and as described on the drawings / equipment schedules.

Local gas solenoid valves shall be provided and installed by the contractor - refer to fixed gas detection and alarm systems (Ss_75_50_28_30) for further details.

The Contractor's registered gas installer who will be signing off installation / issuing gas safe certification shall undertake a review of the gas system design and identify any items for discussion which may prevent issue of gas safe certification / setting system to work including checking of pressure drop of system within 2 months of contract commencement. Failure to undertake this exercise prior to commencing installation shall be deemed as acceptance that the design is acceptable to the registered gas installer.

2. System performance: Ss_55_20_34/212 Design of gas supply installations; Ss_55_20_34/222 Pipeline sizes
3. Metering: Pr_80_51_51_33 Gas meters
4. Pipeline material: Pr_65_52_63_17 Copper pipelines; Pr_65_52_63_82 Steel pipelines
5. Support: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps; Pr_20_29_14_65 Pipe clips
6. Gas valves: Pr_65_54_33_33 Gas ball valves; Pr_65_54_33_38 Gas solenoid valves; Pr_65_54_33_50 Mechanical gas safety valves; Pr_65_54_33_35 Gas butterfly valves
7. Gas equipment: Pr_65_53_86_33 Gas boosters; Pr_65_54_33_34 Gas burner safety devices; Pr_65_54_33_37 Gas pressure switches; Pr_70_60_36_72 Radiant tube heaters
8. Plant and equipment identification: Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels; Pr_40_10_57_60 Paper valve charts and schematics; Pr_40_10_57_28 Engraved valve identification labels
9. Execution: Ss_55_20_34/632 Gas Safe registration requirements; Ss_55_20_34/651 Installing gas pipelines; Ss_55_20_34/671 Connection to gas outlets
10. System completion: Ss_55_20_34/812 Testing gas pipeline installations; Ss_55_20_34/842 Commercial and industrial gas installations; Ss_55_20_34/852 Pressure testing of natural gas supply systems; Ss_55_20_34/861 Performance testing; Ss_55_20_34/872 Inspection and test records; Ss_55_20_34/875 Documentation; Ss_55_20_34/882 Maintenance

System performance

Ss_55_20_34/212 Design of gas supply installations ADDED

1. Design: The contractor shall complete the design of the natural gas supply system.
2. Standards
   2.1. General: To IGEM Standard UP/2.
   2.2. Low pressure gas for premises: To BS 6891.
   2.3. Gas pipework for buildings: To BS EN 1775.
   2.4. Industrial gas supply: To BS EN 15001-1.
3. Requirement: The contractor shall submit proposals, including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_55_20_34/222 Pipeline sizes ADDED

1. Sizing: The contractor shall calculate sizes of all gas pipes for the equipment proposed.
2. Equipment gas consumption: Refer to gas schematic

Products

Pr_20_29_14_07 Beam clamps

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems ,

Ss_55_70_38_65 [P] Pumped cold water supply systems , Ss_60_40_37_48 [M] Low temperature hot water heating systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

1. Clamp type: Bolt on, suitable for threaded rod hanger.
2. Material: Stainless steel. Carbon steel.

Pr_20_29_14_08 Beam clips

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_38_65 [P] Pumped cold water supply systems , Ss_60_40_37_48 [M] Low temperature hot water heating systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

1. Clip type: Hammer on, suitable for threaded rod hanger. Hammer on, suitable for wire suspension.
2. Material: Carbon steel. Stainless steel.

Pr_20_29_14_65 Pipe clips ADDED

Shared by: Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Execution: Pr_20_29_14/620 Installing pipeline supports

Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX) , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_97_70 [P] Rainwater reclamation systems , Ss_55_70_38_65 [P] Pumped cold water supply systems , Ss_60_40_37_48 [M] Low temperature hot water heating systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

1. Material: Face engraved rigid plastic laminate.
2. Colour
   2.1. Background: Red.
   2.2. Lettering: White.
3. Typography
4. Information to be included: Equipment name. Equipment reference number. Service.
5. Execution: Pr_40_10_57/611 Installing mechanical plant and equipment identification

Pr_40_10_57_28 Engraved valve identification labels ADDED

Shared by: Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Material: Face engraved rigid plastic laminate.
2. Colour

2.1. Background: Red.

2.2. Lettering: White.

3. Typography

4. Information: Purpose and reference number.
Reference numbers to correspond with system schematic.

5. Execution: Pr_40_10_57/630 Installing valve identification labels

Pr_40_10_57_60 Paper valve charts and schematics ADDED

Shared by: Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX) , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Material: Paper print, encapsulated.

2. Information to be included: Location and identification of pipework regulating, isolating and control valves.
Reference numbers to be included.

3. Execution: Pr_40_10_57/620 Installing valve charts and schematics

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_65_52_62_09 Brazing compounds ADDED

1. Standards

1.1. Lead free solder for capillary fittings: To BS EN ISO 9453.

1.2. Brazing filling: To BS EN ISO 17672.

1.3. Flange jointing rings: To BS EN 1514-4.

Pr_65_52_62_29 Flange jointing rings for copper flanges ADDED

1. Standards

1.1. Lead free solder for capillary fittings: To BS EN ISO 9453.

1.2. Brazing filling: To BS EN ISO 17672.

1.3. Flange jointing rings: To BS EN 1514-4.

Pr_65_52_62_31 Flange jointing rings for steel flanges ADDED

1. Standards

1.1. Jointing compound: To BS 6956-5. To BS 6956-5.

1.2. PTFE tape: To BS EN 751-3.

1.3. Flange jointing rings: To BS EN 1514-4.

1.4. Elastomeric gaskets: To BS EN 681-1.

1.5. Welding rods

1.5.1. Gas welding: To BS EN 12536.

1.5.2. Arc welding: To BS EN ISO 636.

Pr_65_52_62_36 Hemps and pastes ADDED

1. Standards

1.1. Jointing compound: To BS 6956-5.

1.2. PTFE tape: To BS EN 751-3.

1.3. Flange jointing rings: To BS EN 1514-4.

1.4. Elastomeric gaskets: To BS EN 681-1.

1.5. Welding rods

1.5.1. Gas welding: To BS EN 12536.

1.5.2. Arc welding: To BS EN ISO 636.

Pr_65_52_62_81 Solders ADDED

1. Standards
   1.1. Lead free solder for capillary fittings: To BS EN ISO 9453.
   1.2. Brazing filling: To BS EN ISO 17672.
   1.3. Flange jointing rings: To BS EN 1514-4.

Pr_65_52_63_17 Copper pipelines ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_97_70 [P] Rainwater reclamation systems , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. General requirements: Pr_65_52_63_18 Copper pipeline fittings; Pr_65_52_62_81 Solders; Pr_65_52_62_29 Flange jointing rings for copper flanges; Pr_65_52_62_09 Brazing compounds
2. Finish: All pipework systems irrespective of service / fluid conveyed must be painted / finished in black above the 'open' ceilings. Contractor must refer to architects ceiling plans to identify the extent of open ceilings and therefore, the extent of pipework to be painted / finished in black.
3. Standard: To BS EN 1057.
4. Finish: Plain / black in front of house areas where located in visible areas
5. Execution: Pr_65_52_63/631 Installing copper pipelines; Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes

Pr_65_52_63_18 Copper pipeline fittings ADDED

1. Standards
   1.1. Capillary: To BS EN 1254-1, solder ring. To BS EN 1254-1, end feed.
   1.2. Compression: To BS EN 1254-2, type A. To BS EN 1254-2, type B.
   1.3. Flanges: To BS EN 1092-3

Pr_65_52_63_82 Steel pipelines ADDED

Shared by: Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. General requirements: Pr_65_52_63_83 Steel pipeline fittings; Pr_65_52_62_36 Hemps and pastes; Pr_65_52_62_31 Flange jointing rings for steel flanges
2. Finish: All pipework systems irrespective of service/fluid conveyed must be painted black above the 'open' ceilings of each level. Contractor must refer to architects ceiling plans to identify the extent of open ceilings and therefore, the extent of pipework to be painted/finished in black.
3. Standard
   3.1. Up to 150mm: To BS EN 10255, heavy weight. To BS EN 10255, medium weight.
   3.2. 150mm and above: To BS EN 10216-1, designation TR1. To BS EN 10217-1, designation TR1. To BS EN 10216-1, designation TR2. To BS EN 10217-1, designation TR2.
4. Finish: Hot-dip zinc coating.
5. Execution: Pr_65_52_63/680 Installing steel pipelines; Pr_65_52_63/685 Welding steel pipelines

Pr_65_52_63_83 Steel pipeline fittings ADDED

1. Standards
   1.1. Malleable: To BS 143 and 1256.
   1.2. Flanged: To BS EN 1092-1.
   1.3. Welded: To BS EN 10253-1 and BS EN 10253-2.
   1.4. Wrought: To BS EN 10241.
   1.5. Mechanical couplings: LPCB Approved

Pr_65_53_86_33 Gas boosters ADDED

1. General requirements: Pr_65_54_33_37 Gas pressure switches
2. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
3. Standard: To BS 8487.
4. Boosters: In accordance with IGEM Standard UP/2.
5. Design duty
   5.1. Volume of gas: Refer to equipment schedules
   5.2. Required at booster outlet: Refer to equipment schedules
6. Booster installation: Single.
7. Connections: Flanges, steel.
8. Pressure rating: Refer to equipment schedule
9. Control panel: Mounted on booster.
10. Accessories: Control bypass. Initial surge control. Low pressure cut off switch. Non-return valve. Non-return valve for each booster in automatic duplex installations. Outlet pressure control.

Pr_65_54_33_33 Gas ball valves ADDED

1. Standard: To BS EN 331.
2. Arrangement: Lever-operated.
3. Material: Brass. Stainless steel.
4. Connections: Capillary to BS EN 1254-1. Compression to BS EN 1254-2. Flanged to BS EN 1092-2. Flanged to BS EN 1092-3. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_33_34 Gas burner safety devices ADDED

1. Standard: To BS EN 13611.

Pr_65_54_33_35 Gas butterfly valves ADDED

1. Standard: To BS EN 593.
2. Working conditions
   2.1. Type of fluid: Gaseous.
   2.2. Fluid temperature: 10°C.
3. Operation
   3.1. Manual: Lever.
   3.2. Fail safe: Single acting closed.

3.3. Automatic: Electric.

4. Options: Emergency hand control. Anti-static design. Fire type tested design.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_33_37 Gas pressure switches ADDED

1. Pressure application: Detection of positive pressure changes. Differential pressure. High pressure. Low pressure.
2. Accessories: Adjustable control setting. Control spring.

Pr_65_54_33_38 Gas solenoid valves ADDED

1. Arrangement: Two way servo assisted.
2. Mounting: Horizontal pipeline. Vertical pipeline.
3. Solenoid supply voltage: 24 V.
4. Actuation method: Knock off button. Remote signal. Sensor above each burner. Sensor on ceiling.
5. Reset: Automatic.
6. Accessories: Pressure test points.

Pr_65_54_33_50 Mechanical gas safety valves ADDED

1. Arrangement: Cut-off.

Pr_70_60_36_72 Radiant tube heaters ADDED

1. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

2. Standard: To BS EN 416-1, BS EN 777-1, BS EN 777-2, BS EN 777-3 or BS EN 777-4.
3. Mounting: Ceiling.
4. Output: Refer to equipment schedules
5. Length: Refer to equipment schedules
6. Arrangement: Refer to equipment schedules
7. Fuel: Gas.
8. Controls: Black bulb sensors. Refer to clause Ss_75_70_50_36 (heating system control systems) for further details/specification
9. Flues and chimneys: Integral. Non-integral.
10. Accessories: Flexible gas connection hoses. Reflector end stops. Suspension chains and shackles.
11. Execution: Pr_70_60_36/660 Installing radiant tube heaters; Pr_70_60_36/611 Installing heat emitters generally

Pr_80_51_51_33 Gas meters ADDED

1. Standards
   1.1. Third party certification: Measuring Instruments Directive approved.
   1.2. Gas meters: Diaphragm gas meters to BS EN 1359. Rotary displacement gas meters to BS EN 12480.
   1.3. Low pressure meters: In accordance with IGEM Standard GM/6.

2. Accessories: Pulsed output for BMS monitoring. Remote reading facility.
3. Execution: Pr_80_51_51/641 Installing secondary gas meters

Pr_80_77_27_15 Channel supports

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems , Ss_55_70_38_65 [P] Pumped cold water supply systems , Ss_60_40_37_48 [M] Low temperature hot water heating systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

1. Channels
   1.1. Format:
   - Plain
   - Slotted

   1.2. Dimensions:
   - 41 x 21 x 1.5 mm
   - 41 x 21 x 2.5 mm
   - 41 x 41 x 1.5 mm
   - 41 x 41 x 2.5 mm
   - 100x 100mm channel in multiple pipework risers

   1.3. Type:
   - Single
   - Double

   1.4. Material:
   - Carbon steel
   - Stainless steel

   1.5. Finish:
   - Hot dip galvanized

   1.6. Accessories:
   - End caps
   - 90° brackets

Execution

Pr_20_29_14/620 Installing pipeline supports ADDED

1. Position
   1.1. In plant rooms: One-piece strap, sling rod, washer and nuts. Overstrap, washer and nuts. Pipe clip, sling rod, washer and nuts. U-bolt, washers and nuts. Two piece pipe bracket with 2No threaded rod, nuts and washers.
   1.2. Distribution corridors and risers: One-piece strap, sling rod, washer and nuts. Overstrap, washer and nuts. Pipe clip, sling rod, washer and nuts. Roller and chair assembly. U-bolt, washers and nuts.Two piece pipe bracket with 2No threaded rod, nuts and washers.
   1.3. Surface mountings: Split ring, spacer nipple and backplate.

Pr_40_10_57/611 Installing mechanical plant and equipment identification

1. Fixing: Fix with adhesive to equipment.
2. Position: On equipment.

Pr_40_10_57/620 Installing valve charts and schematics ADDED

1. Fixing: Plug and screw to wall.
2. Position: On wall adjacent equipment.

Pr_40_10_57/630 Installing valve identification labels ADDED

1. Fixing: Secure with metal chain.

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_65_52_63/610 Pipelines installation generally ADDED

Shared by: Pr_65_52_63_63 Polyethylene (PE) water pipes and fittings , Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines and Pr_65_52_63_20 Copper refrigerant pipelines

1. Standard: BESA Technical Report TR/20/1 LTHW heating pipework systems. BESA Technical Report TR/20/4 Hot water service. BESA Technical Report TR/20/5 Cold water service. BESA Technical Report TR/20/6 Chilled water. BESA Technical Report TR/20/7 Condenser and cooling water. BESA Technical Report TR/20/9 Natural gas. BS EN 12845:2015 / LPC Rules & Technical Bulletins. BS 9990:2015
2. Dissimilar metals: Prevent electrolytic corrosion.

Pr_65_52_63/615 Installing pipeline fittings ADDED

Shared by: Pr_65_52_63_63 Polyethylene (PE) water pipes and fittings and Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines

1. Fabricated junctions and fittings: Same material as the main pipeline

Pr_65_52_63/620 Installing anchors generally ADDED

Shared by: Pr_65_52_63_63 Polyethylene (PE) water pipes and fittings and Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines

1. Purpose: To resist axial stress transmitted by flexure of horizontal and vertical pipe runs, and loading on vertical pipes.
2. Fixings: Provide associated backing plates, nuts, washers and bolts for attachment to, or building into building structure.
3. Fixing to building structure: Bolted. Built

Pr_65_52_63/625 Installing slide guides ADDED

1. Expansion and contraction: Direct movement from pipe anchor points towards loops, bellows or flexible inserts.
2. Thrust: Linear relative to the axis of pipe.

Pr_65_52_63/631 Installing copper pipelines ADDED

1. General requirements: Pr_65_52_63/610 Pipelines installation generally; Pr_65_52_63/615 Installing pipeline fittings; Pr_65_52_63/690 Spacing of pipelines; Pr_65_52_63/710 General inspection and testing; Pr_65_52_63/620 Installing anchors generally; Pr_65_52_63/625 Installing slide guides
2. Standard: In accordance with CDA publications 88 Copper tube in buildings. In accordance with CDA publications 149 Large diameter copper tubes. In accordance with CDA publications 149 Large diameter copper tubes.
3. Jointing method

3.1. Accessible joints: Capillary, up to 67 mm for pressure up to 600 kPa and 110°C. Capillary, 67–108 mm for pressure up to 400 kPa and 110°C. Compression, up to 54 mm.

4. Expansion loops: Formed bends from single pipe length. Jointed brazed fittings.
5. Anchor

Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes ADDED

1. Preparation, marking and sealing: In accordance with BS EN 14324.

Pr_65_52_63/680 Installing steel pipelines ADDED

1. General requirements: Pr_65_52_63/610 Pipelines installation generally; Pr_65_52_63/615 Installing pipeline fittings; Pr_65_52_63/690 Spacing of pipelines; Pr_65_52_63/710 General inspection and testing; Pr_65_52_63/620 Installing anchors generally; Pr_65_52_63/625 Installing slide guides
2. Accessible joints: Screwed, up to and including 50 mm. Welded and flanged, 65 mm and over.
3. Expansion loops: Formed bends from single pipe length. Jointed welded fittings.
4. Anchor
   4.1. Method: submit proposals
   4.2. Pipe restraints: submit proposals

Pr_65_52_63/685 Welding steel pipelines ADDED

1. Standard: In accordance with BESA Technical Report TR/5.
2. Welder identification: Mark each weld to identify operative. Use weld mapping.
3. Non-destructive examination: Visual examination, to BS EN ISO 17637. Ultrasonic examination.
4. Completed welds: Wire brush and protect from corrosion

Pr_65_52_63/690 Spacing of pipelines ADDED

Pr_65_52_63/710 General inspection and testing ADDED

Shared by: Pr_65_52_63_63 Polyethylene (PE) water pipes and fittings and Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines

1. Safety precautions: In accordance with HSE GS 4.

Pr_65_54_95/610 Installation of valves generally ADDED

Shared by: Pr_65_54_95_66 Pressure reducing valves , Pr_65_54_95_83 Steel globe stop and check valves , Pr_65_54_95_20 Copper alloy underground stop valves , Pr_65_54_95_96 Waterworks gate valves , Pr_65_54_95_82 Steel globe valves , Pr_65_54_95_08 Butterfly valves , Pr_65_54_95_05 Backflow prevention devices , Pr_65_54_95_15 Copper alloy gate valves , Pr_65_54_95_06 Ball valves , Pr_65_54_95_88 Thermostatic mixing valves , Pr_65_54_95_63 Pressure independent control valves , Pr_65_54_95_30 Flow measuring valves , Pr_65_54_95_47 Low pressure thermostatic mixing valves , Pr_65_54_95_16 Copper alloy globe valves , Pr_65_54_95_75 Safety valves , Pr_65_54_95_27 Draining taps , Pr_65_54_95_19 Copper alloy stop valves , Pr_65_54_95_29 Float-operated valves , Pr_65_54_95_18 Copper alloy service stop valves , Pr_65_54_95_81 Steel ball valves , Pr_65_54_95_14 Copper alloy check and double check valves and Pr_65_54_95_26 Double regulating valves

1. Installation: In accordance with BS 6683.
2. Isolation and regulation valves: Provide at equipment and on sub-circuits, and as detailed on drawings.

Provide in-line isolation valves on dry and wet riser vertical piping at maximum 10m centres

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_70_60_36/611 Installing heat emitters generally ADDED

1. Fixing: Secure and parallel or perpendicular to the structure of the building.
2. Stud walls: Fix to studs and/ or noggings.

Pr_70_60_36/660 Installing radiant tube heaters ADDED

1. Standard: To BS 6896.
2. Siting: So persons are not subject to excessive thermal radiation intensity.
3. Surface temperature of combustible material in the vicinity of the heater (maximum): 65°C.

Pr_80_51_51/641 Installing secondary gas meters ADDED

1. Secondary gas meters
   1.1. Low pressure: In accordance with BS 6400-1.
   1.2. Medium pressure: In accordance with BS 6400-2.
   1.3. Non-domestic: In accordance with IGEM/GM/8, part 3 and part 5.
2. Electrical connections: In accordance with IGEM GM/7A.

Ss_55_20_34/632 Gas Safe registration requirements ADDED

1. Type of service: Non-domestic. All services.
2. Type of gas: Natural gas.
3. Area of work: All areas.

Ss_55_20_34/651 Installing gas pipelines ADDED

1. Standards
   1.1. General: To IGEM Standard UP/10.
   1.2. Gas pipelines: To BS 6891 and BS EN 1775. To BS EN 15001-1.

Ss_55_20_34/671 Connection to gas outlets ADDED

1. Equipment: Packaged CHP units. Gas-fired boilers. Gas fires. Instantaneous water heaters, gas fired.
2. Connection: Connect to installed equipment.

System completion

Ss_55_20_34/812 Testing gas pipeline installations ADDED

1. Standards
   1.1. Testing, purging and commissioning: To BS 6891 and BS EN 1775.
   1.2. Soundness testing and purging: To IGEM Standard UP/1A.
   1.3. Tightness testing and direct purging: To IGEM/UP/1B

Ss_55_20_34/842 Commercial and industrial gas installations ADDED

1. Soundness testing and purging: To IGEM Standard UP/1.
2. Testing, purging and commissioning pipelines: To BS EN 15001-2.
3. Commissioning gas fired plant: To IGEM Standard UP/4.

Ss_55_20_34/852 Pressure testing of natural gas supply systems ADDED

1. Notice (minimum): 1 week.
2. Pressure: 2 times working pressure.
3. Duration of test: 1 h.

Ss_55_20_34/861 Performance testing ADDED

1. Reports: Submit on completion.

Ss_55_20_34/872 Inspection and test records ADDED

1. Record sheets
   1.1. Submission: On completion
   1.2. Number of copies: Three.

Ss_55_20_34/875 Documentation ADDED

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: Two.
2. Record drawings
   2.1. Content: Location and arrangement of plant in plant rooms. Location, size and route of mechanical services. Location and identification of pipework regulating, isolation and control valves. Location of outlets.
   2.2. Format: A1 paper print. Electronic.
   2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_55_20_34/882 Maintenance ADDED

1. Servicing and maintenance: Undertake for 12 months after practical completion. Provide all necessary parts and spares.

Ω End of System

Ss_55_70_38_42
[P] Unvented Indirect hot water storage supply systems

ADDED

Systems

Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

ADDED

1. Description:

The central hot water generation plant installation generally comprises/includes, but is not limited to, the following:

- 4no. hot water service packaged PHE Calorifier sets, serving the arena facilities complete with associated system expansion vessel and all safety devices as required by legislation.
- Secondary hot water return circulating pump set.
- Pipework distribution to all outlets routed in copper to be adequately thermally insulated.
- 'Shell and Core' service provision to Kitchens, concessions & bars for extension by fit out contractor.
- Chlorination of the entire water system.
- Temperature maintaining tape for uncirculating lengths of hot water
- Black-out paint on all pipework routed above open ceilings.
- Allowance to be made for expansion of the pipework system, including specialist advice.
- All valves, fittings, flexible connections, bracketry & accessories necessary to make a complete and working installation.

The HW generation system for OVG Manchester will comprise a centralised, unvented hot water plant, with secondary return circulation on the main runs. This will be provided by 4no. skid-mounted, packaged plate and buffer installations (CAL:01-04) located in the Level 04 Hot Water Generation Plantroom L04 E018.

The plant will consist of 4no. 4000 litre cylinders each fitted with a 230kW plate heat exchanger. A recovery time of 1 hour will be designed for the cylinders.

A dedicated cold feed shall run from Level 00 PH plantroom to Level 04 HW plantroom – via 2no. electro-magnetic water conditioners.

Hot water flow and return services will run from this room, via service routes and risers, to serve all hot water requirements throughout the Building.

Plant will be fully packaged, complete with all required fittings including shunt pumps, expansion vessels, pressure / temperature relief valves, isolation, check, non-return and control valves.

The central hot water system will operate in accordance with the latest BS EN standards and water will be stored at 60°C. The HWS system will be distributed in a manner that provides a minimum of 55°C at the point of draw off.

Hot water return pipework will terminate outside of spaces / rooms – so that the venue operator retains full control and can isolate any space in the building from the corridor outside. Uncirculated hot water pipework section within rooms/spaces are to be provided with electric temperature maintenance trace heating tape to maintain desired temperature and protect against legionella risk.

1.1. General Requirements: The HWS system will have insulated copper flow and return pipework.

Each calorifier will incorporate a destratification pump.

No exposed pipework outside of plantrooms will be permitted.

Isolation valves and flow regulators are to be installed to pipework before connecting to sanitary fittings as shown on the schematic drawings.

Drain valves shall be installed at all low points. Final connections to all items of sanitaryware shall be hard plumbed. The use of flexible braided pipework will not be allowed.

All fittings used on the installation shall be PN16 and suitable for the expected working pressure of the system.

The installation shall be pressure tested to 1.5 x the working pressure of the system.

The Sub-Contractor shall provide, install, test and commissions the hot water service secondary return circulation pump as detailed in the equipment schedules. The pump set shall be of the 'in-line' mounted type with bronze or stainless steel housing and direct driven stainless steel impellers. Pipework shall be arranged so that no undue strain is placed on the pump set due to expansion or contraction or weight of adjacent pipework and valves.

Valve set including isolation, pressure reduction, backflow protection, and thermostatic regulation - will be provided at high level outside of each kitchen, concession and bar.

The contractor shall also allow to chlorinate the entire water system prior to hand-over (maximum of 3 days prior to hand over). The Contractor shall at his own expense continue to chlorinate the system or part of the system should the system fail the standard chlorination test.

At the top of every main rising pipe, install a combined “anti-shock” air release and vacuum breaker device with a lock-shield isolating valve to enable its maintenance and/ or repair without interruption in the operation of the boosted system. Ensure that every such device incorporates an automatic air vent with the facility to decelerate approaching water when air is venting. Additionally ensure that every such device permits vacuum relief by allowing air to enter the system when draining it.

All internal distribution within the building from the calorifier shall be routed in copper pipework complete with thermal insulation in Rockwool class O or approved equivalent.

All unprotected hot water draw-off points are to be provided with clear labels which provide the warning “VERY HOT WATER”.

Refer to clause Ss_60_40_37_28 for details of electric resistance trace heating/maintenance tape.

Upon completion of the aforementioned works the Sub-Contractor shall test, commission, and put to full working condition the entire hot water Installation to the satisfaction of the Main Contractor or his appointed representative.

1.2. Kitchens, Concessions & Bars: Each kitchen, concession and bar unit will be provided with a metered valved and capped-off domestic hot water flow supply on the point of entry to the unit as detailed on the drawings and schematics. The fit-out/extension from the valved/capped-off hot water flow pipework and temperature maintenance to all equipment within each unit will be the responsibility of the specialist catering contractor and does not form part of the mechanical contractor scope of works. Hot water return pipework will terminate and connect to flow pipework outside of each unit at high level. Valve set including pressure reduction, backflow protection, and thermostatic regulation - will be provided at high level outside of each kitchen, concession and bar.

1.3. Flexible Connections:

Flexible pipework fittings shall also be used for final termination to sinks and wash hand basins.

Tie bars with rubber top hat washers shall be used where the working pressure exceeds 1.5 bar G.

Where untied bellows are used the manufacturers recommendations for anchors and guides shall be followed. Tie bars shall be threaded and their length adjustable.

For working temperatures up to 60°C the rubber bellows shall be high tensile synthetic fibre reinforced.

Flexible connections with screwed connections shall be reinforced EPDM rubber hoses and shall have at least one full union to avoid torquing on installation.

For domestic hot water services the bellows liner shall be of a food grade nitrile rubber as BOA Group, Type A NITRILE or equal and approved.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this schedule including all component details and layout drawings showing the locations of all components - for approval by the design team.

Flexible connections shall be as supplied by BOA Group or equal and approved.

2. System performance: Ss_55_70_95/210 Design and detailing hot and cold water systems; Ss_55_70_38/240 Centralized hot water storage system
3. Primary heat source: Pr_60_60_08_34 Gas fired condensing boilers
4. Primary: Sealed.
5. Storage unit: Pr_60_50_20_42 Indirectly heated unvented hot water storage cylinders
6. Electric immersion heater: Pr_60_60_96_42 Immersion heaters
7. Pumps
   - 7.1. Primary hot water supply: Pr_65_53_86_11 Canned rotor pumps; Pr_65_53_86_15 Close-coupled in line pumps
   - 7.2. Secondary hot water supply: Pr_65_53_86_11 Canned rotor pumps; Pr_65_53_86_15 Close-coupled in line pumps
8. Pipelines: Pr_65_52_63_17 Copper pipelines
9. Pipeline accessories
   - 9.1. Expansion devices: Pr_65_67_28_03 Angular expansion compensators; Pr_65_67_28_05 Axial expansion compensators; Pr_65_67_28_46 Lateral expansion compensators
   - 9.2. Gauges: Pr_65_52_34_66 Pressure gauges; Pr_65_52_34_88 Temperature gauges
   - 9.3. Accessories: Pr_65_52_61_50 Masking plates; Pr_65_52_61_63 Pipe sleeves; Pr_65_57_96_08 Basket water strainers; Pr_65_57_96_04 Angle water strainers
   - 9.4. Pipeline supports: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps; Pr_20_29_14_65 Pipe clips
10. Valves
    - 10.1. Isolating valves: Pr_65_54_95_06 Ball valves; Pr_65_54_95_15 Copper alloy gate valves; Pr_65_54_95_16 Copper alloy globe valves; Pr_65_54_95_08 Butterfly valves
    - 10.2. Check valves: Pr_65_54_95_14 Copper alloy check and double check valves
    - 10.3. Regulating valves: Pr_65_54_95_66 Pressure reducing valves
    - 10.4. Mixing valves: Pr_65_54_95_47 Low pressure thermostatic mixing valves; Pr_65_54_95_88 Thermostatic mixing valves
    - 10.5. Draining devices: Pr_65_54_95_27 Draining taps
    - 10.6. Accessories: Pr_65_54_93_87 Test points
11. Thermal insulation
    - 11.1. Pipelines: Pr_80_77_76_54 Mineral wool pipe section insulation
    - 11.2. Cylinders: Pr_80_77_76_53 Mineral wool duct slab insulation
12. Vibration isolation: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_84 Spring isolators; Pr_80_77_94_60 Pad mountings; Pr_80_77_94_40 Inertia bases; Pr_80_77_94_42 Isolation hangers; Pr_80_77_94_30 Flexible vibration isolation hoses; Pr_80_77_94_74 Rubber bellows

13. Controls: Ss_75_70_52_96 [P] Water supply control systems
14. Accessories: Pr_60_50_20_28 Expansion vessels
15. Plant and equipment identification: Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels; Pr_40_10_57_60 Paper valve charts and schematics; Pr_40_10_57_28 Engraved valve identification labels
16. Execution: 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
17. 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_95/850 Water quality tests; Ss_55_70_38/860 Spares; Ss_55_70_38/870 Operating tools; Ss_55_70_38/880 Maintenance

Ss_75_70_52_96 [P] Water supply control systems ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

1. Description:

1.1. Central Hot Water Calorifiers :

The hot water generation shall be enabled/disabled by a Timeclock signal from the BMS.

Between the start/stop times the hot water generation plant shall be controlled to provide hot water flow at a pre-set value, initially set at 60°C (adjustable). The plant shall be controlled via immersion temperature sensors mounted in the storage vessel and 2-port control valve/s on the primary constant temperature supplies.

The LPHW connections to the calorifier shall be via plate heat exchangers.

The calorifier shall each include an integral continuously running high output anti-stratification pump. A flow switch shall be provided within the generator pipework to indicate alarm of pump failure onto the BMS and the respective plantroom mechanical control panel.

On the primary LPHW circuit to each calorifier, a 2-port control valve shall be fitted which shall modulate under the dictates of immersion temperature sensors mounted in the storage vessel to maintain the desired setpoint temperature. Each 2-port valve is supplied and free issued by the calorifier manufacturer for fitting by mechanical contractor.

Hot water flow sensor on the secondary flow and hot water return sensor on the secondary return shall provide indication of temperature onto the respective mechanical control panels.

Domestic hot water shall be circulated around the system by a twin-head pump variable speed set. Pump flow failure is to be recorded on the BMS using differential pressure switch across the unit.

A standby electric immersion heater is to be provided to each calorifier.

Each calorifier shall have its own direct acting high temperature limit valve with digital output for BMS of high limit trip condition.

An indicator lamp shall be included on the control panel to show trip condition of each high temperature limit valve.

Each calorifier shall have its own numeric for temperature set point.

An OFF/ON selector switch shall be provided for each pump with run and trip display lamps on the motor control panel.

1.1.1. Control and Monitoring Functions:

The following control and monitoring functions shall be required for each hot water calorifier:

- Hot water storage temperature (high and low level)
- Hot Water secondary return pump enable
- Hot Water secondary return pump fail
- Hot Water secondary return pump hours run
- Hot water return temperature
- 2-port control valve operation
- Anti-stratification pump enable
- Anti-stratification pump fail
- Anti-stratification pump hours run

Each hot water generation packaged plant installation shall be fitted as standard with the following minimum safety devices:

- Anti-Vacuum Valve
- Thermometer
- High Limit Thermostat (Manual Reset)
- Temperature Gauge
- Pressure Gauge
- Expansion vessel
- Expansion relief valve
- Pressure reducing valve
- Check valve
- Temperature and pressure relief valve
- Anti-stratification pump linked to timer
- Access manway 700mm diameter
- Control panel
- All necessary valves and fittings
- Bursting Disk
- Strainer
- Drain Valves as required.
- Motorised Valves as required.
- Double Regulating Valves as required.

1.1.2. Power:

Power to the secondary return circulating pump set is derived from a local isolator supplied & installed under the electrical contract with final connection from the isolator to the unit by the controls specialist.

1.2. HWS Electric Immersion Heater:

Each hot water calorifiers is fitted with a 3Ø 100kw electric immersion heater. In the event of failure of the primary heat source, the immersion heaters will energise under thermostatic control to maintain the stored water at 65°C.

1.2.1. Power:

Power to the immersion unit/s is derived from a local isolator supplied & installed under the electrical contract with final connection from the isolator to the unit by the controls specialist.

1.3. Cold Water Storage Tanks:

High and low level float switches shall be located in each of the cold water storage tanks to indicate limit alarms on the BMS. The float switches shall be interfaced with the associated booster set to shut down the unit in the event of a low water level.

The cold water storage tank shall also be fitted with temperature probes with an alarm to BMS in the event of the water temperature exceeding 20 degrees c.

Fault and status alarms shall be indicated at the BMS.

Cold water storage tanks in the PH Plantroom (TANK:01 & 02) are each to be provided with a BMS compatible monitoring / control system such as Keraflo “Tanktronic” or better and approved.

In-flow to CAT5 TANK:03 to be controlled by a specialist Hybrid controller, capable of monitoring contents of, and interfacing with the delivery pumps in external buried rainwater harvesting tank.
As Aquality or better and approved.

Inflow to the tanks will be controlled by Keraflo KB variable-height, delayed-action float valves (high flow) or better and approved.

1.4. Packaged Cold Water Booster Set:

Each cold water booster set shall pressurise the water distribution to maintain a pre-set outlet pressure. This shall be achieved using the integral controls supplied with the unit. In addition, the booster set shall be interlocked with the water storage tank low level alarm to shut the booster down before the tank runs dry.

The cold water booster set controls shall be within a self contained control panel integrated with the packaged booster set. The control panel shall have a link to BMS in the event of a fault condition.

1.4.1. Control and Monitoring Functions:

All booster sets to be provided with a Grundfos Control MPC in a steel cabinet (or better and approved), IP54, to include main switch, all required fuses, motor protection, switching equipment and microprocessor-controlled CU 352.

All booster sets are to be provided with dry-running protection and diaphragm tanks.

Pump operation is controlled by Control MPC with the following functions:

- Intelligent multipump controller, CU 352.
- Constant-pressure control through continuously variable adjustment of the speed of each individual pump.
- PID controller with adjustable PI parameters (Kp + Ti).
- Constant pressure at setpoint, independent of inlet pressure.
- Soft pressure build-up (To prevent water hammer during startup).
- On/off operation at low flow.
- Automatic cascade control of pumps for optimum efficiency.
- Selection of min. time between start/stop, automatic pump changeover and pump priority.
- Automatic pump test function to prevent idle pumps from seizing up.
- Possibility of standby pump allocation.
- Possibility of backup sensor (redundant primary sensor).
- Secondary sensor (Possible to switch to another sensor/setpoint).
- Multi-sensor (up to 6 sensors to influence the setpoint).
- Manual operation.
- ·Possibility of external setpoint influence.
- Log function.
- Setpoint ramp.

Digital remote-control functions:

- System on/off.
- Max., min. or user-defined duty.
- Up to 6 alternative setpoints.
- Digital inputs and outputs can be configured individually.

Pump and system monitoring functions:

- Minimum and maximum limits of current value.
- Inlet pressure.
- Non-return valve monitoring.
- Motor protection.
- Sensors and cables monitored for malfunction.
- Alarm log with the previous 24 warnings/alarms.

Display and indication functions:

- Colour screen display.
- Green indicator light for operating indications and red indicator light for
- Fault indications
- Potential-free changeover contacts for operation and fault.

All booster sets are to be capable of full interface with building BMS system.

1.4.2. Power:

Power to each booster pump set is derived from a local isolator supplied & installed under the electrical contract with final connection from the isolator to the unit by the electrical contractor.

1.5. UV Water Treatment:

The UV treatment plant will be provided with its self contained control system. Common fault alarm to be interfaced to the BMS.

1.5.1. Power:

Power to the UV plant is derived from a local isolator supplied & installed under the electrical contract with final connection from the isolator to the unit by the electrical contractor.

1.6. Domestic Hot Water Electric Maintenance Tape:

Refer to clause Ss_60_40_37_28 for details

1.7. Domestic Hot Water Electric Trace Heating: Refer to clause Ss_60_40_37_28 for details

1.8. Fan Coil Unit Condensate Lift Pumps:

Condensate pumps are provided where condensate drain runs cannot be drained by gravity. High and low level switches within the pump housing shall activate the pumps. A fault signal shall be generated by either a high level signal or from leak detection tape fitted in the tray below the condensate pump.

1.8.1. Control and Monitoring Functions:

In each case the following monitoring and controls functions shall be required:

Pump enable
On/Off control from integral high and low level float switches.
High level alarm (pump fault)
Leak detection tape signal

1.8.2. Power:

Power to each condensate lift pump shall be derived from a local switched fused spur provided under the electrical contract. Final connections between the fused spur and the pump unit are to form part of the controls specialists' scope of works.

2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control

3. Start and stop control strategies: Ss_75_70_52/203 Domestic hot water demand; Ss_75_70_52/205 Hand off auto switch; Ss_75_70_52/211 Pump overrun
4. Pressurization control strategies: Ss_75_70_52/228 Pump pressurization unit control strategy
5. Distribution control strategies:
6. Pumps control strategies: Ss_75_70_52/237 Variable speed pumps control strategy
7. Equipment: Pr_75_50_18_94 Valve actuators; Pr_75_50_18_51 Mechanical services control panels; Pr_65_54_95_53 Motorized valves; Pr_70_75_94_28 Electronic sounders
8. Sensors: Pr_75_50_76_68 Pressure sensors; Pr_75_50_76_31 Flow in pipe sensors
9. Equipment interconnectivity: Wired.
10. Cables: As Specialist's recommendations.
11. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
12. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals; Pr_25_80_81_44 Intumescent trunking pillows
13. Rewireable installations: Required.
14. Concealed installations: Required.
15. Control equipment power supply: Mains supply.
16. 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_55_70_38/240 Centralized hot water storage system ADDED

1. Primary heat source: Capable of raising temperature of water from 10°C to 60°C within one hour.
2. Temperature range of stored hot water: Minimum of 60°C
3. Water supply: Boosted.

Ss_55_70_95/210 Design and detailing hot and cold water systems ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_55_70_95_50 [P] Mains water distribution network systems

1. Design: Develop the 4A design to contractor information 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. 1999 Water Regulations and IOP design guide.
3. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturer's literature.

Ss_75_70_52/201 Design

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

1. Design: The contractor shall develop the 4A design of the mechanical engineering services, controls and monitoring system to contractor information.

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_52/203 Domestic hot water demand ADDED

Shared by: Ss_75_70_52_36 [M] Heating system control systems

1. Demand for hot water
   1.1. Operation: Start valves, pumps and heat generator plant when signal received
   1.2. Demand signal: Time control. Temperature below storage set point.

Ss_75_70_52/205 Hand off auto switch

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_36 [M] Heating system control systems

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.
2. Monitoring: Each switch to be monitored by BMS for 'Out of Auto' status

Ss_75_70_52/211 Pump overrun ADDED

Shared by: Ss_75_70_52_36 [M] Heating system control systems

1. Operation: Activate when heating plant has been operating, distributing to primary and secondary circuits
2. Period: 15 minutes

Ss_75_70_52/212 Time control

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

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.
2. Extension of plant operation
   2.1. Action: Allow manual override for normal operation, activated by push-button switch
   2.2. Period: 1 hr
3. Winter mode

3.1. Time period: Between 1 October and 30 April.

3.2. Outside temperature: Above 17°C for at least 30 minute

Ss_75_70_52/228 Pump pressurization unit control strategy ADDED

Shared by: Ss_75_70_52_36 [M] Heating system control systems

1. Spill valve
   1.1. Operation: The packaged pressurisation unit controls operate a spill valve when the pressure sensor, positioned in the water pipeline, detects primary water pressure above pre-set level
2. High pressure switch: When activated, disable boiler and close fuel valve. Allow primary and secondary pumps to continue for overrun period.
3. Low pressure switch
   3.1. Operation: When activated, disable boiler and close fuel valve, and disable primary and secondary pumps. Raise a low pressure alarm. Hard wire interlocks
   3.2. Reset: Manual

Ss_75_70_52/237 Variable speed pumps control strategy ADDED

Shared by: Ss_75_70_52_36 [M] Heating system control systems

1. Arrangement: Duty / standby as detailed on the schematics
2. Plant shut down
   2.1. Operation: Manual
   2.2. Long shutdown period: Run pumps for five minutes on a daily basis when shutdown is longer than two days
3. Running of plant
   3.1. Operation: Run pumps on receipt of signal. Modulate pumps to obtain design differential set point between flow and return circuits, across the load at furthest point or according to the lowest negative deviation from the differential set point.
4. Shared duty: Operate pumps together at same speed. If one pump fails increase the speed of the other pump to meet the load and raise an alarm.

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_65 Pipe clips in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_25_80_81_42 Intumescent linear gap seals

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_50_28_30 [M] Fixed gas detection and alarm systems , Ss_75_70_54_10 [M] Building monitoring and management systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

1. Standard: To meet compartmentation ratings
2. Third party certification: LPCB approved for fire systems
3. Fixing: Self-adhesive.
4. Execution: Pr_65_70_11/700 Installing conduit, trunking and ducting

Pr_25_80_81_44 Intumescent trunking pillows ADDED

Shared by: Ss_75_70_54_10 [M] Building monitoring and management systems

1. Standard: Refer to BS EN 1363-1, clause 12.2 for further information
2. Third party certification: LPCB approved for fire systems
3. Execution: Pr_65_70_11/700 Installing conduit, trunking and ducting

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_28 Engraved valve identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_60 Paper valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_60_50_20_28 Expansion vessels ADDED

1. Manufacturer:
    1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage. Any expansion vessels used on potable water systems shall be WRAS approved.
2. Standard: To BS EN 13831.
3. Duty
    3.1. Size: Refer to equipment schedules. The contractor must include for re-confirming the system content from his working drawings prior to ordering.
4. Membrane: Replaceable.
5. Accessories: Vessel connecting kit. Wall bracket.

Pr_60_50_20_42 Indirectly heated unvented hot water storage cylinders ADDED

1. Description:

    Ensure that all cylinders and calorifiers are selected for the appropriate working pressure to which they could be subjected (eg in some systems this is the ‘closed-flow’ pressure of the associated water pressure boost pump set.)

    Provide combined temperature and pressure relief valves and all safety and control devices required by the Building Regulations, in accordance with BS 6283-2 and BS EN 1490 and as detailed in this specification and the equipment schedules.
2. Manufacturer:
    1. Manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
3. Standard: To BS EN 12897.
4. Capacity: Refer to equipment schedules
5. Pressure: Refer to equipment schedules

6. Safety equipment: Provide energy cut-out device, temperature relief valve, pressure-reducing valve and backflow prevention in accordance with BS EN 12897.
7. Accessories: Refer to equipment schedules

Pr_60_60_08_34 Gas fired condensing boilers ADDED

Shared by: Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Description:

Provide boilers and associated equipment in accordance with the equipment schedules.

Install the boilers in the location and arrangement shown on the drawings.

Provide written confirmation from the boiler manufacturer that the boiler will function correctly when connected to the flue and chimney system shown on the drawings.

Ensure each boiler achieves the required rated outputs when firing on low pressure natural gas and with primary flow and return temperatures.

Ensure all boilers have 'CE' marking and have energy performance labelling in accordance with The Boiler (Efficiency) Regulations.

Ensure that boilers of heat output up to 400 kW meet the requirements of the ErP Directive (EU) No 813/2013, and that boilers of heat output up to 70 kW have an ecodesign label appropriate to the system components installed.

Provide all boilers complete with the following equipment and fittings:

1. Insulated metal casings
2. Burner modulating control see individual boiler type clauses below for details
3. Manual reset high limit temperature and alarm reset
4. No flame lock-out and alarm indication
5. Boiler temperature gauge
6. Boiler pressure gauge
7. Safety/relief valve, in accordance with BS 759, with discharge pipe terminating 150mm above floor level (see clause 730)
8. Hose union and valved drain outlet
9. Flue outlets – see schedule T10-1 for dimensions
10. Electrical isolators
11. Acoustic shroud if required to achieve specific noise levels
12. Volt-free contacts for enable and high/low cut-out indication to the control system
13. Anti-vibration mounts
14. Pre-wired instrument panel with on/off switch
15. All necessary valves, mountings and fittings to BS 759 (see clause 730)
16. Manufacturer's standard cleaning tools
17. Condensate drain pipework

Type test boilers for thermal performance in accordance with BS 7190.

Ensure electrical safety and performance of boilers in accordance with BS 5986.
Install gas fired boilers fully in accordance with BS 6644 and BS 6798, and oil fired boilers in accordance with BS 5410. Install all boilers fully in accordance with the manufacturer's instructions and recommendations.

Where isolating valves are fitted to individual boilers in a sealed system, install an expansion vessel of adequate capacity to accommodate the volume change of the system water contained within the boiler and the adjacent pipework. Fit a drain cock, pressure gauge and lockshield valve in the connecting pipework to the expansion vessel. Use an expansion vessel conforming to BS EN 13831 and sized in accordance with the principles within BS 7074.

Install the boilers so as to provide sufficient air circulation for draught diverter operation, sufficient air for combustion and cooling, a minimum of 75mm from combustible material, and space for maintenance in accordance with the manufacturer's instructions and recommendations.

Arrange for commissioning of the boilers by the manufacturer's own personnel.
Configure each boiler such that a common alarm is provided via volt-free contacts for transmission back to the local MCCP and to the control panel.

Configure on/off control and boiler sequencing via the control system.

Provide a gas isolating valve and governor/regulation station at each boiler/burner.

Provide a rack in each boiler room, fixed locally to the boilers, on which to mount the boiler cleaning tools, jointed flue brushes and 15m of best quality reinforced nylon hose pipe for connecting to boiler drain-off cocks.

Provide gas fired condensing boilers in accordance with BS EN 677 and BS EN 15417.

2. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

3. Standards
   - 3.1. Boilers with heat input not exceeding 70 kW: Combination boiler to BS EN 15502-1 and BS EN 15502-2-2. Combination boiler to BS EN 15502-1 and BS EN 15502-2-1. Heat only boiler to BS EN 15502-1 and BS EN 15502-2-2. Heat only boiler to BS EN 15502-1 and BS EN 15502-2-1. System boiler to BS EN 15502-1 and BS EN 15502-2-2. System boiler to BS EN 15502-1 and BS EN 15502-2-1.
   - 3.2. Boilers with heat input greater than 70 kW but not exceeding 1000 kW: Type B to BS EN 656 and BS EN 15417. Type B to BS EN 13836 and BS EN 15417. To BS EN 15502-1 and BS EN 15502-2-1.
   - 3.3. Thermal performance testing: To BS 845-1.
4. Output: Refer to equipment schedules
5. Seasonal efficiency (gross calorific value (minimum)): Refer to equipment schedules
6. NOx emissions (maximum): Refer to equipment schedules
7. Mounting: As detailed on the GA plans
8. Operating pressure: Refer to equipment schedules

9. Test pressure: Refer to equipment schedules
10. Operating temperature: Refer to equipment schedules
11. Fuel: Natural gas.
12. Electrical supply type: Refer to equipment schedules
13. Accessories: Pressure gauge. Safety valve. Temperature gauge. Expansion vessel. Optimization control unit with two digital sensors.
14. Execution: Pr_60_60_08/610 Installing gas and oil-fired boilers

Pr_60_60_96_42 Immersion heaters ADDED

1. Standards: To BS EN 60335-1 and BS EN 60335-2-73.
2. Third party certification: BEAB approved
3. Arrangement: Refer to equipment schedules
4. Rating: Refer to equipment schedules
5. Thermostat: Stem type adjustable.

Pr_65_52_34_66 Pressure gauges ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

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 1600kPa (16bar).
4. Material: Stainless steel.
5. Connections: ‘Ring’ pattern siphon and gauge cock. ‘U’ pattern siphon and gauge cock.
6. Execution: Pr_65_52_34/630 Installing pressure gauges

Pr_65_52_34_88 Temperature gauges ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standard: To BS EN 13190.
2. Format: Vapour pressure. Bi-metallic.
3. Diameter: 100.
4. Case: Brass.
5. Connections: Angle stem. Straight stem.
6. Integral accessories: 100 mm immersion length pocket.

See Pr_65_52_61_50 Masking plates in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_61_63 Pipe sleeves in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_62_09 Brazing compounds in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_29 Flange jointing rings for copper flanges in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_81 Solders in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_17 Copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_18 Copper pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_53_86/320 Pumps generally ADDED

Shared by: Pr_65_53_86_66 Pressure booster pumps and Pr_65_53_24_86 Submersible pumps

1. General Requirements:
    1. Contractor to perform the final pressure drop calculations based on his working drawings.
    2. All pump sets to be in accordance withy the requirements of this specification and the details contained in the equipment schedule.
    3. Provide pumps manufactured and tested in accordance with appropriate British Standard, in particular BS EN60335-2-41 and BS EN 60335-2-51 where applicable.
    4. Select pump at or near most efficient part of performance curve for duty required.
    5. Contractor MUST calculate and adjust scheduled resistances to compensate for actual resistance of selected components (including all installed plant and valves) and confirm these duties prior to ordering any equipment.
    6. All pumps to be suitable for auto-changeover control. Controls Specialist to include time-clock for each pump set, within associated MCC panel, for automatic control. In event of no flow detected the standby pump will be brought online automatically.
    7. A differential pressure switch, located across the pumps, shall initiate an alarm on sensing a no flow condition on the duty pump and the standby pump shall run. The system shall monitor the hours run of each pump and share operating time between them. A time delay shall ensure that the system does not shut down during pump changeover.
    8. Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.
    9. All equipment to be issued with a full and detailed manual for installation, operating/maintenance and fault finding.
    10. As part of the BREEAM requirements all pumps with a rated electrical input of 10kW or greater shall have separate electrical metering (by the electrical contractor). Where required and where pumps are power fed from motor control centre the electrical metering shall be installed in the MCC. The electrical input for all pumps shall be confirmed in the Mechanical Contractor’s pump technical submission.
2. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
3. General safety standard: To BS EN 809.
4. Electrical safety: To BS EN 60335-1 and BS EN 60335-2-51.
5. Dynamic balance: To BS ISO 21940-21.
6. Test standards: To BS EN ISO 9906 and in accordance with BS EN ISO 5198.
7. Belts and pulleys: To BS 3790.
8. Rotodynamic pumps: To BS EN 16297-1 and BS EN 16644.
9. Connections
    9.1. Flanged, copper alloy and composite: To BS EN 1092-3.
    9.2. Flanged, cast iron: To BS EN 1092-2.
    9.3. Threaded: To BS EN 10226-1.

Pr_65_53_86_11 Canned rotor pumps ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. General requirements: Pr_65_53_86/320 Pumps generally
2. Arrangement: Refer to equipment schedules and system schematics
3. Duties
   - 3.1. Operation: Duty. Duty/standby as detailed under 'description'
   - 3.2. Flow rate: Refer to equipment schedules
   - 3.3. Resistance: Refer to equipment schedules
   - 3.4. Motor
     - 3.4.1. Nominal voltage: Refer to equipment schedules
     - 3.4.2. Frequency: Refer to equipment schedules
4. Speed control: Variable.
5. Connections: Flanged, copper alloy. Threaded.
6. Accessories: Anti-vibration mountings. Flexible connections. Matching flanges. Positive closure non-return device. Blanking plate and gasket.
7. Execution: Pr_65_53_86/610 Installation of pumps generally; Pr_65_53_86/640 Commissioning preparation

Pr_65_53_86_15 Close-coupled in line pumps ADDED

Shared by: Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. General requirements: Pr_65_53_86/320 Pumps generally
2. Arrangement: Refer to equipment schedules and system schematics
3. Duties
   - 3.1. Operation: Refer to equipment schedules
   - 3.2. Flow rate: Refer to equipment schedules
   - 3.3. Resistance: Refer to equipment schedules
   - 3.4. Motor
     - 3.4.1. Nominal voltage: Refer to equipment schedules
     - 3.4.2. Frequency: Refer to equipment schedules
4. Speed control: Variable.
5. Accessories: Anti-vibration mountings. Flexible connections. Matching flanges. Positive closure non-return device. Blanking plate and gasket. Flanged, copper alloy. Flanged, cast iron.
6. Execution: Pr_65_53_86/610 Installation of pumps generally; Pr_65_53_86/640 Commissioning preparation

Pr_65_54_93_87 Test points ADDED

Shared by: Pr_65_54_95_30 Flow measuring valves , Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Arrangement: Self-sealing.
2. Material: Brass.
3. Connections: 6 mm (¼ inch) extended length.

Pr_65_54_95_06 Ball valves ADDED

Shared by: Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Material: Brass copper alloy.
2. Connections: Threaded to BS EN 6675 Threaded ends and as detailed in the equipment schedule. Connections Capillary to BS EN 1254-1.Pressure tight joints threaded to BS EN 10226-1
3. Finish: Natural.
4. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_08 Butterfly valves ADDED

Shared by: Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standard: To BS EN 593.
2. Working conditions
   2.1. Type of fluid: Water.
3. Operation
   3.1. Manual: Lever.
   3.2. Automatic: Electric.
4. Options: Fire type tested design. Emergency hand control.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_14 Copper alloy check and double check valves ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standard: To BS 5154.And BS 6282.
2. Third party certification: LPCB Approved for fire systems.
   WRAS approved for potable water
3. Material: Copper alloy.
4. Connections: Capillary to BS EN 1254-1. Compression to BS EN 1254-2. Flanged to BS EN 1092-3. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
5. Options: Position indicator. Body tappings and drain plug.
6. Execution: Reference to missing clause Installation of check valves

Pr_65_54_95_15 Copper alloy gate valves ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standard: To BS EN 12288.
2. Connections: Capillary to BS EN 1254-1 or BS EN 1254-5. Compression to BS EN 1254-2. Flanged to BS EN 1092-3 or BS EN 1759-3. Loose nut/ union body ends. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
3. Options: Lever.
   Handwheel - Fire systems
4. Accessories: Body tappings and drain plug. Test points.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_16 Copper alloy globe valves ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standard: To BS 5154.
2. Connections: Capillary to BS EN 1254-1. Compression to BS EN 1254-2. Flanged to BS EN 1092-3. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
3. Operation: Handwheel.
4. Options: Body tappings and drain plug. Locking device. Position indicator. Test points. Non-metallic renewable seat/ disk rings. Metallic renewable seat/ disk rings.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_27 Draining taps ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Standard: To BS 2879.
2. Size: ¾ inch - Mechanical systems.
   Size as per BS EN 12845 / LPC Rules & TB's and BS9990 requirements - Fire systems.
   Wras approved for use in potable water systems.
3. Material: Copper alloy.
4. Connections: Threaded joints to BS EN 10226-1.
5. Accessories: Lever pattern key.
   Handwheel
6. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_47 Low pressure thermostatic mixing valves ADDED

1. Standard: To BS EN 1287.
2. Connections: Compression to BS EN 1254-2. Threaded to BS EN ISO 228-1.Pressure tight joints threaded to BS EN 10226-1
3. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_53 Motorized valves ADDED

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_55_70_97_70 [P] Rainwater reclamation systems and Ss_75_70_52_36 [M] Heating system control systems

1. Manufacturer: All valves (including PICVs) are to be based on Flocon Valves (contact Dennis 07802 889890) or better and approved.
2. Standard: To BS EN 60730-2-8.
3. Arrangement: Two port. Three port, diverting. Four port, diverting. Butterfly valve.
4. Valve authority
   4.1. Design: 0.5
   4.2. Minimum: 0.25
5. Material: Brass. Copper alloy.
6. Connections: As detailed on system schematics
7. Execution: Pr_65_54_95/641 Installing motorized valves

Pr_65_54_95_66 Pressure reducing valves ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

1. Standard: To BS EN 1567
2. Third party accreditation: Water Regulations Advisory Scheme-approved.
3. Form: Water pressure reducing.
4. Adjustment: Adjustable.
5. Operating conditions
   5.1. Temperature (maximum): 80ºC.
   5.2. Maximum working pressure: As detailed in this specification and in the equipment schedules and drawings.
6. Connections: Compression to BS EN 1254-2. Copper alloy composite flanges to BS EN 1092-3. Pressure tight joints threaded to BS EN 10226-1. Threaded to BS EN ISO 228-1.Capillary to BS EN 1254-1.
7. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_88 Thermostatic mixing valves ADDED

1. Description: All thermostatic mixing valves to be provided with an anti-scald feature, rated at 10 bar Max providing a control set temperature of 43°C. TMVs to be TMV3 rated throughout the Arena.
2. Standard: To BS EN 1111.
3. Arrangement: Pre-set.
4. Connections: Threaded to BS EN ISO 228-1.Pressure tight joints threaded to BS EN 10226-1
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_57_96_04 Angle water strainers ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Material: Bronze.
2. Connections: Threaded. Compression.
3. Integral accessories: Plugged connections for drain, air vent and differential pressure monitoring.
4. Execution: Pr_65_57_96/650 Installing strainers

Pr_65_57_96_08 Basket water strainers ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Baskets
2. Material: Bronze.
3. Connections: Compression. Flanged. Threaded.
4. Integral accessories: Plugged connections for drain, air vent and differential pressure monitoring.
5. Execution: Pr_65_57_96/650 Installing strainers

Pr_65_67_28_03 Angular expansion compensators ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Description: The contractor shall also allow for adequate expansion of the hot and cold water distribution pipework via adequate expansion joints. He shall liaise with a specialist manufacturer who will advise as to the extent of expansion provision required.
2. Connections: Flanged.
3. Execution: Pr_65_67_28/620 Installing expansion compensators

Pr_65_67_28_05 Axial expansion compensators ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Description: The contractor shall also allow for adequate expansion of the hot and cold water distribution pipework via adequate expansion joints. He shall liaise with a specialist manufacturer who will advise as to the extent of expansion provision required.
2. Execution: Pr_65_67_28/620 Installing expansion compensators

Pr_65_67_28_46 Lateral expansion compensators ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Description: The contractor shall also allow for adequate expansion of the hot and cold water distribution pipework via adequate expansion joints. He shall liaise with a specialist manufacturer who will advise as to the extent of expansion provision required.
2. Material
   2.1. Bellows: Stainless steel 1.4571 (316 Ti), to BS EN 10088-1.
   2.2. Inner sleeve: Stainless steel 1.4541 (321), to BS EN 10088-1.
   2.3. Tie bars: Gr 8.8, to BS EN ISO 898-1, zinc plated.
3. Connections: Flanged.
4. Execution: Pr_65_67_28/620 Installing expansion compensators

Pr_65_70_11_12 Cable baskets

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_50_28_30 [M] Fixed gas detection and alarm systems , Ss_75_70_54_10 [M] Building monitoring and management systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_80 [M] Smoke and heat detection extract control systems

1. Standard: To BS EN 61537.
2. Sizes
3. Features
   3.1. Segregation: Not required.
   3.2. Protective cover: Not required.
4. 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_17 Cable trays

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_50_28_30 [M] Fixed gas detection and alarm systems , Ss_75_70_54_10 [M] Building monitoring and management systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke

and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

1. Standard: To BS EN 61537.
2. Material: Metal.
3. Resistance against flame propagation: Non-flame propagating.
4. Electrical properties
   4.1. Continuity characteristics: With electrical continuity.
5. Width: To be determined / confirmed by the Contractor.
6. Execution: Pr_65_70_11/640 Installing cable supports on roofs; Pr_65_70_11/650 Multiple cable runs; Pr_65_70_11/661 Cable support zones

Pr_65_70_11_18 Cable trunking

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_54_10 [M] Building monitoring and management systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Standards: To BS EN 50085-1 and BS EN 50085-2-1.
2. Temperature properties
   2.1. Storage and transport temperature (minimum): -5°C.
   2.2. Installation and application temperature (minimum): +15°C.
   2.3. Application temperature (maximum): +60°C.
3. Resistance to flame propagation: Non-flame propagating.
4. Electrical properties: With electrical insulating characteristics. With electrical continuity characteristics.
5. Protection by enclosure
   5.1. Protection against ingress of solid objects (minimum): To BS EN 60529, IP4X.
   5.2. Protection against ingress of water (minimum): To BS EN 60529, IPX1.
   5.3. Protection against access to hazardous parts (minimum): To BS EN 60529, IPXXD.
6. Access method: With tools.
7. Compartments: Refer to GA drawings
8. Accessories and fittings
   8.1. Generally: Factory made by the cable trunking or ducting manufacturer and of the same material type and finish as the cable trunking or ducting.
   8.2. Types: Hanger brackets,.
9. Execution: Pr_65_70_11/765 Conduit, trunking and ducting zones; Pr_65_70_11/740 Installing trunking generally

Pr_65_70_11_20 Conduit fittings

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_50_28_30 [M] Fixed gas detection and alarm systems , Ss_75_70_54_10 [M] Building monitoring and management systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_80 [M] Smoke and heat detection extract control systems

1. Standards: To BS EN 61386-1 and to BS EN 61386-21, BS EN 61386-22, or BS EN 61386-23 as appropriate; or to BS 4607-1.

2. Material
   2.1. Finish: Match conduit.
3. Conduit boxes: Fit covers of same material and finish as boxes. Include brass earthing terminals in PVC-U boxes.
4. Execution: Pr_65_70_11/700 Installing conduit, trunking and ducting

Pr_65_70_11_30 Flexible conduit

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_50_28_96 [P], [M] Water leak detection and alarm systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_54_10 [M] Building monitoring and management systems , Pr_75_50_76_30 Flow in duct sensors , Pr_75_50_76_03 Air temperature sensors , Pr_75_50_76_47 Liquid temperature sensors , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Pr_75_50_18_21 Damper actuators , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Standards: To BS EN 61386-1 and BS EN 61386-23.
2. Resistance to bending: Flexible.
3. Electrical characteristics: With electrical continuity properties. With electrical continuity and insulating characteristics.
4. Resistance to external influences
   4.1. Protection against ingress of solid objects (minimum): To BS EN 60529, IP3X.
   4.2. Protection against ingress of water (minimum): To BS EN 60529, IPX0.
5. Resistance to corrosion: Medium protection, inside and outside.
6. Resistance to flame propagation: Non-flame propagating.
7. Execution: Pr_65_70_11/765 Conduit, trunking and ducting zones; Pr_65_70_11/735 Installing conduit connections to equipment

Pr_65_70_11_71 Rigid conduit

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_50_28_96 [P], [M] Water leak detection and alarm systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Standards: To BS EN 61386-1 and BS EN 61386-21.
2. Resistance to bending: Rigid.
3. Electrical characteristics: With electrical continuity and insulating characteristics.
4. Resistance to external influences
   4.1. Protection against ingress of solid objects (minimum): To BS EN 60529, IP3X.
   4.2. Protection against ingress of water (minimum): To BS EN 60529, IPX0.
5. Resistance to corrosion: Medium protection, inside and outside.
6. Resistance to flame propagation: Non-flame propagating.
7. Execution: Pr_65_70_11/765 Conduit, trunking and ducting zones; Pr_65_70_11/720 Installing rigid metallic conduit; Pr_65_70_11/725 Installing rigid non metallic conduit; Pr_65_70_11/735 Installing conduit connections to equipment

Pr_70_75_94_28 Electronic sounders ADDED

Shared by: Ss_75_50_28_96 [P], [M] Water leak detection and alarm systems and Ss_75_50_28_30 [M] Fixed gas detection and alarm systems

1. Ingress protection (minimum): To BS EN 60529, IP 44.
2. Colour: White.
3. Flashing beacon: Integral.
4. Power supply: From detection and alarm system control panel.
5. Execution: Pr_70_75_94/610 Installing electronic sounders

Pr_75_50_18_51 Mechanical services control panels

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_55_70_97_70 [P] Rainwater reclamation systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Enclosure
   1.1. Ingress protection (minimum): To BS EN 60529, IP44. To BS EN 60529, IP54.
   1.2. Mechanical protection (minimum): To BS EN 62262, IK05. To BS EN 62262, IK06. To BS EN 62262, IK07. To BS EN 62262, IK08. To BS EN 62262, IK09. To BS EN 62262, IK10.
   1.3. Material: Polycarbonate.
   1.4. Finish:
      - Externally polyester powder coated
      - Internal partitions, zinc coated
   1.5. Doors and panels
      1.5.1. Form: Right angle return construction with rounded edges and corners, concealed hinges and internal gaskets.
      1.5.2. Swing: 90°.
      1.5.3. Hardware: Corrosion-resistant lever type handles with latching mechanism.
      1.5.4. Locks: Cylinder, with standardized key type.
2. Isolator
   2.1. Type: Switch-disconnector to BS EN 60947-3.
   2.2. Mechanical interlocking: Door-interlocked operating handles. Rotary handle.
3. Internal separation
   3.1. Form: 4 type 2.
4. Cable entry: Suitable for front or rear access cabling entry via top gland plates.
5. Gland plate gaskets: Match the assembly’s degree of ingress protection.
6. Internal cable zones: Sufficient to allow cabling to be neatly routed and terminated.
7. Interconnecting cable: Single core PVC insulated cables to BS 6231.
8. Terminals
   8.1. Mounting: Suitable for mounting to 35 mm DIN rail.
   8.2. Identification
      8.2.1. Neutral and earth bar terminals: Label with the outgoing circuit reference.
      8.2.2. Cable terminations: Label with circuit reference, with push-on plastics markers.
9. Trunking
   9.1. Standard: To BS EN 50085-2-3.
   9.2. Material: PVC-U.
10. Execution: Pr_75_50_18/631 Installing control panels

Pr_75_50_18_94 Valve actuators ADDED

Shared by: Ss_55_70_97_70 [P] Rainwater reclamation systems and Ss_75_70_52_36 [M] Heating system control systems

1. Standard: To BS EN 60730-2-8.
2. Operation: On/off. Modulating as detailed in Controls Description
3. Ancillaries: Digital valve position indicator at BMS head end and via web browser
4. Execution: Pr_75_50_18/610 Installing valve actuators

Pr_75_50_76_31 Flow in pipe sensors ADDED

Shared by: Ss_75_70_52_36 [M] Heating system control systems

1. Standards: To BS EN 60730-1 and BS EN 60730-2-15.
2. Equipment interconnectivity
   2.1. Wired: Required.
3. Application: Water flow cut out. Water flow operating.
4. Execution: Pr_75_50_76/660 Installing flow sensors

Pr_75_50_76_68 Pressure sensors

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Standards: To BS EN 60730-1 and BS EN 60730-2-6.
2. Accuracy: ±2% measured value.
3. Equipment interconnectivity
   3.1. Wired: Required.
4. Execution: Pr_75_50_76/670 Installing pressure sensors

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_80_77_76_53 Mineral wool duct slab insulation

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

1. Standard: To BS 3958-5. To BS EN 14303.
2. Form: Rigid slabs.
3. Thermal conductivity: 0.032 W/m·K at 0°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_95 Valve and flange insulation casing; Pr_80_77_76_76 Self-adhesive insulation casing Ventureclad. Refer to equipment schedules for further details
8. Items to be insulated: Cover plates. Removable access covers.

9. Execution: Pr_80_77_76/660 Installing foil faced mineral wool insulation on ductwork; Pr_80_77_76/770 Insulation carried through ductwork supports; Pr_80_77_76/780 Installing vapour barriers

See Pr_80_77_76_54 Mineral wool pipe section insulation in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_80_77_76_76 Self-adhesive insulation casing

Shared by: Pr_80_77_76_52 Mineral wool duct metal mesh faced mattress insulation

1. Manufacturer: Pipework and ductwork casing / protection to be as 'Proclad' system as manufactured by ProTech Global or better and approved.
2. Material: Self adhesive casing / protection as detailed below:
   2.1. External Pipework & Ductwork: A multi-laminate casing system to be used for ductwork as per Proclad.150 and pipework as per Proclad Plus as manufactured by Protech Global system or better and approved.
   2.2. Pipework and Ductwork within Plantrooms: A multi-laminate casing system to be used for duct work and pipework; Ducting as per Proclad.150 and pipework as per Proclad Plus as manufactured by Protech Global system or better and approved
   2.3. Ductwork in Areas Requiring Additional Mechanical Protection: A multi-layered laminate casing system to be used for ductwork as per 'ProClad.350 Plus' (heavy duty) as manufactured by ProTech Global system or better and approved.
   2.4. Jointing Tape: Where required, the contractor shall use a multi-layered laminate tape to provide weatherproof jointing seal to pipework and ductwork fittings as per ProTech Global system or better and approved.
3. Properties: The protective casing is to include a biaxial protective film which has a zero-perm rating to prevent moisture ingress and with increased strength and UV resistance.

   Casing system is to be certified as meeting the requirements for a Class '0' surface, as defined in Approved Document B to the Building Regulations (latest edition).
4. Colour:
   4.1. General: Generally self finish.
   4.2. Exposed Services: Matt Black Finish: The contractor will be responsible for applying matt black finish to all required exposed pipework and ductwork (where required) and therefore, must seek confirmation from the architect for extent of provision. Matt black tape as per 'GTB.65' ProTechGlobal system to be used or better and approved.
5. Training: The contractor must be trained and certified (by the manufacturer) to install the casing systems as described above.
6. Execution: Pr_80_77_76/715 Installing self adhesive cladding and jacketing

Pr_80_77_76_95 Valve and flange insulation casing

Shared by: Pr_80_77_76_52 Mineral wool duct metal mesh faced mattress insulation and Pr_80_77_76_62 Phenolic foam insulation

1. Manufacturer: Prolite Boxes as manufactured by SlottedSection and protected by the ProClad system (clause Pr_80_77_76_76) as manufactured by ProTech Global or better and approved.
2. Material: Phenolic insulation board and ProClad weatherproof laminate as Detailed below

   No duct wrap on site will be acceptable. Finish shall be sheet aluminium or equal and better approved.

2.1. External Pipework Fittings: : Made to measure removable phenolic boxes weather protected by the ProClad system available in black, grey, white and silver finish all as manufactured by SlottedSection or better and approved.

2.2. External Pipework Fittings In Areas Requiring More Mechanical Protection: : Made to measure removable phenolic boxes weather protected by the ProClad 350 Plus system available in black, grey, white and silver finish all as manufactured by SlottedSection or better and approved.

2.3. Plantroom Pipework Fittings: Made to measure removable phenolic boxes protected by the ProClad system available in black, grey,white and silver finish all as manufactured by SlottedSection or better and approved.

2.4. Jointing Tape:: Prolite Boxes are to be weather sealed using matching thin multi-layered laminate tape as per the ProTech Global system or better and approved.

2.5. Silicon Mastic: : Prolite Boxes are to be sealed onto the pipe insulation using suitable weather and UV resistant silicon mastic, clear or matching colour.

3. Properties: Prolite Boxes are manufactured from phenolic insulation boards and weather protected by the ProTech ProClad system. This has a biaxial protective film which has a zero-perm rating to prevent moisture ingress and has increased strength and UV protection.
4. Training:: Prolite Boxes must be installed by qualified Thermal Insulation Engineers who have undergone trained by the manufacturer to install the casing systems as described above. Contact www.slottedsection.co.uk to arrange for an on site fitting demonstration.
5. Colour: Self finish.
6. Execution: Pr_80_77_76/720 Installing sheet aluminium protection

Pr_80_77_94_15 Compression isolators

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Ss_55_70_38_65 [P] Pumped cold water supply systems , Ss_60_40_37_48 [M] Low temperature hot water heating systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_80_77_94_30 Flexible vibration isolation hoses ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Description:
    1. Flexible connections shall be as supplied by BOA or equal and approved.
    2. Flexible connections shall be fitted to all pump suction and discharge connection and other centrifugal reciprocating or vibrating equipment where it is marked on the drawing, and where anti-vibration mounts or inertia bases are fitted. Flexible pipework fittings shall also be used for final termination to the labyrinth heating coils and trench heaters.
    3. Rubber bellows shall be fitted as close to the sources of vibration as practicable. The pipe at the other end of the bellows shall be fixed points.
    4. Rubber bellows shall be a single convolution of multi ply reinforced EPDM rubber with wire reinforced cuffs. Flanges shall be able to swivel and be removable. The date of manufacture shall be moulded on the bellows. For traceability membranes shall have an indelible identification showing manufacturer, country of origin, the type and a batch number.
    5. Tie bars with rubber top hat washers shall be used where the working pressure exceeds 1.5 bar G. Where untied bellows are used the manufacturers recommendations for anchors and guides shall be followed. Tie bars shall be threaded and their length adjustable.

6. All flexibles used on heating circuits shall have a design life of 120 months at 100°C and after this time have a minimum burst pressure of 30 bar, and in compliance with DIN 4809 Part 1.
7. For working temperatures up to 70°C the rubber bellows shall be high tensile synthetic fibre reinforced. As BOA, Type A EPDM or equal and approved.
8. For working temperatures between 70°C and 100°C the bellows carcase shall be aramid reinforced
throughout. Aramid reinforced bellows shall be manufactured and approved to the recogni sed European standard, DIN4809 Part 1 as BOA, Type A EPDMT or equal and approved.
9. For temperatures above 100°C bellows shall be a thick wall spirally wound multi-ply construction with Van Stone ends and swivel flanges as BOA, Type Epsilon or equal and approved.
10. Flexible connections with screwed connections shall be reinforced EPDM rubber hoses and shall have at least one full union to avoid torquing on installation as BOA, Type RH, MHC, MHS, A EPDM or equal and approved.
11. For hot water services the bellows liner shall be of a food grade nitrile rubber as BOA Limited, Type A NITRILE or equal and approved.
12. If the bellows are required to absorb lateral movements e.g. settlement or thermal expansion they shall be an BOA, Type D EPDM (EA67/68), or Type D EPDMT or equal and approved.
13. Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the design team.
14. All equipment to be issued with a full and detailed manual for installation, operating/maintenance and fault finding.

2. Flexible hoses type: Stainless steel braided.
3. Connections
   3.1. Rubber cored: Copper compression.
   3.2. Stainless steel: Copper compression.
4. Execution: Pr_80_77_94/620 Installation of flexible hoses and rubber bellows

Pr_80_77_94_40 Inertia bases ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Inertia bases type: External isolator mounting brackets. Internal isolator mounting brackets. Neoprene pad isolated.
2. Material: Welded steel channel perimeter frame.
3. Reinforcing steelwork and mesh: Required.
4. Size: To suit plant
5. Execution: Pr_80_77_94/610 Cast in situ bases

Pr_80_77_94_42 Isolation hangers

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Ss_55_70_38_65 [P] Pumped cold water supply systems , Ss_60_40_37_48 [M] Low temperature hot water heating systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

1. Isolation hangers type: Spring and neoprene rubber.

Pr_80_77_94_60 Pad mountings ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Material: Composite neoprene/ cork/ neoprene. Composite synthetic rubber.

Pr_80_77_94_74 Rubber bellows ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_60_40_37_48 [M] Low temperature hot water heating systems

1. Rubber bellows type: Untied.
2. Material
   2.1. Liner: Acrylonitrile-butadiene rubber (NBR). Butyl. Ethylene-propylene diene monomer (EPDM) rubber.
   2.2. Reinforcement: Corrosion resistant steel wire.
   2.3. Cover: Ethylene propylene diene monomer (EPDM) rubber.
3. Connections: Flanged.
4. Execution: Pr_80_77_94/620 Installation of flexible hoses and rubber bellows

Pr_80_77_94_84 Spring isolators

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Ss_55_70_38_65 [P] Pumped cold water supply systems , Ss_60_40_37_48 [M] Low temperature hot water heating systems and Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

1. Spring isolators type: Caged. Vertical restrained.

Execution

See Pr_20_29_14/620 Installing pipeline supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/620 Installing valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/630 Installing valve identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_60_60_08/610 Installing gas and oil-fired boilers ADDED

1. Standards
   1.1. Gas fired boilers: In accordance with BS 6798 or BS 6644.
   1.2. Oil fired boilers: In accordance with BS 5410-1 or BS 5410-2.
2. Space around boiler: Facilitate boiler maintenance and servicing.
3. Preparation: Pressure test joints immediately before installing lagging and casing. Submit test results.

4. Fixing of equipment, components and accessories: Fix securely to purpose-made bases or supports.
5. Access: Provide for inspection and servicing of boilers and ancillary equipment.

Pr_65_52_34/630 Installing pressure gauges ADDED

1. Position: Between the supply pipe stop valve and the check valve on a town main connection. Downstream of outlet check valve and upstream of outlet stop valve on pump supply. Immediately downstream of the alarm valve. Immediately downstream of the tail end valve but upstream of any subsidiary stop valve. Immediately upstream of the main control stop valve.

See Pr_65_52_63/610 Pipelines installation generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/615 Installing pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/620 Installing anchors generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/625 Installing slide guides in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/631 Installing copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/690 Spacing of pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/710 General inspection and testing in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_53_86/610 Installation of pumps generally ADDED

Shared by: Pr_65_53_86_66 Pressure booster pumps and Pr_65_53_24_86 Submersible pumps

1. Pipeline connections: Arrange to prevent transmission of pipeline forces to pump casing.
2. Pressure gauge tappings: Provide in flow and return pipeline connections and in common suction and delivery pipeline.
3. Brackets: Support pipeline mounted pumps on purpose made brackets lined with vibration absorbent material.
4. Alignment: Align and balance to minimize vibration.
5. Belt tension: Correctly tension drive belts.
6. Access: Provide adequate space for service and maintenance.
7. Identification plate
    7.1. Format: Engraved
    7.2. Details: Manufacturer’s name and address, serial number, duty and maximum head, speed and electrical loading

Pr_65_53_86/640 Commissioning preparation ADDED

Shared by: Pr_65_53_86_66 Pressure booster pumps

1. In-line pumps: Change impeller if necessary.
2. Belt driven pumps: Change belt and pulley if necessary.

See Pr_65_54_95/610 Installation of valves generally in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_54_95/641 Installing motorized valves ADDED

1. General requirements:
2. Spindles: Vertical.

Pr_65_57_96/650 Installing strainers ADDED

1. Angle type: Install with strainer cap at the bottom. Inlet at the top or side.
2. Y-type: Install in direction of flow with the pocket in the horizontal plane.

Pr_65_67_28/620 Installing expansion compensators ADDED

1. Position: As recommended by the specialist
2. Anchors and guides: Locate to contain movement and resist maximum imposed loads.

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:
   - 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_11/640 Installing cable supports on roofs

1. Position: Elevate above roof.
2. Mounting: Load spreading supports.

Pr_65_70_11/650 Multiple cable runs

1. Requirement: Use cable tray 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

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:
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. Spare containment:
7. Draw wires:
8. Distance from other services running parallel (minimum)
    8.1. Generally:
    8.2. Above radiators:
    8.3. Steam services:
9. Drainage of conduit, trunking and ducting: Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
10. Fire barriers: Provide to maintain integrity of fire compartments.
11. Rewireable installations: Enable rewiring from accessible boxes or accessories only.
12. Support: Independently fix and support conduit, trunking and ducting from building structure.
13. Cleaning: Clean insides of conduit, trunking and ducting before installing cables.
14. Cabling: Install when conduit, trunking and ducting enclosure is complete.
15. 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. Conduit in walls:
9. Suspended ceiling installations: Fasten outlet boxes to structure above ceiling.

Pr_65_70_11/720 Installing rigid metallic conduit

1. General requirements: Pr_65_70_11/700 Installing conduit, trunking and ducting; Pr_65_70_11/710 Installing conduit generally
2. Fixings:

3. Joints: Plain. Screwed.
4. Threaded conduits: Tightly screw to ensure electrical continuity, with no thread showing.
5. 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_11/725 Installing rigid non metallic conduit

1. General requirements: Pr_65_70_11/700 Installing conduit, trunking and ducting; Pr_65_70_11/710 Installing conduit generally
2. Joints: Solvent.
3. Conduit connections to boxes and items of equipment: Threaded bushed entries.

Pr_65_70_11/735 Installing conduit connections to equipment

1. General requirements: Pr_65_70_11/700 Installing conduit, trunking and ducting; Pr_65_70_11/710 Installing conduit generally
2. Surface mounted equipment
   2.1. Concealed conduit: Conceal the final connection.
   2.2. Exposed conduit: Contain the final connection from the conduit box within flexible metal conduit.
3. Equipment subject to vibration: Flexible metal conduit of adequate length to facilitate removal of equipment for maintenance. Final termination in swivel connectors.
4. Connections to external equipment: Flexible conduit.

Pr_65_70_11/740 Installing trunking generally

1. Changes of direction: Manufacturer's bends and tees.
2. Joints
   2.1. Generally: Manufacturer's jointing fittings. Maintain rigidity of trunking across joint.
   2.2. Number of joints: Minimize.
   2.3. Lengths of trunking: Maximize.
   2.4. Open ends: Blank using manufacturer's removable end caps.
   2.5. Metal edging: Protect with PVC edging strip.
   2.6. Electrical continuity: Maintain at each joint with a copper link fitted on the outside of the trunking.
3. Connections to conduit, boxes, equipment and accessories: Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.
4. Connections to trunking covers: Minimize.
5. Electrical continuity of covers: Electrically continuous with the trunking or provide protective conductors.
6. Access: Provide space around trunking to permit access for installing and maintaining cables. Set out access with covers on a continuous face to allow cabling to be laid in throughout its entire length.
7. Trunking passing through building fabric openings: Provide fixed trunking covers. Extend covers 50 mm from both sides of the opening.
8. Cable retaining straps: Required except when trunking cover is on top.

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.

Pr_70_75_94/610 Installing electronic sounders ADDED

1. Position: In control room.
2. Mounting height generally (above finished floor level): 2.1 m.

Pr_75_50_18/605 Installing control components ADDED

Shared by: Pr_75_50_46_30 Float switches and Pr_75_50_18_29 Field controllers

1. Insulation: Submit details of proposed insulation method where control components are on insulated pipelines.
2. Supports: Do not strain components.
3. Access: Adequate for operation and maintenance.

Pr_75_50_18/610 Installing valve actuators ADDED

1. General requirements: Pr_75_50_18/605 Installing control components
2. Position: Top of valve.
3. Interconnection: To sensor. To central control panel.

Pr_75_50_18/631 Installing control panels

1. Clearance (minimum):
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_50_76/651 Installing sensors generally

Shared by: Pr_75_50_76_03 Air temperature sensors and Pr_75_50_76_47 Liquid temperature sensors

1. Standard: In accordance with BCIA Guide: Control sensor installation.
2. Screening: Screen from direct sunlight.
3. Immersion: Immerse the sensor adequately in the medium.
4. Immersion pockets: Provide for pipe sensors. Fill with thermal conductive compound.
5. Cable: Flexible. Allow sufficient spare cable to allow for removal of sensor.
6. Stratification: Install more than one sensor or an averaging sensor if necessary.
7. Positions of sensors: To be determined by the contractor to suit the final installations.

Pr_75_50_76/660 Installing flow sensors ADDED

Shared by: Pr_75_50_76_30 Flow in duct sensors

1. Differential pressure water sensors: Do not locate valves between sensing points.
2. Differential pressure air sensors: Locate an adequate distance from fans, filters, bends, fittings, etc.
3. Velocity sensors: Locate an adequate distance from fans, filters, bends, fittings, etc.
4. Interconnection:
    - To valve actuator

- To pump
- To central control panel.

5. Cable type: To be confirmed by controls specialist
6. Cable containment: Pr_65_70_11_30 Flexible conduit

Pr_75_50_76/670 Installing pressure sensors

1. General requirements: Pr_75_50_76/651 Installing sensors generally
2. Tapping points: Do not locate in turbulent flow. Locate an adequate distance from bends or fittings.
3. Vibration: Install on vibration free surface.
4. Interconnection: To central control panel. To pump. To fan. To valve actuator. To damper actuator.
5. Cable type: To be confirmed by controls specialist
6. Cable containment: Pr_65_70_11_30 Flexible conduit

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/625 Installing foil faced mineral wool insulation on pipelines in Ss_50_30_02_40 [P] Internal gravity rainwater 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: Self adhesive stick pins. Further support with 0.7–1.0 x 50 mm mesh galvanized wire netting.
3. Joints, pin penetrations, cut outs for test holes and supports: Seal with 100 mm wide class 0 foil tape.

Pr_80_77_76/715 Installing self adhesive cladding and jacketing

1. Application: Cover insulation with self adhesive cladding and jacketing with 50 mm overlaps.

Pr_80_77_76/720 Installing sheet aluminium protection

1. Application: Form sheet to fit circumference of insulation with 50 mm longitudinal and circumferential overlaps. Secure overlaps with self tapping screws or rivets. Seal joints with grey sealant.
2. Expansion: Make provision.

Pr_80_77_76/770 Insulation carried through ductwork supports

Shared by: Pr_80_77_76_52 Mineral wool duct metal mesh faced mattress insulation

1. High density phenolic foam: Close butt to insulation.
2. Sleeve: Provide sheet metal protective sleeve.

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_80_77_94/610 Cast in situ bases ADDED

1. Supported equipment: Arrange equipment on base to distribute load evenly.

Pr_80_77_94/620 Installation of flexible hoses and rubber bellows ADDED

1. Position: Close to the source of vibration.

Ss_55_70_38/620 Installing hot and cold water systems generally ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

1. Standard: To BS 8558 and BS EN 806-4 1999 Water Regulations and IOP design guide.
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.

   Where pipework is fixed vertically, brackets to be installed at every storey level with intermediate supports fixed to the building structure. Tighten fixings as work proceeds so that every storey is self-supporting.

   Where pipework is installed horizontally, brackets are to be installed to the spacings recommended by the pipework manufacturer.

   In all cases adequate allowance for expansion shall be made in both vertical and horizontal installations.
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 ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

1. Standard: To BS 8558 and BS EN 806-4.
2. Notice (minimum): 1 week.
3. Pressure: 1.5x times working pressure.
4. Duration of test: 1 hr

Ss_55_70_38/660 Flushing hot and cold water systems ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply 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 ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply 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 ADDED

Shared by: Ss_55_70_38_65 [P] Pumped 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): 1 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 ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

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

Ss_55_70_38/830 Demonstrations ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

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

Ss_55_70_38/840 Documentation ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply 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.
   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 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: Two.
3. Submittal date: At handover.
4. Wholesome water consumption notice: Submit within 30 days.

Ss_55_70_38/860 Spares ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

1. Pipeline ancillaries
   1.1. Keys: Two of each type
   1.2. Hose unions: Two of each type
2. Belts and pulleys: Two of each type

Ss_55_70_38/870 Operating tools ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

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

Ss_55_70_38/880 Maintenance ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems

1. Servicing and maintenance: Undertake for 12 months after completion.

Ss_55_70_95/850 Water quality tests ADDED

Shared by: Ss_55_70_38_65 [P] Pumped cold water supply systems and Ss_55_70_95_50 [P] Mains water distribution network systems

1. Standard: To BS EN 806-4.
2. Samples
   2.1. Sample points: Main supply to site. Hot water storage cylinder. Cold water storage Tanks. Hot and cold water outlets at the furthest points on the system.
   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: Two.

Ss_75_70_52/810 Inspection and testing

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

1. Standard: In accordance with BS 7671.
2. Notice before commencing tests (minimum): One 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_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

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_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

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

Ss_75_70_52/840 Spares

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

1. Spare fuses
    1.1. Number: Two of each type used.
2. Spare devices: Two of each type used.
3. Spare lamps
    3.1. Number: Two of each type and colour used.

Ss_75_70_52/850 Keys

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

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

Ss_75_70_52/860 Documentation

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

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 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. Cable schedules
   3.1. Location: In O&M manuals
4. Submittal date: At handover.

Ss_75_70_52/870 Servicing and maintenance

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems , Ss_75_70_52_80 [M] Smoke and heat detection extract control systems , Ss_75_70_52_36 [M] Heating system control systems and Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

1. Requirement: Undertake until 12 months after completion.

Ω End of System

Ss_55_70_38_65
[P] Pumped cold water supply systems ADDED

Systems

Ss_55_70_38_65 [P] Pumped cold water supply systems ADDED

1. Description:

The domestic cold water installation includes (but is not limited to) the following main elements:

- Potable cold water sectional storage tanks (2no.)
- Potable cold water booster set
- Non-potable cold water sectional storage tank
- Non-potable cold water booster set
- 'Shell and Core' service provision to Kitchens, concessions & bars
- Electromagnetic water conditioners
- Ultraviolet (UV) disinfection units
- Control and valving for rainwater harvesting system.
- Trace heating for freeze protection for external pipework
- Pipework distribution to all fittings routed in copper (thermally insulated)
- Chrome Plated Copper pipework where pipework is exposed.
- Black-out paint on all pipework routed above open ceilings
- Commissioning, testing and chlorination of the entire water system
- All valves, meters, fittings, flexible connections, bracketry & accessories necessary to make a complete and working installation.

Cold Water Storage:

2 no. potable cold water storage tanks (TANK:01 & TANK:02) will be located in the Level 01 external compound on the east side of the site.

Each tank will hold 100m³ of water, and will be of GRP sectional construction, with central division and raised valve housing. Tanks will be plinth-mounted, with externally flanged sides and internally flanged bases. Tank inflows will be controlled by Keraflo valves and tank operation and contents will be monitored / controlled by a BMS compatible system – as Keraflo “Tanktronic” or better and approved.

The combined potable storage of 200m³ will be served by an inflow of 14 l/s is based on providing a 4 hour fill time.

Tank controls to be configured to provide two operational water level scenarios within each Domestic Potable Water tank / compartment. The two scenarios are Event Day and Non-Event day, enabling an automated reduced total stored water capacity when no event is occurring, to reduce stagnation and water wastage.

A CAT5 cold water storage tank (TANK:03) will be located in the Level 00 PH Plantroom L00 S008. This tank will hold 30m³ of water, and will be of GRP sectional construction, with central division and raised valve housing This tank will provide storage to the CAT5 system and each compartment will be dual fed – with a supply from the below ground rainwater harvesting tank (for details refer to Civils package) and a supply from the potable BCWS system as a back up.

Tank inflows will be controlled by Keraflo valves and tank operation and contents will be monitored / controlled by a BMS compatible system – as Keraflo “Tanktronic” or better and approved.

Filling of this tank will be monitored by a BMS compatible rainwater harvesting hybrid controller system – which will monitor contents levels in the below ground harvesting tank and draw on this when available – topping up from the BCWS system in dry periods.

This packaged rainwater harvesting control system is to be by "Aquality" or better and approved.

Cold Water Boosting:

The Building will be served by 2 separate, skid-mounted packaged cold water booster sets (BS:01 & BS:02), both located in the Level 00 PH Plantroom L00 S008

BS:01 will serve the potable water system. The set will consist of 5no. variable speed, inverter driven pumps, an accumulator vessel and associated controls and fittings.

Refer to equipment schedules for operational duty of this installation.

BS:01 will provide a BCWS to the building and a dedicated cold feed supply to the Level 04 hot water plantroom.

A pressure limiting valve is to be fitted to the BCWS and Cold Feed supplies from BS:01.

BS:02 will serve the CAT5 non-potable water system. The set will consist of 3no. variable speed, inverter driven pumps, an accumulator vessel and associated controls and fittings.

Refer to equipment schedules for operational duty of this installation.

A pressure limiting valve is to be fitted to the BCWS and Cold Feed supplies from BS:02.

BS:02 will also serve the irrigation system for the building and site – the operation of which will occur at night and so will not run simultaneously to the CAT5 system during an event.

An irrigation system control panel will be located in the Level 00 PH plantroom.

For details of all elements of the irrigation system (including control system) refer to the irrigation specialist's package.

The pumps of both booster sets will be programmed to operate in the most efficient duty / assist / standby sequencing to reflect the large variations in demand likely for the venue's different usages / modes.

Water Treatment / Conditioning:

UV disinfection will be provided on the BCWS and CAT5 services in the Level 00 PH Plantroom (L00 S008) – by UV Units UV:01 and UV:02.

UV disinfection will be provided on the incoming Harvested Rainwater supply in the Level 00 PH Plantroom (L00 S008) – by UV Unit UV:03.

These to be mounted in locations shown on the services drawings. Each to be twin In-line stainless steel Ultra Violet disinfection units c/w 3-way lamp on indicator, volt free contact for BMS output. Mounted in parallel after booster pump. Model to be WRAS approved.

An automatic reverse rinsing actuator shall be provided to enable automatic filter cleaning at pre-settable times. A mesh grade of 50 microns shall be utilised.

Scale control will be provided to the HW plant cold feeds by 2no. in-line electromagnetic water conditioners – WS:01 and WS:02 – located in Level 04 Hot Water Plantroom L04 E018. These are to be mounted on the cold-feeds to each pair of calorifiers.

For details refer to equipment schedules.

Allowance to be made for any additional filtration recommended by selected rainwater harvesting system specialist.

For details of water treatment and filtration on the below ground elements of the rainwater harvesting system refer to civil engineer's package.

1.1. General Requirements:

Pressure reducing valves and double check valves will be provided on the branch connections at each floor level and outside rooms / areas as indicated on the drawings.

Solenoid isolation valves, controlled by PIR sensors will be provided on connections to each toilet area to automatically "shut off" the supply when the toilets are unoccupied and to obtain the relevant BREEAM credit.

Connections to individual sanitary fittings, sinks and showers etc. will be provided with service valves and toilet flushing cisterns incorporating integral overflow devices.

Urinal Cistern filling system - including presence detector and control valve at every cistern - is to be included. Selection and user interface profile to suit architect's selected washroom system and sanitary schedule.

Valved and 'capped' branches will be provided, from the boosted water distribution system, to serve the Concession, kitchen, bar and Retail areas. Each boosted hot and cold water branch will be provided with backflow protection, pressure control and a water meter with a BMS interface to log fit out area usage.

Trace heating will be installed for frost protection where pipework is routed either through externally exposed or unheated areas. Refer to relevant section of this specification for further details.

All boosted potable cold water systems will provide and maintain water to a potable quality throughout the building. All necessary air breaks and back flow prevention devices will be provided to ensure the system conforms to the current Water Regulations and the Local Water Authority requirements.

Maximum temperature of any cold water outlet is 10°C.

The contractor shall ensure that an anti-surge valve is fitted within the boosted water supply's at the top of risers to avoid water hammer.

Isolation valves incorporating flow regulators are to be installed on individual branches to sanitary fittings to aid water conservation.

Drain valve shall be installed at all low points. Final connections to all items of sanitarytware are to be via hard plumbed pipework. The use of flexible braided pipework shall not be permitted.

Low level branch pipework:
Domestic hot and cold connections to individual fittings to be 15mm unless otherwise indicated on catering specialist's schedule or sanitary fitting manufacturer's spec.
For low level branch pipework sizes generally as follows:
WHBs:
1no. = 15mm, 2no. - 3no. = 22mm, 4no. - 6no. 28mm
WCs:
1no. = 15mm, 2no. - 3no. = 22mm, 4no. - 6no. 28mm
Urinal Cisterns:
1no. = 15mm, 2no. - 3no. = 22mm, 4no. - 6no. 28mm

The contractor shall also allow to chlorinate the entire water system prior to hand-over (maximum of 3 days prior to hand over). The Contractor shall at his own expense continue to chlorinate the system or part of the system should the system fail the standard chlorination test.

At the top of every domestic water main rising pipe, install a combined ’anti-shock’ air release and vacuum breaker device with a lock-shield isolating valve to enable its maintenance and/ or repair without interruption in the operation of the boosted cold water system. Ensure that every such device incorporates an automatic air vent with the facility to decelerate approaching water when air is venting. Additionally ensure that every such device permits vacuum relief by allowing air to enter the system when draining.

The contractor shall also allow for adequate expansion of the hot and cold water distribution pipework via adequate expansion joints. Liaise with a specialist manufacturer who will advise as to the extent of expansion provision required.

All internal distribution within the building will be routed in copper pipework complete with thermal insulation in Mineral wool of approved equivalent.

The boosted cold water supply to the Hot Water Calorifiers will pass through electromagnetic water conditioners that will assist in the reduction of scale formation within the hot water services distribution system.

All components shall be WRAS approved.

1.2. Kitchens, Concessions & Bars: Each kitchen, concession and bar unit will be provided with metered valved and capped-off boosted cold water potable pipework on the point of entry to the unit as detailed on the drawings and schematics. The fit-out/extension from the valved/capped-off cold water pipework to all equipment within each unit will be the responsibility of the specialist catering contractor and does not form part of the mechanical contractor scope of works.

1.3. Flexible Connections:

Flexible pipework fittings shall also be used for final termination to toilet cisterns sinks and

wash hand basins.

Tie bars with rubber top hat washers shall be used where the working pressure exceeds 1.5 bar G.

Compression fittings shall not be used on the Boosted Hot and cold water systems.

Where untied bellows are used the manufacturers recommendations for anchors and guides shall be followed. Tie bars shall be threaded and their length adjustable.

For working temperatures up to 70°C the rubber bellows shall be high tensile synthetic fibre reinforced.

Flexible connections with screwed connections shall be reinforced EPDM rubber hoses and shall have at least one full union to avoid torquing on installation.

For domestic cold water services the bellows liner shall be of a food grade nitrile rubber as BOA Group, Type A NITRILE or equal and approved.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this schedule including all component details and layout drawings showing the locations of all components - for approval by the design team.

Flexible connections shall be as supplied by BOA Group or equal and approved.

2. System performance: Ss_55_70_95/210 Design and detailing hot and cold water systems; Ss_55_70_38/220 Cold water supply
3. Arrangement: Automatic variable speed pumping system.
4. Water meters: Pr_80_51_51_97 Water meters
5. Cold water boosting
   5.1. Pressure booster sets: Pr_65_53_86_66 Pressure booster pumps
6. Pumps: Pr_65_53_86_11 Canned rotor pumps
7. Storage tank or cistern: Pr_60_50_96_36 Glass reinforced plastics tanks
8. Water treatment plant: Pr_60_55_97_50 Magnetic water conditioners; Pr_60_55_97_93 Ultraviolet (UV) disinfection devices; Pr_60_55_97_44 Ion exchange softening units
9. Pipelines
   9.1. Below ground: Pr_65_52_63_63 Polyethylene (PE) water pipes and fittings
   9.2. Above ground: Pr_65_52_63_17 Copper pipelines
10. Pipeline accessories
    10.1. Expansion devices: Pr_65_67_28_03 Angular expansion compensators; Pr_65_67_28_05 Axial expansion compensators; Pr_65_67_28_46 Lateral expansion compensators
    10.2. Gauges: Pr_65_52_34_66 Pressure gauges; Pr_65_52_34_88 Temperature gauges
    10.3. Accessories: Pr_65_52_61_50 Masking plates; Pr_65_52_61_63 Pipe sleeves; Pr_65_57_96_08 Basket water strainers; Pr_65_57_96_04 Angle water strainers
    10.4. Pipeline supports: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps; Pr_20_29_14_65 Pipe clips

11. Valves
    11.1. Float valves: Pr_65_54_95_29 Float-operated valves
    11.2. Isolating valves: Pr_65_54_95_15 Copper alloy gate valves; Pr_65_54_95_16 Copper alloy globe valves
    11.3. Check valves: Pr_65_54_95_14 Copper alloy check and double check valves
    11.4. Regulating valves: Pr_65_54_95_66 Pressure reducing valves
    11.5. Draining devices: Pr_65_54_95_27 Draining taps
    11.6. Accessories: Pr_65_54_95_05 Backflow prevention devices; Pr_65_54_93_87 Test points
12. Thermal insulation
    12.1. Pipelines: Pr_80_77_76_54 Mineral wool pipe section insulation
    12.2. Tanks: Pre-insulated by tank manufacturer
13. Vibration isolation: Pr_80_77_94_84 Spring isolators; Pr_80_77_94_15 Compression isolators; Pr_80_77_94_42 Isolation hangers; Pr_80_77_94_40 Inertia bases; Pr_80_77_94_30 Flexible vibration isolation hoses; Pr_80_77_94_74 Rubber bellows; Pr_80_77_94_60 Pad mountings
14. Drinking water outlets: At kitchen sinks and as detailed on the system schematics
15. Flush control devices: Pr_75_50_46_31 Flush control devices
16. Controls: Ss_75_70_52_96 [P] Water supply control systems
17. Accessories: Water leak detection and alarm system.
18. Plant and equipment identification: Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels; Pr_40_10_57_60 Paper valve charts and schematics; Pr_40_10_57_28 Engraved valve identification labels
19. Execution: 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
20. 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_95/850 Water quality tests; Ss_55_70_38/860 Spares; Ss_55_70_38/870 Operating tools; Ss_55_70_38/880 Maintenance

See Ss_75_70_52_96 [P] Water supply control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

System performance

Ss_55_70_38/220 Cold water supply ADDED

1. Incoming mains water supply: Identify site factors and submit report.
2. Type of system: Pumped from storage provision.
3. Design parameters: To BS 8558. To BS EN 806-2. In accordance with CIPHE Plumbing engineering services design guide.
4. Storage capacity: Refer to equipment schedules

See Ss_55_70_95/210 Design and detailing hot and cold water systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/203 Domestic hot water demand in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/211 Pump overrun in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/228 Pump pressurization unit control strategy in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/237 Variable speed pumps control strategy in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_65 Pipe clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_25_80_81_44 Intumescent trunking pillows in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_28 Engraved valve identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_60 Paper valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_60_50_96_36 Glass reinforced plastics tanks ADDED

1. Description:

   Supply, install, test and commission cold water storage cisterns as detailed in this specification and equipment schedules.

   For all cisterns used in conjunction with water pressure boosting equipment, arrange their connections to achieve ‘Type A’ air gaps as defined in the WRAS Water Regulations Guide.

   In order to ensure that the cold water temperature does not exceed 20°C, thermally insulate and distance all such cisterns from the commonly adjacent hot water and heating pipes and other sources of heat.

   For one-piece cold only cisterns up to 500 litres capacity use polypropylene or glass reinforced plastic complying with BS 7181.

   For one-piece cold water storage and combined feed and expansion cisterns up to 500 litres capacity use thermoplastic material cistern(s) complying with BS 4213.

For one-piece and sectional cisterns above 500 litres capacity use glass reinforced plastic material complying with BS EN 13280.

For stored water volumes greater than 1,000 litres capacity provide tanks that are duplicated or compartmented and interconnected. Ensure that all such tanks are capable of isolation and independent operation to enable maintenance and repair work without interruption of water supply to the distribution system.

Arrange pipework and valves from all duplicate/compartmented tanks to deliver parallel flow and ensure that water flows equally from each compartment in service.

Arrange the make-up water into each compartment to be controlled so that all compartments fill equally and simultaneously when make-up is triggered by any compartment.

Provide a 100mm diameter thermometer in each compartment of each cistern to measure cold water storage temperature.

For plastic or copper pipe connections to a tank use a copper alloy connector, having a shoulder to bear on the inside of the cistern and secured by a backnut to the outside. Use corrosion resistant support washers both on the inside and the outside of the cistern with additional soft washers being used with glass reinforced plastics and fibre-cement cisterns or where there are irregular surfaces.

1.1. General Requirements:

1. Any part of the potable cold water system downstream of the cold water storage tank must first pass through a functioning UV unit downstream of any cold water booster set to avoid contamination. A temporary building supply must not be used for filling during testing or commissioning etc. Water will be sampled at outlets prior to occupation. Any trace of contamination will result in the Contractor draining the system and disinfecting again. No contamination is acceptable.
2. Sectional tank erected on site by Specialist Contractor/Tank Supplier.
3. Sectional tank provided with all preformed connections at manufacture to suit all pipework and ancillary equipment connections.
4. Sectional tanks and ancillary equipment to be fully WRAS Approved for use with Wholesome Water. Hot press moulded to BS EN 13280:2001, Bracing Design to BS 6700:1997.
5. Sectional panels with encapsulated insulation 0.6W/m2K. Insulation CFC and HCFC free.
6. Sectional tank internal fasteners and fixings to be Grade 316 stainless steel. External fasteners and fixings to be galvanised steel.
7. WRAS Approved sealing strip provided at panel joints.
8. All internal roof support struts to Wholesome Water Storage Tanks shall be solid construction and not tubular.

2. Manufacturer:

1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

3. Standard: To BS EN 13280.
4. Arrangement: Sectional tank. Refer to system schematic
5. Class: Refer to equipment schedules
6. Water
   6.1. Quality: Non-potable.
7. Manholes: 600 x 600 mm.
8. Division plates: Required.
9. Baffle plates: Required.
10. Weir plates: Required.
11. Connections
    11.1. Inlet: Refer to system schematics
    11.2. Outlet: Refer to system schematics
    11.3. Vent pipes: Refer to system schematics
12. Inspection at factory: Not required.
13. Accessories: Ball valve boxes. External access ladder. Level alarm. Level switches. Temperature probes. Refer to equipment schedules for specific details and quantities. Pr_65_52_34_16 Contents gauges
14. Execution: Pr_60_50_96/610 Cleaning; Pr_60_50_96/630 Installing tanks and cisterns

Pr_60_55_97_44 Ion exchange softening units ADDED

Pr_60_55_97_50 Magnetic water conditioners ADDED

1. Manufacturer:
   1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

2. Execution: Pr_60_55_97/640 Installing water conditioning devices

Pr_60_55_97_93 Ultraviolet (UV) disinfection devices ADDED

Shared by: Ss_55_70_97_70 [P] Rainwater reclamation systems

1. Description: UV system to be mounted in parallel after booster pump.

   An automatic reverse rinsing actuator shall be provided to enable automatic filter cleaning at pre-settable times. A mesh grade of 50 microns shall be utilised
2. Manufacturer:
   1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

3. Components: Alarm facilities. Lamp timer. Turbidimeter. Ultraviolet intensity monitor.

Pr_65_52_34_16 Contents gauges ADDED

1. Arrangement: Sight glass

2. Float level indicator: Hydrostatic dial type.

See Pr_65_52_34_66 Pressure gauges in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_52_34_88 Temperature gauges in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_52_61_50 Masking plates in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_61_63 Pipe sleeves in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_62_09 Brazing compounds in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_52_62_27 Elastomeric ring seals ADDED

Shared by: Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines

1. Standards
   1.1. Compression: To BS EN 1254-3.
   1.2. Electrofusion: To BS EN 12201-3.
   1.3. Socket and spigot: To BS EN 12201-3.
   1.4. Solvent cement: To BS EN 14814 where applicable
   1.5. Elastomeric ring seal: To BS EN 681-1.

See Pr_65_52_62_29 Flange jointing rings for copper flanges in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_81 Solders in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_17 Copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_18 Copper pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_52_63_63 Polyethylene (PE) water pipes and fittings ADDED

1. General requirements: Pr_65_52_62_27 Elastomeric ring seals
2. Standards
   2.1. Pipes: To BS EN 12201-2. TO BS ISO 4427-2, PE 100. To BS ISO 4427-2, PE 80. To BS ISO 4427-2, PE 63. To BS ISO 4427-2, PE 40.
   2.2. Fittings: To BS EN 12201-3. To BS ISO 4427-3, PE 40. To BS ISO 4427-3, PE 63. To BS ISO 4427-3, PE 80. To BS ISO 4427-3, PE 100.
3. Colour: Black.
4. Execution: Pr_65_52_63/645 Installing plastics pipelines; Pr_65_52_63/700 Installing buried pipelines; Pr_65_52_63/705 Protection of buried pipelines

See Pr_65_53_86/320 Pumps generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_53_86_11 Canned rotor pumps in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_53_86_66 Pressure booster pumps ADDED

1. Description:

   Arrange the packaged skid mounted booster pump set to operate under its own factory fitted

integral controls from a pressure sensor in its discharge piping. each pump to be inverter driven and fitted with individual inverters.

Closed valve head not to exceed pump duty by more than 2 bar.

Arrange the packaged boost pump set to be enabled and disabled from the BMS with a manual override mounted on its integral control panel.

In the event of the packaged boost pump set automatic control system producing a common alarm fault signal, relay that signal as an alarm at the BMS.

Cold water booster pumps to be WRAS approved in accordance with the requirements of this specification and the equipment schedule.

2. General requirements: Pr_65_53_86/320 Pumps generally
3. Duties
   - 3.1. Operation: Duty and standby, Duty and assist.For actual configuration refer to specific systems requirements.
   - 3.2. Motor
     - 3.2.1. Nominal voltage: Three phase 400 V a.c.
     - 3.2.2. Frequency: 50 Hz.
4. Pumps
   - 4.1. Arrangement: Horizontal end suction centrifugal. Vertical multistage centrifugal.
   - 4.2. Number: Refer to system schematics
5. Control panel mounting: Wall. Frame.
6. Accessories: Anti-vibration mountings. Flexible connections. Matching flanges.
7. Execution: Pr_65_53_86/610 Installation of pumps generally; Pr_65_53_86/640 Commissioning preparation

Pr_65_54_93_06 Ball valve floats ADDED

1. Standards
   - 1.1. Copper: To BS 1968.
   - 1.2. Plastics: To BS 2456.

See Pr_65_54_93_87 Test points in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_54_95_05 Backflow prevention devices ADDED

Shared by: Ss_55_70_97_70 [P] Rainwater reclamation systems and Ss_55_70_95_50 [P] Mains water distribution network systems

1. Standards
   - 1.1. Anti-pollution check valves: To BS EN 13959.
   - 1.2. Hose union: To BS EN 14454.
   - 1.3. In-line anti-vacuum valves: To BS EN 14451.
2. Material: Copper alloy.
3. Connections: Pressure tight joints threaded to BS EN 10226-1. Compression to BS EN 1254-2.
4. Execution: Pr_65_54_95/610 Installation of valves generally

See Pr_65_54_95_14 Copper alloy check and double check valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_15 Copper alloy gate valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_16 Copper alloy globe valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_27 Draining taps in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_54_95_29 Float-operated valves ADDED

1. General requirements: Pr_65_54_93_06 Ball valve floats
2. Diaphragm type
   2.1. Standard: To BS 1212-2.
3. Delayed action type
   3.1. Standard: To BS 1212-2.
   3.2. Valve chamber: Raised. Not raised. as detailed on equipment schedules
4. Piston type
   4.1. Standard: To BS 1212-1.
   4.2. Arrangement: Non-equilibrium.
5. Plastics body diaphragm type
   5.1. Standard: To BS 1212-3.
6. Compact type: To BS 1212-4.
7. Execution: Pr_65_54_95/610 Installation of valves generally

See Pr_65_54_95_53 Motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_66 Pressure reducing valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_57_96_04 Angle water strainers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_57_96_08 Basket water strainers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_67_28_03 Angular expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_67_28_05 Axial expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_67_28_46 Lateral expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_75_94_28 Electronic sounders in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18_94 Valve actuators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_46_31 Flush control devices ADDED

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: Water Regulations Advisory Scheme (WRAS) approved.
3. Operation: Occupancy sensor.
4. Controller: Mains operated.

See Pr_75_50_76_31 Flow in pipe sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_80_51_51_97 Water meters ADDED

Shared by: Ss_75_50_28_96 [P], [M] Water leak detection and alarm systems and Ss_55_70_97_70 [P] Rainwater reclamation systems

1. Description:
   1. All water flow meters shall be WRAS approved.
   2. Refer to the PH schematics and drawings for the number and location of the water flow meters.
   3. Flow meter on the hot water pipeline shall be suitable for hot water temperature system.
   4. The M&E Contractor shall liaise with Building Control and obtain Building Control approval of the metering for the works. All additional items required by Building Control shall be provided. The submission of the energy metering strategy shall be issued to Building Control for approval prior to any replacement works commencing.
   5. All flow meters shall be fully tested and commissioned. Testing and commissioning procedures shall be agreed prior to the tests being carried out and any ordering of test equipment. This shall be in the form of method statements from the M&E Contractor - describing the set-ups, design parameter criteria, testing and commissioning equipment and methods being proposed.
   6. Energy use and sub-metering shall meet Building Regulation and CIBSE TM39 requirements as a minimum.
   7. Staff Training: The M&E Contractor shall include within the tender costs for training the Client's maintenance operative/representative(s) in all aspects of the energy metering installation, systems and their operation. The full and complete understanding of these

systems by the Clients' maintenance operative shall be a pre-condition of practical completion. The M&E Contractor shall inform the Employer's Agent at which stage they feel that this individual should be based on site with them as they complete the project.

8. All meters shall be suitable of suitable construction for their installed location and the environment to which they are exposed.
9. Meters shall be linked to a full measuring system where requires. The system shall be hardwired to a central local data collection.
10. The M&E Contractor shall allow for liaison with the Energy Management Team, Client's maintenance team and the energy meter manufacturer to finalise all energy monitoring requirements, including site visits and attendance of meetings as necessary.
11. The M&E Contractor is to confirm flow rates and pipe sizes etc. prior to ordering equipment.
12. Flow meters to have a correct MINIMUM distance of straight pipe before the meter, as required by meter manufacturer.
13. The M&E Contractor shall include for all power wiring, controls wiring, containment and ancillaries to proved a full and complete energy metering installation.
14. The M&E Contractor shall verify and confirm all flow rates – see also Schedule of Mechanical Systems Commissioning.
15. Prior to ordering equipment the M&E Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.
16. All equipment to be issued with a full and detailed manual for installation, operating/maintenance and fault findings.
17. All meters to have connections for Pulsed readings to remote BMS.
18. Metering components to include:

- LCD display (minimum 8 digit read)
- Flow probe
- Return probe
- All necessary wiring – to installed positions.

2. Standards: To BS EN ISO 4064-1 and BS EN ISO 4064-4.
3. Third party certification: WRAS approved. Measuring Instruments Directive approved.
4. Format: In-line meters.
5. Power supply: External power supply.
6. Connections: Flanges.
7. Indicating device: Type 1 - analogue.
8. Features: Pulsed output for remote monitoring.
9. Execution: Pr_80_51_51/670 Installing water meters

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_80_77_76_54 Mineral wool pipe section insulation in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_30 Flexible vibration isolation hoses in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_40 Inertia bases in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_60 Pad mountings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_74 Rubber bellows in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

See Pr_20_29_14/620 Installing pipeline supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/620 Installing valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/630 Installing valve identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_60_50_96/610 Cleaning ADDED

1. General: Clean out tanks and cisterns before site testing and commissioning.

Pr_60_50_96/630 Installing tanks and cisterns ADDED

1. Standards
   1.1. Moulded plastics: In accordance with BS 4213.
   1.2. Glass reinforced plastics: In accordance with BS EN 13280.
2. Position: Refer to system drawings
3. Base: Install the tank on a firm, level and continuous base to spread the load. Base to be set out in accordance with tank manufacturers requirements.
4. Access: Allow for internal and external inspection and cleaning. Provide space for cleaning and maintenance with clearance above the tank to service valves.
5. Limiting conditions: Refer to system drawings

Pr_60_55_97/640 Installing water conditioning devices ADDED

1. Standard: In accordance with BS EN 15161 for devices for treatment of drinking water in buildings.

See Pr_65_52_34/630 Installing pressure gauges in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_52_63/610 Pipelines installation generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/615 Installing pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/620 Installing anchors generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/625 Installing slide guides in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/631 Installing copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_52_63/645 Installing plastics pipelines ADDED

Shared by: Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines

1. General requirements: Pr_65_52_63/610 Pipelines installation generally; Pr_65_52_63/615 Installing pipeline fittings; Pr_65_52_63/710 General inspection and testing; Pr_65_52_63/620 Installing anchors generally
2. Pipeline material: Polybutylene.
3. Jointing method:
    - Electrofusion to DVS2207
    - Compression
    - Threaded
    - Flanged
4. Anchor: Submit proposals

See Pr_65_52_63/690 Spacing of pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_52_63/700 Installing buried pipelines ADDED

1. Depth of cover: Refer to NJUG guidelines document
2. Set out: Lay in straight lines as standard.
3. Concealment: Do not lay under surfaced footpaths or drives.
4. Installation:
    - Thoroughly clean lengths of pipe internally before laying.
    - Temporarily cap until jointing takes place.
    - After laying and jointing keep leading end capped.
    - Protect the surface of the pipe from the risks of fretting damage, scrapes and so on that could occur if encased in concrete. Under such conditions, it is recommended that the PE pipe is wrapped in a heavy-duty polyethylene membrane prior to pouring the concrete. The wrapping must extend beyond the concreted area, over a joint at either end and into the adjacent earth.
    - The pipe must come above ground using a steel or cast iron change piece. This pipe should be Denso-wrapped to avoid alkaline reaction with the lime in the concrete.
    - The above ground connection pipe should be supported by a foot bracket, to avoid direct stain being imposed on the PE piping below ground.
5. Thrust blocks: Install at changes of direction and blank ends.

Pr_65_52_63/705 Protection of buried pipelines ADDED

1. Earth cover (minimum)
    1.1. Water pipework: Refer to NJUG guidelines document
    1.2. Fuel oil and gas: Refer to NJUG guidelines document
    1.3. Under roadways: Refer to NJUG guidelines document
2. Marker tape: Required.

See Pr_65_52_63/710 General inspection and testing in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_53_86/610 Installation of pumps generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_53_86/640 Commissioning preparation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95/610 Installation of valves generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_54_95/641 Installing motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_57_96/650 Installing strainers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_67_28/620 Installing expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_75_94/610 Installing electronic sounders in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/605 Installing control components in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/610 Installing valve actuators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/660 Installing flow sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_80_51_51/670 Installing water meters ADDED

1. Standards: To BS EN ISO 4064-5.

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/625 Installing foil faced mineral wool insulation on pipelines in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_94/610 Cast in situ bases in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94/620 Installation of flexible hoses and rubber bellows in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/620 Installing hot and cold water systems generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/650 Hydraulic pressure testing of hot and cold water supply systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/660 Flushing hot and cold water systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/670 Disinfection of hot and cold water systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

System completion

See Ss_55_70_38/810 Commissioning of hot and cold water supply systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/820 Inspection and test records in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/830 Demonstrations in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/840 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/860 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/870 Operating tools in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_38/880 Maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_55_70_95/850 Water quality tests in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_55_70_95_50
[P] Mains water distribution network systems ADDED

Systems

Ss_55_70_95_50 [P] Mains water distribution network systems ADDED

1. Description:

Domestic Water to OVG Manchester will be provided by a new incoming metered supply from the United Utilities Water Main in Joe Mercer Way.

An incoming 110mm MDPE main will enter the building from below ground in the Northwest corner, rise to internal high level, convert to 108mm copper, and run alongside the main pipework racetrack route to the east side of the building.

This supply will rise to Level 01(adjacent to Open Store L00 E009), where it will provide a mains fill to the 2no. potable bulk storage tanks located in the Level 01 external compound area. The required flow rate will be 14 l/s, to achieve a tank-fill time of 4 hrs. For details of routing refer to ME services drawings.

The incoming supply shall be metered at the site boundary, and at the potable tanks. The system design will be based around the conservation of water through BMS linked leak detection/consumption monitoring which meets the criteria for the necessary credits for BREEAM 'Excellent' standard targeted. All meters will be interfaced with the BMS for data logging/alarm.

A preliminary quotation has been obtained from United Utilities and is available for the contractor to take forward and liaise with the local water authority with regards to the installation of the new water mains connection to site.

Separate unmetered fire supplies dedicated to serve the demands of the sprinkler and hydrant systems shall be provided. For details of these refer to the Fire Protection specification section.

1.1. General:

The contractor shall be fully responsible for all programming, inspections, associated builderswork, coordination and liaison with the local water Authority throughout the duration of the project to handover.

The Contractor shall also allow to pay the installation charge by the local water authority for the new supplies based on the latest quotation.

From the point of building entry, the incoming mains water will be routed in thermally insulated copper pipework to the water tank area.

Where the incoming mains water runs through unheated areas it shall be trace heated to prevent freezing, in accordance with clause Ss_60_40_37_28.

2. System performance: Ss_55_70_95/210 Design and detailing hot and cold water systems
3. Water company: United Utilites
4. Position of incoming mains water supply: Refer to external services drawing.
5. Valves: Pr_65_54_95_18 Copper alloy service stop valves; Pr_65_54_95_96 Waterworks gate valves; Pr_65_54_95_19 Copper alloy stop valves; Pr_65_54_95_20 Copper alloy underground stop valves; Pr_65_54_95_05 Backflow prevention devices
6. System completion: Ss_55_70_95/850 Water quality tests

System performance

See Ss_55_70_95/210 Design and detailing hot and cold water systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Products

See Pr_65_54_95_05 Backflow prevention devices in Ss_55_70_38_65 [P] Pumped cold water supply systems

Pr_65_54_95_18 Copper alloy service stop valves ADDED

Shared by: Ss_75_50_28_96 [P], [M] Water leak detection and alarm systems

1. Standard: To BS 6675.
2. Material: Bronze. Dezincification resistant brass (DZR) copper alloy.
3. Connections: Threaded joints to BS EN ISO 228-1. Compression to BS EN 1254-2. Pressure tight threaded joints to BS EN 10226-1.
4. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_19 Copper alloy stop valves ADDED

Shared by: Ss_75_50_28_96 [P], [M] Water leak detection and alarm systems

1. Standard: To BS EN 1213.
2. Material: Copper alloy.
3. Connections: Compression to BS EN 1254-2. Pressure tight threaded joints to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
4. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_20 Copper alloy underground stop valves ADDED

1. Standard: To BS 5433.
2. Connections: Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
3. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_96 Waterworks gate valves ADDED

1. Standards: To BS 5163-1, BS 5163-2 and BS EN 1074-2.
2. Connections: Flanged to BS EN 1092-2.
3. Options: Handwheel.
4. Actuation
    4.1. Method: Electric.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Execution

See Pr_65_54_95/610 Installation of valves generally in Ss_55_20_34_57 [M] Natural gas supply systems

System completion

See Ss_55_70_95/850 Water quality tests in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_55_70_97_70
[P] Rainwater reclamation systems ADDED

Systems

Ss_55_70_97_70 [P] Rainwater reclamation systems ADDED

1. Description:

The building will be provided with a rainwater harvesting system to BS EN 16941-1:2018 (On-site non-potable water systems) and BS 8515:2009+A1:2013 (Rainwater harvesting systems - Code of practice). The system will comprise of below ground storage installation (combined with attenuation storage) situated below the Level 00 Service Yard, pre-tank rainwater filters, dye injection system, and all required valving and controls.

All below ground elements of the rainwater harvesting system (including Filters, Storage tank, Submersible pump, overflows, pipework) are designed and specified by the Civil engineer. For details of these items refer to the civils package.

Above ground elements of the rainwater harvesting system (Hybrid Controller, Storm Control system panel, above ground harvested rainwater pipeline) are covered in the ME drawings and equipment schedules.

Description of the overall harvesting system is described here for convenience, however operation of the system with regards to all elements of the below ground drainage design and attenuation strategy is the responsibility of the below ground drainage designer and is to be detailed in their package of information.

The contractor is to engage a rainwater harvesting specialist to develop the Stage 4A information to contractor information.

Stage 4A scheme is based on an "Aquality" system. Installed scheme to be Aquality, or better and approved.

A volume of 200m³ harvesting storage has been allowed for and comprises part of the larger below ground attenuation installation. The rainwater will be pumped by means of Duty/Standby submersible pumps which will be located in the underground rainwater attenuation tank and will be supplied by others.

A 108mm harvested RW supply rises to high level in Open Store L00 E009, and runs to the Level 00 PH plantroom. This supply fills the 30m³ CAT5 tank. The tank also receives a fill from the BCWS system.

Filling of this tank is controlled by a Hybrid controller unit, which monitors levels in the below ground harvesting tank, and draws on this source, or BCWS system, as required.

Control and interaction of the harvested and attenuation aspects of the below ground installation is provided by a **Storm control centre** located in the Level 00 PH plantroom utlising weather date via a wall-mounted aerial connected to the DAS network.
Details and specification of this system is to be covered in the civil engineers package. The real time flow control system using continuous monitoring and adaptive control shall be Aqua Storm Control Lite by Aquality Ltd, Wadsworth Rd, Perivale, London UB6 7JJ. The system shall comprise of Control panel with GSM aerial, actuated valve type A/B , level sensor, GSM Aerial, site controller, and connected to geocellular data capable of reading and predicting weather data to manage flow rates out of the drainage structure. The Aquality Storm Control Lite system allows any rainwater harvesting tank volume to count towards the sites storm attenuation volume requirement. Alternatively, the system can be installed within a storm attenuation system to allow any attenuation tank to act as a rainwater harvesting system.

The system works by linking the tanks to a rainfall forecast algorithm. This allows the tanks to be drained down at the allowable discharge rate (Greenfield runoff or otherwise agreed with the lead local flood authority) prior to significant rainfall events (above a 1:5 year event typically).

The control centre receives site specific rainfall predictions from various sources including the British Met office. The controller runs this data through an algorithm estimating the likely runoff volume for the upcoming rain events. The site controller then automatically takes action to ensure civil infrastructure is adequately prepared to deal with the predicted runoff.

The design and supply of the associated equipment will be undertaken by the specialist contractor.

The Non Potable "CAT5" system will feed all WC and Urinal cisterns, washdown points and the irrigation sytem. Pipework distribution to all outlets routed in copper (thermally insulated)

Contractor to include for chlorination of the entire water system and all valves, fittings, bracketry & accessories necessary to make a complete and working installation.

Provide dedicated pipework for the rainwater system that is free-draining to avoid stagnation.

The rainwater harvesting systems will shall be provided with the manufacturers comprehensive integral control system. The various control devices serving this plant will be provided with a full interface to the BMS for alarm notifications and critical faults with regards to pump flow failure.

The system shall be as supplied by:

Aquality Trading & Consulting Ltd.
6 Wadsworth Road
London UB6 7JJ

(or better & approved)

1.1. Design Parameters for Performance (D&B) Specification:

This specification is written based on legislation, standards and guidance in force in the UK generally, and within England by default.

Comply fully with the edition (including amendments) of each of the following, current at the time of tender:

The Water Supply (Water Fittings) Regulations
The Water Supply (Water Quality) Regulations
British Standards (inc. BS.EN... as detailed within this specification)
BSRIA AG 4/94 Guide to legionellosis - temperature measurements for hot and cold water services
BSRIA TN 6/2002 Water reclamation guidance. Design and construction of systems using greywater
BSRIA TN 7/2002 Water reclamation standard. Laboratory testing of systems using greywater
CIBSE Guide G Public health engineering.
CIRIA C539 Rainwater and greywater use in buildings
HS(G) 70 The control of legionellosis including legionnaires disease
HTM 04-01 The control of legionella, hygiene, 'safe' hot water, cold water and drinking systems
CIPHE Plumbing engineering services design guide
EU Bathing Water Guideline 2006/7/EC
NHBC Guidance

2. System performance: Ss_55_70_97/230 Design of rainwater harvesting (recovery) system; Ss_55_70_97/240 Controls
3. Rainwater collection system: Gravity rainwater systems. Refer to civils package for contributory sections of below ground rainwater pipework system.
4. Mains water supply pipelines: Pr_65_52_63_17 Copper pipelines
5. Backflow prevention: Pr_65_54_95_05 Backflow prevention devices
6. Collection tank:
7. Pump: Pr_65_53_24_86 Submersible pumps
8. Meter: Pr_80_51_51_97 Water meters
9. Distribution pipelines: Pr_65_52_63_17 Copper pipelines
10. Water treatment
    10.1. Filtration: Pr_65_57_96_53 Mesh water filters; Pr_65_57_96_30 Floating tank water filters; Pr_65_57_96_35 Gravel water filters; Pr_65_57_96_09 Bottle brush water filters; Pr_65_57_96_86 Subsurface vortex water filters; Pr_65_57_96_70 Rapid gravity water filters
    10.2. Disinfection method: Pr_60_55_97_93 Ultraviolet (UV) disinfection devices
11. Plant and equipment identification: Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
12. Controls: Pr_75_50_46_30 Float switches; Pr_75_50_18_94 Valve actuators; Pr_65_54_95_53 Motorized valves; Pr_75_50_18_51 Mechanical services control panels
13. Execution: Ss_55_70_97/620 Mains water top up connection; Ss_55_70_97/640 Installing rainwater harvesting systems; Ss_55_70_97/650 Installing reclaimed water identification
14. System completion: Ss_55_70_97/810 Testing and setting to work; Ss_55_70_97/820 Documentation; Ss_55_70_97/830 Maintenance

System performance

Ss_55_70_97/230 Design of rainwater harvesting (recovery) system ADDED

1. Design: Develop the Stage 4A scheme to contractor information for the rainwater harvesting system.

2. Standards: In accordance with BS 8515, WRAS 9-02-04 and Information and Guidance Note 9-02-05.
3. Parameters
   3.1. Proposed usage: Non-potable, internal and external use.
   3.2. Storage capacity: Refer to civils package.
   3.3. Back-up water supply: Required.
   3.4. Feed to fittings: Pumped.
   3.5. Controls
      3.5.1. Units: Control unit with system status monitor.
4. Requirement: Submit proposals, including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_55_70_97/240 Controls ADDED

1. Visual indicators : System powered. System supplying mains water. System locked out.
2. Fail safe operation circumstances: Loss of disinfection process. Interruption of power.
3. Pump control unit: Operate pump to match demand. Protect pumps from running dry. Protect the motor from over heating and electric overload. Permit manual override.
4. Functions: Signal consumable items need replenishment or replacement. Ensure rainwater is not stored over the permitted period. Ensure applications receive water from the back-up supply on failure of the rainwater system. Indicate system failure. Control pumps and minimize their use. Provide volt-free output for connection to building management system.
5. General Requirements:

Rainwater Harvesting control panel:

Provide a central electronic control panel (requiring a 230V/50Hz/16A supply) to the tank room, with micro-processor and LCD display for operation status, settings and fault indication, in an IP65 rated case.

Configure the control module for operation of two process streams independently, with pressurised distribution and fully automatic water management.

Provide controls for the BCWS water back-up and the booster pump set.

Configure the control panel to monitor the water level in the below ground harvesting tank, the water level within the CAT5 tank, and leakage.

Install a pulsed meter to the pipe feeding the CAT5 tank, providing a signal to the BMS to enable monitoring of rainwater consumption.

Install a level switch or electronic/ultrasonic level probe, located in the tank, to inhibit operation of the pump on low water level via the BMS.

Ensure that faults are communicated to the BMS via volt-free contacts.

Control panel to include:

level sensors with switchable colour LED display, power on, water level indication for below ground storage and CAT5 tank, operation mode, supply pump on/off, BCWS water top-up on/off, CAT5 tank overflow alarm, supply pump alarm, manual alarm/fuse reset, main switch, dual chamber control and maintenance setting

- Fully automatic water management for rainwater use with automatic, house internal BCWS-water top-up via AA or AB type air gap according to EN BS 16941-1 and BS EN 1717
- BCWS water supply into GRP CAT5 tank via two servo-assisted solenoid valves (normally closed), duty cycle 100% continuous rating
- Electronic control for submersible supply pump incl. on/off switch, dry run protection and motor protection
- Visible and audible alarm signals in case of malfunction of submersible pump or BCWS water top-up and volt-free contact for general fault message (connection to BMS)
- 3 no level sensors and LED level indication for external underground rainwater storage tank and 2 for building internal dual chamber CAT5

Storm Control Centre:

• Automated control – the system will automatically control the water level in the buried tank through the operation of an actuating valve (binary open/ close state). • Proportional tank draw down at 20 levels in 5% increments • Manual control – remote, online manual control for overriding automation from a web-dashboard. • Housing type – the controller is IP66 moisture ingress protected and has on-board temperature sensors to enable charging boosts in sub-zero conditions. • In case of piped overflows, pump can be operated by ASC • Fail-safe system: Issues SMS warning messages to ASC and site operators; - System is capable of outputting to BMS system for general fault alarms; - The control panel has a built-in battery backup to allow the system to continue working in the event of power failure; - Within all the failure scenarios, the system defaults back to a storm attenuation system (actuator valve open);

5.1. Rainwater Systems:

Configure the control unit to flush the mains water pipe and dump the backup stored

water every 10 days to avoid stagnation.

Locate a two-position float switch or electronic/ultrasonic level probe in the break tank, to control the submersible rainwater pump via the BMS. Arrange the controls so that in the event of surplus water in the below ground tank, a second level switch will operate through the BMS, to override the break tank switch and allow water to be pumped to high level. When the day tank is full and the associated level switch signals a high limit, stop the pump. Only at this point will the excess rainwater discharge from the below ground tank, via the high level overflow into the surface water drains.

Products

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_60_55_97_93 Ultraviolet (UV) disinfection devices in Ss_55_70_38_65 [P] Pumped cold water supply systems

See Pr_65_52_62_09 Brazing compounds in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_29 Flange jointing rings for copper flanges in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_81 Solders in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_17 Copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_18 Copper pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_53_24_86 Submersible pumps ADDED

1. General requirements: Pr_65_53_86/320 Pumps generally
2. Duties
   2.1. Operation: Duty/standby.
3. Accessories: Anti-vibration mountings. Flexible connections. Float switch.
4. Execution: Pr_65_53_86/610 Installation of pumps generally

See Pr_65_53_86/320 Pumps generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_05 Backflow prevention devices in Ss_55_70_38_65 [P] Pumped cold water supply systems

See Pr_65_54_95_53 Motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_57_96_09 Bottle brush water filters ADDED

1. Initial filters
   1.1. Filters: As manufacturers recommendations

Pr_65_57_96_30 Floating tank water filters ADDED

1. Initial filters
   1.1. Filters: As manufacturers recommendations

Pr_65_57_96_35 Gravel water filters ADDED

1. Initial filters
   1.1. Filters: As manufacturers recommendations
2. Biological: Reed beds. Membrane. Activated carbon.

Pr_65_57_96_53 Mesh water filters ADDED

1. Initial filters
   1.1. Filters: As manufacturers recommendations

Pr_65_57_96_70 Rapid gravity water filters ADDED

1. Initial filters
   1.1. Filters: As manufacturers recommendations

Pr_65_57_96_86 Subsurface vortex water filters ADDED

1. Initial filters
   1.1. Filters: As manufacturers recommendations

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18_94 Valve actuators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_46_30 Float switches ADDED

1. Third party certification: WRC approved.
2. Housing: Polypropylene . Stainless steel .
3. Operating mechanism: Float with integral roller ball and micro-switch.
4. Contact rating
   4.1. Nominal voltage: 230 V a.c.
5. Ingress protection (minimum): Continuous immersion
6. Operation in specific gravities: 0.8—1.3.
7. Fluid: Potable water.
8. Execution: Pr_75_50_18/605 Installing control components

See Pr_80_51_51_97 Water meters in Ss_55_70_38_65 [P] Pumped cold water supply systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_63/610 Pipelines installation generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/615 Installing pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/620 Installing anchors generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/625 Installing slide guides in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/631 Installing copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/690 Spacing of pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/710 General inspection and testing in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_53_86/610 Installation of pumps generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95/610 Installation of valves generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_54_95/641 Installing motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/605 Installing control components in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/610 Installing valve actuators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_51_51/670 Installing water meters in Ss_55_70_38_65 [P] Pumped cold water supply systems

Ss_55_70_97/620 Mains water top up connection ADDED

1. Backflow prevention method: Refer to system schematic

Ss_55_70_97/640 Installing rainwater harvesting systems ADDED

1. Standards: In accordance with BS 8515.
2. Tanks: Fit tanks with a method to prevent floating debris entering tank.

Ss_55_70_97/650 Installing reclaimed water identification ADDED

1. Standards: In accordance with WRAS Information and Guidance Note 9-02-05.
2. Pipelines
   2.1. Grey water: Green/ black/ green bands and the words GREY WATER.
   2.2. Reclaimed water: Green/ black/ green with white band in the centre and the words RECLAIMED WATER.
3. Outlets: Label according to quality and end use.

System completion

Ss_55_70_97/810 Testing and setting to work ADDED

1. Standards
   1.1. Greywater systems: In accordance with BS 8525-1.
   1.2. Rainwater harvesting systems: In accordance with BS 8515.

Ss_55_70_97/820 Documentation ADDED

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: Two.
2. Record drawings
   2.1. Content: Location and arrangement of plant. Location, size and route of pipelines. 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: Two.
3. Submittal date: At handover.

Ss_55_70_97/830 Maintenance ADDED

1. Servicing and maintenance: Undertake for 12 months after completion.

Ω End of System

Ss_60_40_17_94
[M] Variable refrigerant flow systems (VRF/DX) ADDED

Systems

Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX) ADDED

1. Description:

The VRF installation generally comprises / includes for the following:

1. Internal VRF / split DX fan coil units (including spigot plenums and associated ductwork / grilles)
2. External condenser plant
3. Centralised Daikin controller talks to BMS
4. Centralised Daikin controller expansion panel(s) as required talks to BMS
5. Interconnecting refrigerant liquid / suction pipework and control signal cabling
6. Branch selector boxes
7. Refnet Joints (as required)
8. Room controllers (where required)
    a. The contractor is to take particular note that each individual room within the Talent Area at Level GF (Dressing rooms, Green Room, Games Room etc.) are to be provided with individual wall mounted room controllers and be capable of providing a bespoke thermal environment to each room simultaneously.
9. Condensate discharge pipework
10. Ductwork (including fire-rated where identified on the drawings and / or required by the fire engineer's design), flexible connections to each fan unit, shut-off dampers, dampers including fire, fire/smoke dampers, attenuators, grilles, ambient terminals, supports, bracketry and all other fittings required to make a complete and working installation.
11. All services distribution, plant, ancillaries etc are to be provided with a matte black finish (TBC by the architect) wherever they may be visible to the general public within the building.

1.1. BREEAM Requirement: POL.03 refrigerant pump down 2 credits

1.2. Systems: 91no. separate systems are to be provided within the mechanical package. These systems shall fall within 4no categories:

1.2.1. Category 1 -Technical Room Cooling: Refrigerant based split system dedicated to serve cooling to the technical rooms (MER, SCRs, UPS rooms) throughout the building.

These systems are to be centrally controlled via the BMS and be provided with local temperature sensors within the room served.

These systems are provided with N+1 redundancy.

1.2.2. Category 2 - Ecology Unit Cooling: Ecology units provided with integral DX cooling coils are to be provided an external air cooled condenser as described within the equipment schedules.

The condenser units are to be matched to the coil capacities.

These refrigerant systems shall be operated by signals interlocked with the Ecology unit served.

1.2.3. Category 3 - Centrally controlled VRF systems: VRF systems serving GA areas (concourses, multifaith room, atrium floor, bar areas etc) are to be centrally controlled via the BMS.

Temperature sensors located in the proximity of each FCU return air path shall provide control and local temperature feedback to the BMS.

Each FCU shall be provided with a matched Branch Selector box.

1.2.4. Category 4 - Locally controlled VRF systems: VRF systems serving occupied BoH areas (staff offices, dressing rooms, green room, games room, meeting room, tea rooms etc) are to be locally controlled via local, wall mounted controller.

Temperature sensors located in the proximity of each FCU return air path shall provide control and local temperature feedback to the BMS.

Each FCU shall be provided with a matched Branch Selector box.

1.2.5. General System Requirements: Each system shall be capable of providing heating or cooling as applicable for each of the specified area.

Each condenser outdoor unit is be provided with appropriate bracketry / supports included for by the contractor.

Each indoor unit will require a 240V AC mains supply provided by the contractor.

Control will be a floating 18 to 36v DC voltage.

All systems to be provided with BMS enable / disable and common alarm facility.

All refrigerant pipework (suction and liquid lines) to be insulated with slip on close cell elastomeric pipe insulation with a fire performance class "0" of the 1985 building regulations.

Insulated flexible ductwork to terminal grilles from each fan coil unit must not exceed 750mm in length.

All necessary condensate pipework shall be installed by the Approved Installer in accordance with manufacturer's design and installation instructions and the unit's installation manual, into a local SVP via a suitable waterless trap. Minimum size of condensate pipes to be 25mm copper or plastic, insulated and pumped or by gravity from each fan coil / cassette. Drains to run 1:100 min falls.

1.2.6. Fan Coil Units - general requirements: VRF ducted fan coil units are to be provided as detailed on the GA plans and system schematics.

Each fan coil unit to be provided with an acoustically lined discharge plenum with size /

quantity of spigots as detailed on the drawings.

Provide condensate disposal to FCUs at 1:100 fall, including for lift pumps where required. The first 1,500mm from each FCU is to be thermally insulated copper pipework, thereafter, pipework can revert to uninsulated ABS.

The contractor is to include for replacing each fan coil unit return air filter with new modules at Practical Completion.

Refer to clause Ss_65_80_05_30 for details of the associated ventilation ancillary products which all apply to this system (ductwork, dampers, grilles etc).

1.2.7. Factory Testing & Witnessing: Two of each type / size of fan coil unit shall be offered for factory inspection, load and acoustic testing and witnessing to the client and the Consultant for approval prior to delivery to site of any part of the order. The contractor is to include for all costs (including travel arrangements) associated with the factory inspection/witnessing for 5no. client team representatives.

1.3. Room Temperature Sensor / Control: Category 1:
Centrally controlled with local room temperature sensor.

Category 2:
Control to be via signal from ecology unit.

Category 3:
Centrally controlled via temperature sensors located within each FCU return air path. Local controller not provided. Control of the installation will be via a centralised system interfaced with the BMS.

Category 4:
Locally controlled via wall mounted simplified controller. Temperature sensors to be located within each FCU return air path

Each system shall be interfaced with the fire alarm system, so that they automatically shut down upon activation of the fire alarm. On clearance of a fire alarm, plant shall revert to normal operation.

VRF equipment as manufactured by Daikin or better and approved.

Refer to clause Ss_75_70_52_97 for further control details.

2. System performance: Ss_60_40_17/211 Design of variable refrigerant flow systems
3. Compressor: Pr_60_60_13_27 Electric driven refrigerant compressors
4. System: Two pipe cooling only. Three pipe heat recovery.
5. Pipelines: Pr_65_52_63_20 Copper refrigerant pipelines
6. Thermal insulation: Pr_80_77_76_58 Nitrile rubber insulation
7. Outlets: Pr_70_65_03_94 Variable refrigerant flow units
8. Controls: Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX)

9. Plant and equipment identification: Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels; Pr_40_10_57_60 Paper valve charts and schematics
10. Execution: Ss_60_40_17/621 Installing variable refrigerant flow systems generally
11. System completion: Ss_60_40_17/811 Commissioning of refrigerating systems; Ss_60_40_17/820 Performance testing; Ss_60_40_17/831 Inspection and test records; Ss_60_40_17/841 Demonstrations; Ss_60_40_17/851 Documentation; Ss_60_40_17/861 Servicing and maintenance

Ss_75_70_52_97 [M] Refrigerant (VRF/DX) fan coil unit control systems (VRF/DX) ADDED

1. Description:

All control and monitoring functions for the VRF / DX heat pumps shall be from the manufacturers centralised control system.

The start and stop times for the system shall be Timeclock controlled. Initially the system shall be set to start and stop at 8.00am and 18.00 (both adjustable).

The air source heat pump installation is split into zones as indicated on the equipment schedules and schematics.

Each air conditioning zone shall be capable of providing heating or cooling as required by the occupants irrespective of the demands from other systems served from the outdoor condenser unit(s) ie. simultaneous heating and cooling.

The indoor units will operate under the dictates of either the manufacturers hard-wired room controller or central BMS controller as detailed under clause Ss_60_40_17_94 (variable refrigerant flow systems)

Where hard-wired controllers are provided, they should be capable of altering/controlling the following functions:

1. on / off
2. operating mode (heating / cooling / auto)
3. 7-day programmable
4. room temperature *(set point)*
5. fan speed (high / medium / low)
6. Adjustable fin/louvre (cassette style units only)

Provide a BACnet monitoring system for the VRF system which provides:

1. real time continuous monitoring and analysis of the system's operating parameters

2. facilities to import / export data (registration data, layout data, image data and test data) from / to the monitoring system in a CSV or similar format via a USB adaptor. Some manufacturers have their own software that would require installing on a head end PC.
3. connection with the network
4. monitoring to send necessary details (date / time of error occurrence, address of the error-source unit, error code, and the address of the unit that detected the error) of a malfunction via email to the BMS head-end.

1.1. Power: Power to the external condenser unit(s) is derived from the the electrical distribution board via a local isolator . The isolator is installed under the electrical contract, with final connection from the isolator undertaken by the electrical contractor.

Power to the indoor unit(s) derived from a local switched spur installed under the electrical contract. Final connection from the isolator is to be undertaken by the electrical contractor.

2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Equipment to be controlled: Air source heat pump (VRF)
4. Start and stop control: Pr_75_51_17_89 Time switches (integral to BMS outstations); Ss_75_70_52/209 Optimum start and stop cooling; Ss_75_70_52/210 Optimum start and stop heating
5. Normal operation
   5.1. Operation: Supply and outdoor fans switched on and heat pump enabled when air flow is proven.
   Switch on compressor when room temperature is above cooling set point or below heating set point.
   Switch on heat pump once flow has been verified.
   Switch off compressor and outdoor fan when room temperature is in the dead zone between these two set points.
   5.2. Set point control: Refer to design criteria schedule
   5.3. Heating set point limits: Refer to design criteria schedule
   5.4. Cooling set point: Refer to design criteria schedule
6. Low room temperature
   6.1. Operation: Enable heat pump to provide heating, and switch on fans when low temperature condition is signalled.
   6.2. Low room temperature setting: 14°C
7. Fan failure signal: Disable heat pump units.
8. Sensors: Pr_75_50_76_03 Air temperature sensors
9. Equipment interconnectivity: Wired.
10. Cables: As specified by the controls specialist
11. Containment: Pr_65_70_11_17 Cable trays
12. Containment accessories: Pr_25_80_81_42 Intumescent linear gap seals
13. Rewireable installations: Required.
14. Concealed installations: Required.
15. Control equipment power supply: Mains supply.
16. 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_17/211 Design of variable refrigerant flow systems ADDED

1. Design: Complete the design of the variable refrigerant flow system.
2. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/209 Optimum start and stop cooling ADDED

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

1. Start
   1.1. Optimum start time: Following learning period, achieve temperature set point within +/- 15 minutes of start of occupancy. Take account of day of week and holidays. Use a self-adaptive control algorithm to calculate when to start plant outside of normal operation by measuring outside and internal zone air temperature and using thermal response of structure and plant.
   1.2. Zone cooling set point: Refer to equipment schedules
   1.3. Maximum precool time: 2 hrs
   1.4. Air handling plant start: Use separate control for each air handling plant. Start air handling plant and cooling system.
2. Stop
   2.1. Optimum stop time: Take account of day of week and holidays. Use a self-adaptive algorithm to calculate the earliest time prior to end of occupancy when plant can be shutdown.
   2.2. Maximum acceptable temperature during occupied period: 24°C
   2.3. Maximum period between stop and end of occupied period: 2 hrs

Ss_75_70_52/210 Optimum start and stop heating

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Start
   1.1. Optimum start time: Following learning period, achieve temperature set point within +/- 15 minutes of start of occupancy. Take account of day of week and holidays. Use a self-adaptive control algorithm to calculate when to start plant outside of normal operation by measuring outside and internal zone air temperature and using thermal response of structure and plant.
   1.2. Zone heating set point: Refer to equipment schedules
   1.3. Maximum preheat time: 2 hrs
   1.4. Air handling plant start: Use separate control for each air handling plant. Start air handling plant and cooling system.
2. Stop
   2.1. Optimum stop time: Take account of day of week and holidays. Use a self-adaptive algorithm to calculate the earliest time prior to end of occupancy when plant can be shutdown.
   2.2. Minimum acceptable temperature during occupied period: 24°C
   2.3. Maximum period between stop and end of occupied period: 2 hrs

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Products

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_60 Paper valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_60_60_13_27 Electric driven refrigerant compressors ADDED

1. Standards: To BS EN 378-1, BS EN 378-2, BS EN 14511-1, BS EN 14511-2, BS EN 14511-3, BS EN 14511-4 and BS EN 60335-2-40.
2. Output cooling: Refer to equipment schedules
3. Output heating: Refer to equipment schedules
4. Electrical supply type: Three phase.
5. Drive: Inverter.
6. Refrigerant: Manufacturers standard
7. Accessories: Accumulator heater. Discharge temperature sensors. High pressure sensors. High pressure switch. Internal compressor crankcase heater. Internal overload relay. Low pressure switch. Overcurrent relay. Overcurrent sensor. Reverse phase protection. Suction temperature sensors.

Pr_65_52_63_20 Copper refrigerant pipelines ADDED

1. Standard: To BS EN 378-2.
2. Pipelines: To BS EN 12735-1.
3. Execution: Pr_65_52_63/665 Installing refrigerant pipework

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_65_03_94 Variable refrigerant flow units ADDED

1. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
2. Standards: To BS EN 378-1 and BS EN 378-2.
3. Arrangement: Refer to equipment schedules
4. Output cooling: Refer to equipment schedules
5. Output heating: Refer to equipment schedules

Pr_75_50_76_03 Air temperature sensors

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems ,

Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Standard: To BS EN 60730-2-9.
2. Application:
    - Frost protection
    - Duct mounted immersion
    - Room
    - Outside air
3. Range: -10°C to 40°C
4. Accuracy: ±0.5°C
5. Equipment interconnectivity
    5.1. Wired: Required.
6. Execution: Pr_75_50_76/675 Installing temperature sensors

Pr_75_51_17_89 Time switches (integral to BMS outstations)

Shared by: Ss_75_70_52_28 [M] Extract ventilation control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_36 [M] Heating system control systems

1. Standards: To BS EN 60730-1 and BS EN 60730-2-7.
2. Equipment interconnectivity: Wired.
3. Format: Electronic digital.
4. Display: Liquid crystal display (LCD).
5. Programme capability: 3 on and 3 off operations per day.
6. Number of switching channels: Four.
7. Override facility: Manual.
8. GMT/BST daylight saving: Automatic.
9. Enclosure
    9.1. Ingress protection (minimum): To BS EN 60529, IP23. To BS EN 60529, IP44. To BS EN 60529, IP55.
10. Battery backup: 50 h.
11. Execution: Pr_75_51_17/620 Installing time switches

Pr_80_77_76_47 Loadbearing pipeline support insulation

Shared by: Pr_80_77_76_62 Phenolic foam insulation

1. Pipelines carrying fluids at temperature up to 120°C: 300 mm length of high density phenolic foam.
2. Pipelines carrying cold fluids: 300 mm length of high density phenolic foam
3. Execution: Pr_80_77_76/750 Installing at loadbearing pipelines supports

Pr_80_77_76_58 Nitrile rubber insulation ADDED

1. Standard: To BS EN 60684-3-151.
2. Form: Pipe section.
3. Thermal conductivity: 0.035 W/m·K at 0°C.
4. Finish: Plain.
5. Reaction to fire classification: Class 'O'

6. Insulation thickness (minimum): To BS 5422.
7. Vapour barrier
   7.1. Vapour permeability: To BS 5422, clause 5.6.
8. Accessories: Pr_80_77_76_94 Valve and flange insulation; Pr_80_77_76_47 Loadbearing pipeline support insulation
9. Items to be insulated: Cover plates. Removable access covers.
10. Execution: Pr_80_77_76/630 Installing nitrile rubber insulation on pipelines; Pr_80_77_76/760 Insulation not carried through pipelines supports; Pr_80_77_76/755 Installing at non-loadbearing pipelines supports; Pr_80_77_76/780 Installing vapour barriers

Pr_80_77_76_94 Valve and flange insulation

Shared by: Pr_80_77_76_62 Phenolic foam insulation

1. Form:
   - Removable and reusable pads
   - Removable and reusable preformed rigid covers
2. Finish:
   - Aluminium foil faced
3. Execution: Pr_80_77_76/740 Installing at valves and flanges

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/620 Installing valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_63/610 Pipelines installation generally in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_52_63/665 Installing refrigerant pipework ADDED

1. General requirements: Pr_65_52_63/610 Pipelines installation generally
2. Standards: To BS EN 378-3 and BS EN 378-4.

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_76/675 Installing temperature sensors

Shared by: Pr_75_50_76_47 Liquid temperature sensors

1. General requirements: Pr_75_50_76/651 Installing sensors generally
2. Room sensors
   2.1. Height: 1.5m above floor
   2.2. Position: Away from heat sources and draughts. Away from direct solar radiation. Not on external walls. In the area controlled. Away from corners and doors.
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 air flow. Position downstream of supply fans. 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 damper actuator
   - To valve actuator
   - To fan
   - To pump
   - To central control panel.
9. Cable type: To be confirmed by controls specialist
10. Cable containment: Pr_65_70_11_30 Flexible conduit

Pr_75_51_17/620 Installing time switches

1. Position: Adjacent to low voltage switchgear.

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_80_77_76/630 Installing nitrile rubber insulation on pipelines ADDED

1. General requirements: Pr_80_77_76/610 Installing insulation and protection products generally
2. Joints: Close butt, secure with adhesive.
3. At fittings: Fabricate from mitre cut pieces. Secure with adhesive.

Pr_80_77_76/740 Installing at valves and flanges

1. Application: Do not obstruct removal of nuts and bolts, or operation of valves.

Pr_80_77_76/750 Installing at loadbearing pipelines supports

1. Application: Close butt to insulation.
2. Joints: Seal with 100 mm wide class 0 foil tape.

3. Sleeve: Provide sheet metal protection sleeve.

Pr_80_77_76/755 Installing at non-loadbearing pipelines supports

Shared by: Pr_80_77_76_62 Phenolic foam insulation

1. Insulation: Carry through pipe support.

Pr_80_77_76/760 Insulation not carried through pipelines supports

Shared by: Pr_80_77_76_62 Phenolic foam insulation

1. Insulation at supports: Provide aluminium end caps.

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Ss_60_40_17/621 Installing variable refrigerant flow systems generally ADDED

1. Standards: To BS EN 378-3 and BS EN 378-4.
2. Fixing of equipment, components and accessories: Fix securely on purpose-made bases or supports.
3. External units: Protect from high winds. Prevent snow, leaves and debris from blocking air flow.
4. Access: Provide for inspection and servicing of heat pumps and ancillary equipment.
5. Refrigerant lines: Short and straight.
6. Location of outdoor units: Away from windows and adjacent buildings.

System completion

Ss_60_40_17/811 Commissioning of refrigerating systems ADDED

1. Pre-commissioning: In accordance with CIBSE Commissioning Code R.
2. Commissioning: In accordance with CIBSE Commissioning Code R.
3. Notice (minimum): 1 week.

Ss_60_40_17/820 Performance testing ADDED

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.
   - 4.2. Number: Three.
   - 4.3. Duration of loan: 1 week.
5. Reports: Submit on completion.

Ss_60_40_17/831 Inspection and test records ADDED

1. Construction phase reports: System design is commissionable. Post-installation. System cleanliness. 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_60_40_17/841 Demonstrations ADDED

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

Ss_60_40_17/851 Documentation ADDED

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.
   1.4. Number of copies: Two.
2. Record drawings
   2.1. Contents: Location and arrangement of plant in plant rooms. Location, size and route of mechanical 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_17/861 Servicing and maintenance ADDED

1. Requirement: Undertake for 12 months after completion.

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_60_40_37_28
[M][F][P] Electrical resistance trace heating systems ADDED

Systems

Ss_60_40_37_28 [M][F][P] Electrical resistance trace heating systems ADDED

1. Description - Electric Trace Heating:

The system comprises / includes for the following:

1. Freeze protection for external domestic cold water pipework and pipework running through external and unheated areas.
2. BMS volt free contact output from each installed system.
3. All manufacturers ancillary items as recommended for a complete and working installation.

Trace heating to be as nVent (Raychem) Thermal management or better and approved. Details of system as below:

Type 10.XL.2: pipework 15mm to 100mmØ using RayClic cable jointing

Type 26.XL.2: pipework 125mm and above using RayClic cable jointing

Control: self regulating

Control set point: 5°C

Control Unit: AT-TS-13 complete with BMS interface

Max length per control unit:

Type 10.XL.2: 215 mts based on 20amp circuit breaker.

Type 26.XL.2: 135 mts based on 20amp circuit breaker.

If the air temperature within the areas identified falls below a pre-set value, initially set at 2.0°C (adjustable), the electric trace heating shall be enabled. This shall then maintain the pipework system at 5.0°C under it's own thermostatic controls.

Provide warning labels every 3mts along length of pipework plus at each change of direction.

Provide additional protection for valves 50mmØ and above where exposed to risk of freezing.

The Contractor is to make due allowance for all necessary power supplies required to provide a fully functioning system as described within this section of the specification.

1.1. Control and Monitoring Functions:: The following control and monitoring functions shall be required for this system:

Trace heating system enabled
Trace heating system fault (Critical)
External temperature.
Enclosed / sheltered plantrooms temperature.

1.2. Power:: Power to the trace heating is derived from the electrical distribution board via a local isolator. The isolator is installed under the electrical contract, with final connection from the isolator undertaken by the electrical contractor.

2. Description - Hot Water Electric Temperature Maintenance Tape:

The system comprises / includes for the following:

1. Uncirculated lengths of hot water flow pipework in accordance with HSE anti-legionella guidelines. This includes HW flow pipework withing rooms / areas where HW return run has terminated outside the space.
2. BMS volt free contact output from each installed system.
1. All manufacturers ancillary items as recommended for a complete and working installation.

Hot water temperature maintenance tape to be as nVent (Raychem) Thermal management or better and approved. Details of system as below:

System Type HWAT-M:

Control: self regulating

Control set point: 55°C

Control Unit: HWAT ECO complete with BMS interface

Max length per control unit:

100 mts based on 20amp circuit breaker

Provide warning labels every 3mts along length of pipework plus at each change of direction.

Utilise RayClic cable jointing.

Circuit breaker (TYPE C) per unit dependant on cable length, maximum size 20A.

30mA residual current device per control circuit.

The Contractor is to make due allowance for all necessary power supplies required to provide a fully functioning system as described within this section of the specification.

2.1. Control and Monitoring Functions:: The following control and monitoring functions shall be required for this system:

Maintenance tape system enabled
Maintenance tape system fault (Critical)

2.2. Power: Power to the temperature maintenance system is derived from the electrical distribution board via a local isolator. The isolator is installed under the electrical contract, with final connection from the isolator undertaken by the electrical contractor.

3. System performance: Ss_60_40_37/211 Design of electrical resistance trace heating systems in non-explosive atmospheres; Ss_60_40_37/231 Service conditions
4. Application: Freeze protection. DHW temperature maintenance.
5. Heat emitters: Series resistance trace heating cables and tapes
6. Controls: Pr_75_50_76_27 Electronic trace heating thermostats; Pr_75_50_18_26 Electric trace heating control and monitoring panels
7. Ancillary components: End terminations. Trace heating junction boxes. Power connections.
8. Execution: Ss_60_40_37/631 Heat trace and equipment labelling; Ss_60_40_37/621 Installing electrical resistance trace heating systems
9. System completion: Ss_60_40_37/811 Testing and commissioning electrical resistance trace heating systems; Ss_60_40_37/821 Documentation; Ss_60_40_37/841 Maintenance

System performance

Ss_60_40_37/211 Design of electrical resistance trace heating systems in non-explosive atmospheres ADDED

1. Design: Develop the Stage 4A electrical resistance trace heating and DHW temperature maintenance system requirements to contractor information
2. Standards
   2.1. Safety: To BS EN 60519-1 and BS EN 60519-10.
   2.2. Generally: To BS EN 62395-1 and in accordance with BS EN 62395-2.
3. Application: Critical.
4. Components: Flanges. Pipes. Valves, Gutters
5. Material: Metallic.
6. Performance criteria
   6.1. Maintenance temperature: Above 2°C. Above 5°C.
   6.2. Set point control: Maintain process temperature within ±5°C of the controller setting.
7. Requirements: Submit proposals, including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_60_40_37/231 Service conditions ADDED

1. Environment: External. Internal.
2. Ambient temperature (minimum): -5°C.

3. Ambient temperature (maximum): 35°C.

Products

Pr_75_50_18_26 Electric trace heating control and monitoring panels ADDED

1. Standards: To BS EN 60730-1 and BS EN 60730-2-9. To BS EN 61010-1. To BS EN IEC 60079-0 and BS EN 60079-1. To BS EN IEC 60079-0 and BS EN IEC 60079-7.
2. Application: Ambient air sensing. Surface sensing (line sensing).
3. Controller
    3.1. Communication
        3.1.1. Network protocols: Volt free contacts
4. Switch arrangement
5. Enclosure
    5.1. Visual indication: LED indication for output relay status.
    5.2. Mounting type: Wall.
6. Execution: Pr_75_50_18/660 Installing temperature control and monitoring units

Pr_75_50_76_27 Electronic trace heating thermostats ADDED

1. Standards: To BS EN 60730-1 and BS EN 60730-2-9. To BS EN IEC 60079-0 and BS EN 60079-1 or BS EN IEC 60079-7.
2. Application: Ambient air and surface.
3. Accessories: Pipe mounting bracket. Sensor support bracket. Sensor.
4. Execution: Pr_75_50_76/655 Installing trace heating electronic thermostats

Execution

Pr_75_50_18/660 Installing temperature control and monitoring units ADDED

1. Programming
    1.1. Alarms
        1.1.1. Configuration: In accordance with the requirements of the design and the manufacturers' instructions.

Pr_75_50_76/655 Installing trace heating electronic thermostats ADDED

1. Standards: In accordance with BS EN 62395-2 and BS 7671. In accordance with BS EN 60079-30-2 and BS 7671.

Ss_60_40_37/621 Installing electrical resistance trace heating systems ADDED

1. Standards: In accordance with BS EN 62395-2 and BS 7671. In accordance with BS EN 60079-30-2 and BS 7671.
2. Coordination with other works: Do not commence installation of the trace heating system until all work on the pipes or vessels to be protected is complete.
3. Components
    3.1. Accessories: Install all mounting brackets for controllers, thermostats and other equipment prior to the installation of heating cables and tapes.

Ss_60_40_37/631 Heat trace and equipment labelling ADDED

1. Standards: To BS EN 62395-1. To BS EN IEC 60079-0 and BS EN 60079-30-1.

2. Location of labels
   2.1. Trace heating: Fix labels warning of the presence of trace heating to the outside of the thermal insulation and weather barrier at 3 m intervals, alternating on either side of the pipe.
   2.2. Equipment: Directly fixed to the equipment when the size of unit allows or, where this is not practicable, on a separate label fixed immediately adjacent (within 75 mm) of the piece of equipment. Labels should be visible after installation of the equipment, thermal insulation and weather barrier.

System completion

Ss_60_40_37/811 Testing and commissioning electrical resistance trace heating systems ADDED

1. Standards: In accordance with BS EN 62395-2 and BS 7671. In accordance with BS EN 60079-14, BS EN 60079-30-2 and BS 7671.
2. Coordination with other works: Do not commence commissioning of the trace heating system until the installation of the thermal insulation and weather barrier is completed.
3. Enclosures: Free from moisture and foreign objects, lids fitted securely and glands where installed are of the correct type for the environment and area classification.
4. Alarms and monitoring: Verify the correct operation of all equipment.
5. Maintenance temperature: Confirm that the maintenance temperature is achieved within the time allowed, as required by the design performance criteria. Confirm that the trace heating can maintain the surface temperature above the value required by the design performance criteria.

Ss_60_40_37/821 Documentation ADDED

1. Standards: In accordance with BS EN 62395-2. In accordance with BS EN 60079-14 and BS EN 60079-30-2.
2. Record drawings
   2.1. Drawing format: A1 paper print drawing. Electronic drawing.
   2.2. Number of copies: Two.
   2.3. Submittal date: At handover.
3. Commissioning record: Provide as a part of the final documentation

Ss_60_40_37/841 Maintenance ADDED

1. Standards: In accordance with BS EN 62395-2 and BS 7671. In accordance with BS EN 60079-30-2 and BS 7671.
2. Duration: Until 12 months after practical completion.
3. Frequency of inspections: Before the first winter of operation.

Ω End of System

Ss_60_40_37_48
[M] Low temperature hot water heating systems ADDED

Systems

Ss_60_40_37_48 [M] Low temperature hot water heating systems ADDED

1. Description:

The heating installation generally comprises / includes for the following:

1. 5no. high efficiency, low NOx gas fired boilers
2. Individual boiler module primary shunt pump sets
3. Hot water generation heating CT secondary circulating pump set
4. Pressurisation and expansion set
5. Chemical dosing pot incorporating side stream filtration
6. Air separator
7. Boiler flues to roof level
8. Energy Metering
9. Flexible connection to the suction / discharge of each pump set
10. Air cocks at each high point and drain cocks at each low point
11. Valves & end of line bypass arrangement
12. Controls interface to BMS system. Refer to control strategy section of this specification
13. All valves, strainers, binder test points, gauges, flexible mounts, couplings, expansion loops, bellows, anchor points, anti-vibration devices, bracketry and supports & commissioning required to make a complete and working installation.

1.1. Boilers:

The LTHW system will be the primary means for generating domestic hot water. The building's heating plant will consist of 5no. high efficiency low NOx, gas fired, premix, fully modulating, condensing boiler modules supplied in a cascade arrangement supported on a floor mounted frame. The system shall be supplied complete with a manufacturers flow and return water header and gas header kit. The water headers shall include a low loss header with integral dirt and air separation features.

Boilers are to be provided with:

1. Menu driven microprocessor controls for comprehensive operating and service diagnostic facility
2. 1no. NABIC safety valve, complete with copper discharge pipe terminating 50mm above finished floor level
3. 1no. Hose union drain cock and key
4. 1no. High limit sensor
5. Primary shunt pump module controllers

Each boiler shall comprise individual modules with each module provided with the following (all as detailed on the central plant heating schematic):

1. Flue connection

2. Gas manifold connection
3. LTHW flow and return connections

The boilers are to be Veissmann or better and approved as per the equipment schedule.

The boilers are to operate on an 80°C / 60°C flow and return temperatures.

The boiler plant shall operate under the dictates of an automatic controls system.

Any damaged casings shall be replaced with new casings at the contractors cost.

The boilers shall be installed in accordance with the manufacturer's recommendations and shall be commissioned by the manufacturer.

1.1.1. BREEAM Requirement: Boiler must be selected to achieve the necessary credits for BREEAM as detailed within the equipment schedules. The contractor will be responsible for all costs associated with replacing a boiler that does not conform to stated Nox level threshold.

1.2. Flue Systems: Provide a twin walled flue, with a 316 grade stainless steel internal skin, a 25mm insulated annulus and a 304 grade stainless steel external skin, from each boiler to a common vertical flue stack complete with a 25mm insulation infill

The joints shall be sealed with a high temperature silicone sealant and locking bands. Each boiler flue shall be complete with a stainless steel draught stabiliser as deemed necessary by the specialist flue designer.

Flue arrangements shall be supplied / installed through Specialist Flue Services or equal and approved.

1.3. Circulating Pump Sets:

1.3.1. General: All pump sets are to be provided as twin head variable speed in line units based on a duty / standby arrangement.

The contractor must include for calculating the external pressure drop for each pump set based on their installation drawings prior to ordering. Where the calculated figures differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the pump selection accordingly. If an undersized pump has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement motor / pump unit at their own expense.

Primary shunt pumps serving each boiler module are to be single head fixed speed units and are remote to each boiler module, provided and installed by the contractor.

The final connections to the pump suction and delivery ports shall be carried out using

line size type anti-vibration couplings as manufactured by Engineering Appliances Ltd, or equal and approved, suitable for the medium conveyed.

Pipework to the pumps shall be so arranged such that no undue strain is placed on the pump set due to expansion or contraction or weight of adjacent pipework and valves. All heating circulating pump sets shall be variable speed, inverter control sets as detailed in the schedules with pressure transducers located in the distribution pipework as detailed on the schematic.

Pressure / temperature gauges shall be installed on inlet and discharge of each pump set. Strainers shall be provided within each individual pump set configuration, upstream of the pump.

The pumps to be closed coupled or inline vertical pump sets dependant on the system duty. All pumps to operate at a maximum speed of 1450 rpm. All pump sets to be fitted with non-return valves as detailed on the schematic. Each pump set shall include a pressure gauge on the inlet and outlet connections.

Two port pressure independent control valves (PICVs) shall be fitted on each calorifier feed.

The domestic hot water primary pump set will have differential pressure sensors installed integral to the pump set.

Provide pump anti-vibration mounts and flexible connections to the suction / discharge of each pump set.

1.3.2. Pumped Circuits:

Pumped circulation circuits are as follows:

- circuit 1: secondary circuit running at 80°C / 60°C serving the level 04 domestic hot water generation plant.

1.4. Pressurisation and Expansion Set: A pressurisation unit shall be provided complete with controls package and pressure regulator located within the boiler plantroom. The unit shall include volt free contacts for remote alarm facilities. Expansion vessel will be provided as detailed on the plantroom drawing and schedules.

The contractor must confirm the system water content to the manufacturer prior to ordering for accurate expansion vessel sizing.

1.5. Dosing Pot: A compact 4.5 litre chemical dosing pot incorporating dirt & air separation, magnetic filtration and side stream filtration shall be provided in the positions indicated on the drawings.

The unit should be used as part of the system Pre Commission cleaning to reduce effluent water during the flushing procedure, therefore the contractor should make allowance for additional filters as required.

The Sub-Contractor shall, on completion, provide a pre-commission chemical clean using an approved proprietary product.

Refer to clause Pr_60_55_97_12 for further details.

1.6. Combined Air/Dirt Separator:

A combined air / dirt separator shall be provided as detailed on the schematic.

1.7. Pipework & Thermal Insulation: All pipework is to be routed in steel and is to be thermally insulated (including valve sets) as detailed within this specification / equipment schedules.

Where pipework passes laterally through a fire fighting lobby (in ceiling void), all associated fixings must be fire-rated and the thermal insulation applied within this zone must similarly be fire-rated. No valves or fittings are permitted to be located within the demise of a fire-fighting lobby area.

1.8. Energy Metering: Provide energy / heat metering for BMS logging of energy as indicated on the system schematics.

The M&E Contractor shall liaise with Building Control and obtain Building Control approval of the energy metering for the works. All additional items required by Building Control shall be provided. The submission of the energy metering strategy shall be issued to Building Control for approval prior to any works commencing.

Energy use and sub-metering shall meet Building Regulation and CIBSE TM39 requirements as a minimum.

Metering components to include:
• LCD display (minimum 8 digit read)
• Flow probe
• Return probe
• All necessary wiring – to installed positions

The M&E Contractor is to confirm flow rates and pipe sizes etc. prior to ordering equipment.

Flow meters to have a correct MINIMUM distance of straight pipe before the meter, as required by meter manufacturer.

The M&E Contractor shall include for all power wiring, controls wiring, containment and ancillaries to prove a full and complete energy metering installation.

1.8.1. Staff training: The M&E Contractor shall include within the tender costs for training the Client's maintenance operative/representative(s) in all aspects of the energy metering installation, systems and their operation. The full and complete understanding of these systems by the Clients' maintenance operative shall be a pre-condition of practical completion.

1.9. Thermal Expansion & Contraction:

1.9.1. Thermal Expansion & Contraction: Where possible provision for movement due to thermal expansion and contraction shall be made by natural changes in the direction of pipework.

Anchors and guides shall be positioned to contain all movement and resist the

maximum loads imposed.

Anchors and guides are to be located at points which prevent excess stresses on pipework, joints and equipment connections.

Similar provisions shall be made for building movement or building settlement.

1.9.2. Expansion Joints: Where natural flexing of the pipework is not practicable thermal and building movement shall be accommodated by the use of expansion joints.

Expansion joints may be of the restrained or unrestrained type and shall be provided with welded, screwed or flanged ends as appropriate.

Expansion joint convolutions shall be of a thick wall spirally wound multi-ply construction with a corrosion resistant inner ply in AISI 316Ti stainless steel.

Expansion joins shall be capable of not less than 5,000 complete reversals of movement at the given working conditions and the manufacturer shall be able to produce calculations to that effect, in full compliance with EJMA (Expansion Joint Manufacturers Association).

Expansion joints shall be capable of withstanding a pressure 1.5 times their design pressure without deformation.

Expansion joints and their corresponding anchors and guides shall be indicated on the drawings.

Prior to commencement of the installation, the contractor must agree with the bellows manufacturer to visit site to ensure his guidelines for selection and installation are adhered to, and that the anchors and guides are correctly positioned to ensure that the bellows function as intended. Prior to application of heat onto the systems, the bellows manufacturer is to visit site to check the bellows installation.

All the above to be agreed with the bellows manufacturer prior to placing an order.

1.9.3. Unrestrained Expansion Joints: Axial expansion joints shall only be used in positions where their pressure thrust can be contained by adequate anchor points. The manufacturer shall submit calculations for loadings on main anchors. Recommended guide spacing must be strictly adhered to.

Axial expansion joints as BOA Group or equal and approved.

1.9.4. Restrained Expansion Joints: Restrained expansion joints should be used for angular or lateral movement. These restraints shall be capable of absorbing the full pressure thrust of the bellows.

Angular expansion joints shall be of the thick wall spirally wound multi-ply construction and be used in pairs or in threes. Angular expansion joints as BOA Group or equal and approved.

Lateral expansion joints shall be of the thick wall spirally wound multi-ply construction and be fitted with threaded tie bars and low friction self lubricating hemispherical nuts allowing movement in two planes. Lateral expansion joints as BOA Group or equal and approved.

1.9.5. General: Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this system including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the design team.

All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.

1.10. Flexible Connections: Flexible connections shall be fitted to all pump suction and discharge connection and other centrifugal reciprocating or vibrating equipment where it is marked on the drawing, and where anti-vibration mounts or inertia bases are fitted.

Rubber bellows shall be fitted as close to the sources of vibration as practicable. The pipe at the other end of the bellows shall be fixed points.

Rubber bellows shall be a single convolution of multi ply reinforced EPDM rubber with wire reinforced cuffs. Flanges shall be able to swivel and be removable. The date of manufacture shall be moulded on the bellows. For traceability membranes shall have an indelible identification showing manufacturer, country of origin, the type and a batch number.

Tie bars with rubber top hat washers shall be used where the working pressure exceeds 1.5 bar G.

Where untied bellows are used the manufacturers recommendations for anchors and guides shall be followed. Tie bars shall be threaded and their length adjustable.

All flexibles used on heating circuits shall have a design life of 120 months at 100°C and after this time have a minimum burst pressure of 30 bar, and be in compliance with DIN 4809 Part 1.

For working temperatures up to 70°C the rubber bellows shall be high tensile synthetic fibre reinforced.

For working temperatures between 70°C and 100°C the bellows carcass shall be aramid reinforced throughout.

Aramid reinforced bellows shall be manufactured and approved to the recognised European standard, DIN.4809 Part 1 as BOA Group or equal and approved.

Flexible connections with screwed connections shall be reinforced EPDM rubber hoses and shall have at least one full union to avoid torquing on installation.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this system including all component details and layout drawings

showing the locations of all components - for approval by the design team.

Flexible connections shall be as supplied by BOA Group or better and approved.

1.11. Valves & End of Line Bypass Arrangement: At the end of the secondary branch, install a constant flow valve set at 2% of the total branch flow rate in order to mitigate dead legs and maintain temperature.

Each flow branch to be provided with an isolating valve. each return branch to be provided with an isolating valve and metering station (orifice plate).

All valves, control valves and manifold sets shall be provided with pre-fabricated moulded removable thermal insulated jackets. Insulated jackets shall have a hard shell system, all as manufactured by ThermaXX Jackets or better and approved.

All valves (including PICVs) are to be based on Flocon Valves (contact Dennis 07802 889890) or better and approved.

2. System performance: Ss_60_40_37/210 Design of heating systems; Ss_60_40_37/220 Basic design temperatures for heating systems; Ss_60_40_37/225 Design temperature schedule; Ss_60_40_37/250 System operating parameters for water-based heating systems; Ss_60_40_37/260 Heating system capacity; Ss_60_40_37/275 Variable flow pipework systems; Ss_60_40_37/280 Chemical treatment for heating systems
3. Arrangement: Two-pipe.
4. Distribution: Variable flow, constant temperature.
5. Heat source: Pr_60_60_08_34 Gas fired condensing boilers
6. Burner
   6.1. Arrangement: Supplied with boiler. Integral to boiler.
   6.2. Type: Pr_60_60_10_30 Forced draught gas burners
7. Fuel: Natural gas.
8. Flues and chimneys: Pr_70_65_30_51 Metal flues and chimneys
9. Solid fuel equipment
   9.1. Accumulators: Pr_60_50_20_02 Accumulators
   9.2. Accumulator accessories: Pr_65_52_34_66 Pressure gauges; Pr_65_54_95_75 Safety valves; Pr_65_52_34_88 Temperature gauges
10. Pressurization units: Pr_65_53_86_68 Pressurization units
11. Pumps: Pr_65_53_86_11 Canned rotor pumps; Pr_65_53_86_15 Close-coupled in line pumps
12. Water treatment plant
    12.1. Equipment: Pr_60_55_97_12 Chemical dosing pots
    12.2. Chemicals: Pr_60_55_96_16 Corrosion inhibitor chemicals for closed circuits; Pr_60_55_96_06 Bacteria and biofouling inhibitors
13. Pipelines: Pr_65_52_63_17 Copper pipelines; Pr_65_52_63_82 Steel pipelines
14. Pipeline ancillaries
    14.1. Venting devices: Pr_65_54_93_05 Automatic air vents; Pr_65_54_93/610 Air bottles
    14.2. Expansion devices: Pr_65_67_28_03 Angular expansion compensators; Pr_65_67_28_05 Axial expansion compensators; Pr_65_67_28_46 Lateral expansion compensators
    14.3. De-aerators: Pr_65_67_22_88 Temperature differential de-aerators
    14.4. Separators: Pr_65_55_76_15 Combined air and dirt separators
    14.5. Gauges: Pr_65_52_34_66 Pressure gauges; Pr_65_52_34_88 Temperature gauges

14.6. Accessories: Pr_65_52_61_50 Masking plates; Pr_65_52_61_63 Pipe sleeves; Pr_65_57_96_04 Angle water strainers; Pr_65_57_96_08 Basket water strainers

14.7. Pipeline supports: Pr_20_29_14_07 Beam clamps; Pr_20_29_14_08 Beam clips; Pr_80_77_27_15 Channel supports; Pr_20_29_14_65 Pipe clips

15. Valves

15.1. Isolating valves: Pr_65_54_95_06 Ball valves; Pr_65_54_95_81 Steel ball valves; Pr_65_54_95_82 Steel globe valves; Pr_65_54_95_08 Butterfly valves; Pr_65_54_95_15 Copper alloy gate valves; Pr_65_54_95_16 Copper alloy globe valves

15.2. Check valves: Pr_65_54_95_83 Steel globe stop and check valves; Pr_65_54_95_14 Copper alloy check and double check valves

15.3. Regulating valves: Pr_65_54_95_30 Flow measuring valves; Pr_65_54_95_26 Double regulating valves

15.4. Balancing valves: Pr_65_54_95_63 Pressure independent control valves

15.5. Mixing valves:

15.6. Draining devices: Pr_65_54_95_27 Draining taps

15.7. Accessories: Pr_65_54_95_75 Safety valves; Pr_65_54_93_87 Test points

16. Thermal insulation: Pr_80_77_76_54 Mineral wool pipe section insulation; Pr_80_77_76_62 Phenolic foam insulation

17. Vibration isolation: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_30 Flexible vibration isolation hoses; Pr_80_77_94_40 Inertia bases; Pr_80_77_94_42 Isolation hangers; Pr_80_77_94_60 Pad mountings; Pr_80_77_94_74 Rubber bellows; Pr_80_77_94_84 Spring isolators

18. Controls: Ss_75_70_52_36 [M] Heating system control systems

19. System accessories: Pr_80_77_27_73 Roof equipment supports

20. Plant and equipment identification: Pr_40_10_57_29 Equipment labels and warning notices; Pr_40_10_57_78 Self-adhesive colour pipe bands; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels; Pr_40_10_57_60 Paper valve charts and schematics; Pr_40_10_57_28 Engraved valve identification labels

21. Execution: Ss_60_40_37/620 Installing water based heating systems; Ss_60_40_37/670 Installing water treatment for 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

22. System completion: Ss_60_40_37/830 Commissioning boiler plant; 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; Ss_60_40_37/880 Servicing and maintenance

Ss_75_70_52_36 [M] Heating system control systems ADDED

1. Description:

1.1. Boilers: Demand for heating will be determined by either (i) the optimum start / stop controller or (ii) where there is a demand for heating on the secondary LTHW circuit (signalled by the operation of a control valve).

Arrange the boiler installation to operate with cascade control.

The lead gas fired boiler shall be enabled in the following sequence:

The lead boiler module is to be provided with a pump module controller which will operate the respective shunt / primary pump arrangement and prove flow prior to firing the boiler.

The secondary circulating pump(s) will be enabled and prove flow prior to firing the boiler.

The boiler shall then use its own integral electronic controls to modulate the fully modulating burner to maintain the primary LTHW flow water temperature at 80°C with a return temperature of 60°C.

Automatically initiate the lag boiler in the event of the failure of the lead boiler, with the appropriate alarm being transmitted to the MCP.

If the temperature sensor in the flow header registers a condition less than 75°C (after a 15 min time lag -adjustable), the BMS will send a signal to enable the second module / boiler. This cascade process will continue until either the flow temperature is satisfied or all boiler modules have been enabled. Similarly, under part load conditions, if the temperature sensor registers an over-heat (85°C+), the BMS will knock-off modules as required after a pre-set period. Each boiler is interfaced with its own shunt pump and will shut it off after a pre-set time has elapsed following the respective boiler being disabled.

The lead gas fired boiler shall be varied on a pre-set number of hours run, initially set at 170 (adjustable), to ensure even usage of the central plant.

Each boiler shall incorporate its own integral temperature and safety controls which shall cut the supply to the boiler if overheating occurs. The boilers shall come complete with an advanced menu driven microprocessor comprising comprehensive operation and diagnostic facility.

The boilers will be set-up to maintain a constant 80°C primary flow in the main header. A volt free common alarm shall be provided from each boiler to indicate fault condition on the mechanical control panel / BMS.

Each boiler module shall be interlocked with its respective shunt pump set to prevent firing of the module on pump / water flow failure.

Each boiler shall be interlocked with the pressurisation unit to prevent firing of the boilers in the event of unit failure.

On boiler plant shut down, the shunt pump shall run on for 15 minutes to dissipate residual heat from the boiler.

The heating primary circulating pumps shall also run on for 15 minutes once the heating has been shutdown by the controller.

The boiler room is naturally ventilated. The Contractor is to ensure that the ventilation rates required are achieved via louvres / air inlet openings.

The operation of the boilers are to be interlocked with the main gas solenoid valve.

1.1.1. Control and Monitoring Functions:

The following shall be controlled and monitored for each boiler by the BMS:

- Boiler enable
- Hours run
- Primary Water flow
- Gas consumption
- Primary inlet temperature
- Primary outlet temperature
- High temperature cut-out for each boiler

- Low temperature cut out for each boiler
- Control circuit live
- All internal faults / alarms generated by the boiler control panels

1.1.2. Power: Power to the boilers is derived from the electrical distribution board via a local isolator. The isolator is installed under the electrical contract, with final connection from the isolator undertaken by the electrical contractor.

1.2. Pumped Circuits:

1.2.1. General Requirements: The pumps shall only run when there is demand for them to operate and the static pressure of the circuit served is in normal condition.

Duty pump set selection shall be by a numeric point having automatic weekly duty changeover to ensure even wear on the central plant

In the event of a lead pump failure the duty shall automatically changeover to the standby pump.

A pump trip input shall be provided from the overload contacts of each pump and configured to alarm when on.

A differential pressure switch shall be provided on each pump set and connected as an input to monitor flow conditions. This input is to be configured to alarm when the flow has failed and the pump is enabled with visual indication on control panel fascia of 'FLOW FAILURE' and 'FLOW PROVEN' for each pump.

Pump overload trip condition shall be monitored by the BMS with visual indication on control panel fascia of 'RUN' and 'TRIP' for each pump. Following a failure of the duty pump, should the differential pressure sensor register a fail condition for the standby pump, it shall be left enabled by the BMS with a critical alarm generated.

If there is no hot water primary demand on the secondary circuit, the pumps are to be disabled after a 15 minute overrun for heat dissipation.

Three position OFF/AUTO/MANUAL selector switch shall be provided for each set of pumps with run and trip display lamps on the motor control panel. Each switch is to be monitored to identify 'Out of Auto' status and raise an alert at the head-end.

The start and stop times for the system shall be optimised by the BMS based on the previous 7 days performance. Initially the system shall be set to start and stop at 07.00 and 23.00 (both adjustable).

1.2.2. Primary CT Pumps (serving low loss header): The flow temperature set point of the primary CT circuit shall be set by a numeric point (nominally 80°C).

The primary pump sets serving the low loss header shall have integral inverter driven, direct-coupled motors to give capacity control of the circuit in order to modulate as necessary to achieve the design flow temperature set-point.

The pump sets are to be interlocked with the operation of the secondary circuit circulation pump sets such that if the secondary circuit calls for heating the BMS system

shall send a request to enable the primary pump set.

Temperature sensor inputs shall be provided in the common flow and common return to / from the low loss header.

The low loss header is provided with a flow meter between the flow and return sections. Should short-circuit flow be detected from the return to the flow portion, then the primary pumps must ramp up accordingly to ensure a minimal positive flow to the return portion.

1.2.3. Secondary CT Pumps: The flow temperature set point of each CT secondary circuit shall be set by a numeric point (nominally 80°C).

The pumps serving the hot water generation shall have integral inverter driven, direct-coupled motors to give capacity control of the circuit.

The pump sets are to be interlocked with the operation of the respective circuits' PICVs and control devices such that if the secondary circuit calls for heating the BMS system shall enable the respective pump set and heating plant.

Each circulating pump shall be enabled by a separate digital output from the BMS system, unless its inverter driven in which case signal shall be analogue based.

Temperature sensor inputs shall be provided in the flow and return of each circuit.

The minimum flow shall be 15% of any secondary pump set to prevent overheating in the pump.

The pumps shall only run when there is demand for them to operate and the static pressure of the circuit served is in normal condition.

Power to all system PICVs will be derived from the control outstations with all associated works including final connections undertaken by the controls specialist.

1.2.4. Domestic Hot Water Primary Pumps: The flow temperature set point of the CT secondary circuit shall be set by a numeric point (nominally 80°C).

The hot water generation primary pumps shall have integral inverter driven, direct - coupled motors to give capacity control of the HWS Primary circuit.

The pump set is to be interlocked with the operation of each hot water calorifier 2-port valve such that if the HWS primary calls for heating (under the dictates of a hot water storage temperature sensor) the BMS system shall enable the pump set.

If there is no primary demand the calorifier's 2-port valves are closed and the heating installation will not operate unless in frost protection mode.

Temperature sensor inputs shall be provided in the common flow and common return of each HWS primary circuit.

The minimum flow shall be 20% of any pump to prevent overheating in the pump.

1.2.5. Control and Monitoring Functions (primary circuit):

The following shall be controlled and monitored for the primary pump sets listed above:

- Flow failure of each pump via pressure differential switch across the pump set. (Critical Alarm).
- Auto Changeover of duty pump on flow failure.
- Hours run for each pump.
- Power Absorbed for each pump
- Common flow temperature
- Common return temperature
- Speed of duty pumps
- System pressure
- Low loss header flow meter

1.2.6. Control and Monitoring Functions (secondary circuits):

The following control and monitoring functions shall be required for the CT heating circuit:

- CT heating pump enable
- CT heating pump failure
- CT heating pump auto-changeover
- CT heating circuit flow temperature
- CT heating circuit return temperature
- External ambient temperature
- Flow failure of each pump via pressure differential switch across the pump set (Critical Alarm).
- Hours run for each pump.
- Power Absorbed for each pump

1.2.7. Power: Power to the primary and secondary pumps will be derived direct from the electrical distribution board via local isolators. Each isolator shall be installed under the electrical contract, with final connection from the isolator undertaken by the controls specialist.

1.3. Heating System Pressurisation Set: The unit shall be supplied complete with its own integral controls to pressurise the system and provide cold water make-up. The panel shall be interlocked through the BMS so that any alarm signal on the unit isolates the boilers and pumps.

1.3.1. Control and Monitoring Functions:

The following control and monitoring functions shall be required for this system:

- Supply Live
- High Pressure Alarm (Critical)
- Low Pressure Alarm (Critical)
- Hours Run
- Pump Starts per Hour (Alarm)

- All other alarms generated by the pressurisation set control panel

1.3.2. Power: Power to the pressurisation sets will be derived direct from the electrical distribution board via a local isolator. The isolator is installed under the electrical contract, with final connection from the isolator undertaken by the controls specialist.

1.4. Chemical Dosing Pot Incorporating Side Stream Filtration: Unit to be fitted with a PD (differential pressure) monitor which is to provide a volt-free signal to the BMS to enable a 'filter media check' alert.

1.4.1. Control and Monitoring Functions:

The following control and monitoring functions are required for the chemical dosing pot:

- volt free contact to BMS for filter media notification

1.4.2. Power: Power to the degasser is derived from the electrical distribution board via a local isolator. The isolator is installed under the electrical contract, with final connection from the isolator undertaken by the electrical contractor.

1.5. Hot Water Generation:

Refer to clause Ss_75_70_52_96

1.6. Heat Meters:

Heat meters to be provided on the LTHW flow / return branches as indicated on the schematic. The heat meters will be connected to the BMS network to enable data collection for analysis / monitoring and interrogation.

The meter will have the facility to log / monitor the following and communicate via pulsed output:

- Instantaneous heat consumption
- Instantaneous flow rate
- kWh consumed
- Total heat consumption
- Flow temperature
- Return temperature

1.6.1. Power: Power to each heat meter shall be derived from a local switched fused spur provided under the electrical contract. Final connections between the fused spurs and the control module are to form part of the controls specialists' scope of works.

1.7. Emergency Plant Shut Down:

The gas supply to the venue shall be isolated by shutting the gas solenoid valve when any of the following items of equipment operate:

- Emergency Knock Off Button (boiler room by main exit)
- Electrothermal Link No. 1 above boiler #1
- Electrothermal Link No. 2 above boiler #2

- Electrothermal Link No. 3 above boiler #3
- Electrothermal Link No. 4 above boiler #4
- Electrothermal Link No. 5 above boiler #5
- Fixed Gas Detection and alarm system
- Mains Power Failure
- Fire Alarm System (via hard-wired interface provided by specialised fire alarm contractor)

Refer to clause Ss_75_50_28_30 for details of fixed gas detection and alarm system.

A thermal link should be fitted above each boiler and connected with the gas safety system. In the event that a thermal link reaches a temperature of 72°C, it will send a signal to the gas safety system and close the gas solenoid valve.

Visual indication of an emergency plant shut-down shall be shown on the mechanical control panel along with an Audible alarm. The operation of any of the above signals shall also generate an alarm on both the Fire Alarm Panel and at the security / reception location, labelled as "Heating Plant Emergency Shut-down".

In all shut down scenarios above, the gas solenoid valve shall remain closed until the reset buttons on the fascia of the control panel is depressed and the alarm has been cleared.

The gas isolation system shall include a Fire Alarm Bypass which gives the user the ability to have use of the gas for a pre-set time whilst the fire alarm is being tested.

The gas isolation safety system is to be manufactured by S&S Northern Ltd (Merlin range) or approved equivalent.

1.8. Fire Alarm: Heating Installation: On receipt of a fire alarm signal from the fire alarm system, all heating plant shall shut down. Interface to fire alarm system will be direct hard wired and not software driven. The electrical contractor is responsible for the hard-wired interface to each mechanical control panel with final terminations undertaken by the controls specialist.

In all shut down scenarios above, the plant shall remain disabled until the fire alarm system has been reset and the alarm cleared.

Note that a single volt free contact shall be provided from the fire alarm panel, to accept a voltage at no more than 24 V DC.

1.9. Electric Radiators: Electrical panel radiators are provided to stair cores exposed to external conditions as indicated on the drawings and schedules.

These radiators are to provide background heating for frost protection only.

Thermostatic sensors shall ensure that the temperature within the stair cores is maintained at 11°C.

Power for these radiators is to be derived from the local distribution boards, as dictated by the electrical design requirements.

The radiators shall be controllable via the BMS. Any local controls are to be provided with tamper-proof facilities.

2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Start and stop control: Ss_75_70_52/202 Boost fixed time; Ss_75_70_52/203 Domestic hot water demand; Ss_75_70_52/205 Hand off auto switch; Ss_75_70_52/207 Low temperature interlock signals for plant protection; Ss_75_70_52/210 Optimum start and stop heating; Ss_75_70_52/211 Pump overrun; Pr_75_51_17_89 Time switches (integral to BMS outstations)
4. Heating plant control strategies: Ss_75_70_52/221 Modular boilers control strategy
5. Pumps
   5.1. Equipment: Duplicate primary pumps (run and standby).
   5.2. Primary pumps control strategies: Ss_75_70_52/235 Constant speed pumps control strategy
   5.3. Secondary pumps control strategies: Ss_75_70_52/237 Variable speed pumps control strategy
6. Pressurization system control strategies: Ss_75_70_52/229 Sealed expansion vessel pressurization unit control strategy; Ss_75_70_52/228 Pump pressurization unit control strategy
7. Water distribution control strategies: Constant temperature / variable volume. Refer to description
8. Outlet control strategies: Ss_75_70_52/231 Heating secondary circuits control strategy; Ss_75_70_52/234 Storage calorifier control strategy
9. Equipment: Pr_75_50_18_94 Valve actuators; Pr_75_50_18_51 Mechanical services control panels; Pr_65_54_95_53 Motorized valves
10. Sensors: Pr_75_50_76_03 Air temperature sensors; Pr_75_50_76_31 Flow in pipe sensors; Pr_75_50_76_68 Pressure sensors; Pr_75_50_76_47 Liquid temperature sensors
11. Meters: Pr_80_51_51_37 Heat meters
12. Equipment interconnectivity: Wired.
13. Cables: As specified by the controls specialist
14. Containment: Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
15. Containment accessories: Pr_25_80_81_42 Intumescent linear gap seals
16. Rewireable installations: Required.
17. Concealed installations: Required.
18. Control equipment power supply: Mains supply.
19. 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_37/210 Design of heating systems ADDED

1. Design: Complete the design of the heating systems.
2. Method: In accordance with CIBSE AM11. Full dynamic thermal analysis.
3. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
4. Computer calculations
   4.1. Submittals: Pump sizing calculations. Pipe sizing calculations.
   4.2. Format: IES.

Ss_60_40_37/220 Basic design temperatures for heating systems ADDED

1. Design temperatures: Refer to design criteria schedule
2. External air temperature: Refer to design criteria schedule

Ss_60_40_37/225 Design temperature schedule ADDED

1. Room: Refer to design criteria schedule
2. Temperature °C: Refer to design criteria schedule

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

1. Design flow temperature: Refer to design criteria schedule
2. Temperature difference across primary heating circuit: 20°C.
3. Water velocity: Nominal 1 m/s.

Ss_60_40_37/260 Heating system capacity ADDED

1. Boiler output: Refer to equipment schedules
2. Boiler load (maximum): Refer to equipment schedules

Ss_60_40_37/275 Variable flow pipework systems ADDED

1. Design options: Incorporating differential pressure control valves.

Ss_60_40_37/280 Chemical treatment for heating systems ADDED

1. Treatment: In accordance with BSRIA BG 50/2013.
2. Fill water pre-treatment
   2.1. Water conditioning: Automated chemical dosing.
3. Chemical treatment
   3.1. Corrosion inhibition: Provide
   3.2. Bacteria and biofouling inhibition: Provide
   3.3. Scale inhibition: Provide
4. Non-chemical treatment
   4.1. Filtration: Strainers. Dirt separators.
   4.2. Deaeration: Passive de-aeration.

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/202 Boost fixed time ADDED

1. Boost operation
   1.1. Boost period and time: December, January and February, 2 h.
   1.2. Termination: When zone reaches heating set point temperature.

See Ss_75_70_52/203 Domestic hot water demand in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/207 Low temperature interlock signals for plant protection

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

1. Low outside air temperature condition
   1.1. Operation: When activated, start duty primary and secondary circuit heating pumps. Open primary and secondary heating circuit valves to allow water to circulate through circuits unless plant is in operating mode.
   1.2. Activation set point: Below 3°C
2. Low primary heating return water temperature condition
   2.1. Operation: When activated, start heat source and primary and secondary heating pumps if not already enabled
   2.2. Activation set point: Below 8°C

See Ss_75_70_52/210 Optimum start and stop heating in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Ss_75_70_52/211 Pump overrun in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/221 Modular boilers control strategy ADDED

1. Plant
   1.1. Boilers: Gas fired condensing boilers.
   1.2. Directly linked plant: Gas booster set.
2. Boiler off condition: Disable boiler and primary pumps provided overrun is finished.
3. Boiler firing: On/off.
4. Primary flow
   4.1. Operation: Prove flow before starting lead boiler. If not proved after start-up period, disable boiler and use following boiler in sequence as lead boiler
5. Sequence control strategy
   5.1. Operation: Disable last boiler first when primary return water reaches 73°C, disable boilers 3, 2 and 1 when primary return water reaches 76°C, 79°C and 83°C i.e. 3°C above the point at which they were enabled.
   5.2. Start up delay: Enable next boiler after three minutes of previous boiler firing

5.3. Shedding time delay: Allow five minutes before disabling successive boilers.

5.4. Boiler enabled set point deadband: 4°C

5.5. Boiler sequence change: Every 50 operating hours when plant is off.

5.6. Boiler sequence override: Provide a switch to inhibit the boiler sequence routine.

6. High limit temperature control thermostat
   6.1. Operation: When flow temperature exceeds set point, disable fuel supply and lock-out boiler. Keep isolating valves open for overrun period.
7. Boiler interlocks: Following boiler lock-out, reset via a switch on motor control panel.
8. Panic buttons
   8.1. Operation: Disable fuel supplies to boilers when pressed and raise a fuel valve closed alarm
   8.2. Position: At exit from plant room
9. Fuel detection
   9.1. Detectors: Gas detector above boiler.
   9.2. Activation: Disable fuel supply and shut down boiler via central control panel.
10. Fire alarm: When activated, disable fuel supply and stop all plant.
11. Alarm: Boiler lock out. High limit temperature alarm.
12. Manual alarm reset: At central control panel.
13. Linked equipment: Gas booster set, disable when gas valve is disabled, raise an alarm on failure.

See Ss_75_70_52/228 Pump pressurization unit control strategy in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/229 Sealed expansion vessel pressurization unit control strategy

ADDED

1. Pressure sensor
   1.1. Operation: A pressure sensor positioned in the primary flow circuit downstream of the primary pump will operate a pressurization pump when the pressure drops below the set point until the pressure set point is achieved.
2. High pressure switch
   2.1. Operation: When activated, disable boilers. Allow primary and secondary pumps to continue for run-on period. Raise a high pressure alarm. Hard wire interlocks
   2.2. Run on period: 10 minutes
3. Low pressure switch
   3.1. Operation: When activated, disable boilers and disable primary and secondary pumps. Raise a low pressure alarm. Hard wire interlocks
   3.2. Reset: Manual

Ss_75_70_52/231 Heating secondary circuits control strategy

ADDED

1. Circuit: Variable volume, constant temperature.
2. Low limit
   2.1. Operation: Each calorifier shall monitor the temperature of the stored water to maintain the set point fo 60°C. As the water temperature within any calorifier drops due to draw-off or standing losses ,the associated PICV shall modulate towards open to provide heat to the HWS via the plate heat exchanger. Once the set-point within the calorifier has been met, the PICV shall modulate towards closed to avoid overheating of the stored HWS water.

   2.2. Alarm: Display a warning if water temperature has not risen to set point after 10 minutes. Modulate secondary circuit PICV to maintain set point and display a warning if water temperature falls below set point.

3. PICV control mode:
   3.1. Operation: Modulated control to maintain set-point within calorifiers
   3.2. Set points:: Low limit water temperature set-point, 40°C.
   High limit water temperature set-point, 82°C

Ss_75_70_52/234 Storage calorifier control strategy ADDED

1. Hot water demand
   1.1. Non-operation: Open bypass port of control valve and close isolating valve.
   1.2. Secondary pump: Run continuously.
   1.3. Operation: When demand is signalled, operate secondary pump, open isolating valve and open control valve to maintain the calorifier temperature set point. When upper water storage temperature limit is reached set control valve to full bypass.
   1.4. Set point: 60°C
   1.5. Upper limit temperature: 65°C
2. Alarm: Raise an alarm when secondary flow water temperature falls below 60°C during operating period and when secondary return water temperature falls below 50°C.
3. High limit thermostat
   3.1. Operation: When calorifier water temperature is above the high temperature set point, close the control valve and shut isolating valve. Start secondary pump overrun. Raise alarm.
   3.2. Set point: 90°C
   3.3. Overrun period: 5 minutes
   3.4. Thermostat reset: manual
4. Secondary circuit pump failure: Set control valve to bypass and shut isolating valve.
5. Electric heater: Disable when high limit water storage temperature set point is passed. Operate with valve closed if stored water temperature is below 60°C and heat generator is not operating. Turn off when the stored water temperature reaches 65°C.

Ss_75_70_52/235 Constant speed pumps control strategy ADDED

1. Arrangement: Duty / standby
2. Plant shut down
   2.1. Operation: Turn pumps off and fully close valves serving loads.
   2.2. Long shutdown period: Run pumps for five minutes on a daily basis when shutdown is longer than two days.
3. Operation: Run pumps on receipt of signal.
4. Change lead pump: Weekly.
5. Prove flow
   5.1. Operation: Use a flow measurement device to prove flow. Start standby pump and raise alarm if flow is not proved in specified time
   5.2. Specified time: 15 s
   5.3. Failure: If flow is not proved after standby pump start, raise alarm.
   5.4. Reset: Manual

See Ss_75_70_52/237 Variable speed pumps control strategy in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_65 Pipe clips in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_25_57_06/310 Insulation products generally ADDED

1. Third party product certification: Listing in the Loss Prevention Certification Board (LPCB) Register. Building Research Establishment (BRE) certified. British Board of Agrément (BBA) certified. Listing in CERTIFIRE Register. Fire test certificate from NAMAS laboratory.
2. Evidence of compliance: Submit copy of current certificate for proposed product.
3. Certified effective life (minimum): 20 years.

Pr_25_57_06_50 Mineral fibre slab insulation ADDED

1. General requirements: Pr_25_57_06/310 Insulation products generally
2. Standard: To BS EN 13162.
3. Facing: Refer to equipment schedules
4. Edges: Rebated.
5. Fire performance: Reaction to fire classification of A1, as defined in BS EN 13501-1 Class A2 to BS EN 13501-1.

Pr_25_57_06_56 Mineral wool slab insulation ADDED

1. General requirements: Pr_25_57_06/310 Insulation products generally
2. Standard: To BS EN 13162.
3. Thickness: 40 mm or as necessary for compliance
4. Facing: Refer to equipment schedule
5. Edges: Square.
6. Fire performance: Reaction to fire classification of A1, as defined in BS EN 13501-1 Class A2 to BS EN 13501-1.

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_28 Engraved valve identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_40_10_57_29 Equipment labels and warning notices ADDED

1. Material: Face engraved rigid plastic laminate.
2. Colour
   2.1. Background: White.
   2.2. Lettering: Black.
3. Notice wording: ‘THIS EQUIPMENT MAY START AUTOMATICALLY WITHOUT WARNING. ISOLATE BEFORE CARRYING OUT WORK’.

See Pr_40_10_57_60 Paper valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_78 Self-adhesive colour pipe bands in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_60_50_20_02 Accumulators ADDED

1. Material: Carbon steel, coated externally.

2. Heat exchanger: Carbon steel fixed coil.
3. Insulation
   3.1. Material: Pr_25_57_06_50 Mineral fibre slab insulation; Pr_25_57_06_56 Mineral wool slab insulation
   3.2. Thermal conductivity: 0.039 W/m K.
4. Execution: Pr_60_50_20/610 Installing accumulators

Pr_60_55_96_06 Bacteria and biofouling inhibitors ADDED

1. Non-oxidizing biocides: Provide

Pr_60_55_96_16 Corrosion inhibitor chemicals for closed circuits ADDED

1. Corrosion inhibitors: Provide

Pr_60_55_97_12 Chemical dosing pots ADDED

1. Description: The dosing pot and side stream filter shall be provided with single lever ball valves, tundish, non-return valve, insulation jacket, 4no. rare earth magnetic rods (within a magnet grate), baffle plate, 1no. 20 micron filter cartridge.

   Pressure gauges are to be installed either side of the unit along with a visual flow indicator on the clean return back to the system, flow rate shall be determined based upon system water volume passing through the unit within 24 hours of system circulation (as per BSRIA Best Practice Guidelines), this will be regulated using a Pressure Independent Control Valve (actuator head not required). For low volume systems the manufacturers minimum flow rate advice shall be adopted.

   Post chemical dosing, the unit is to be internally fitted with the 4no. rare earth magnetic rods, magnetic grate, baffle plate and cartridge filter. The isolating ball valves are then to be left open to allow for continuous through flow of system water to comply with BSRIA BG.50.

   The filter media within each unit is to be replaced with a clean 5 micron filter at hand-over to the Client. A box of 4no. spare cartridge filters (5 micron) should be kept adjacent to the unit on-site for the onsite maintenance staff with laminated user instructions mounted on the wall adjacent to each unit.

   Quarterly filter changes and magnet grate cleans are required by the contractor up to practical completion, with inhibitor levels tested and action taken as necessary, along with any other agreed water analysis determined in the wider specification document. Thereafter quarterly maintenance should be carried out by the incumbent water treatment maintenance specialist.

   1.1. Features:: Side Stream Filtration and chemical dosing as described within BSRIA BG.29 and BG.50.

      Magnetic filtration, disposable media filters and passive deaeration to be provided within the unit as described within BSRIA BG.50.

      Unit to be fitted with a PD (differential pressure) monitor which is to provide a volt-free signal to the BMS to enable a 'filter media check' alert.
2. Manufacturer: The unit and associated chemicals shall be as manufactured and supplied by Vexo International (UK) Ltd (www.vexoint.com) or better and approved from their X-POT range.

3. Conformity:: The manufacturer/unit model must meet the intent of BSRIA guides BG29: pre-commissioning cleaning of pipework systems and BG.50: Water treatment for closed heating and cooling systems for products providing side stream filtration and chemical dosing capabilities.
4. Standard: To PD 5500.
5. Material: 316 stainless steel
6. Working pressure (maximum): 4 Bar
7. Execution: Pr_60_55_97/610 Installing dosing equipment

See Pr_60_60_08_34 Gas fired condensing boilers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_60_60_10_30 Forced draught gas burners ADDED

1. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

2. Standard: To BS EN 676.
3. Duty: Refer to equipment schedules
4. Fuel: Natural gas.
5. Burner control: Modulating.
6. Electrical supply: Refer to equipment schedules

See Pr_65_52_34_66 Pressure gauges in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_52_34_88 Temperature gauges in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_52_61_50 Masking plates in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_61_63 Pipe sleeves in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_65_52_62_09 Brazing compounds in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_29 Flange jointing rings for copper flanges in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_31 Flange jointing rings for steel flanges in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_36 Hemps and pastes in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_81 Solders in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_17 Copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_18 Copper pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_82 Steel pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_83 Steel pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_53_86/320 Pumps generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_53_86_11 Canned rotor pumps in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_53_86_15 Close-coupled in line pumps in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_53_86_68 Pressurization units ADDED

1. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

2. General:: System water make up is to be an integral function of the unit. The connection to the mains or boosted cold water service should be via an approved back flow prevention device (RPZ Valve) in accordance with EN1717. The boosted make-up water connection must be derived from the UV treated boosted domestic water supply system.

   The unit must be commissioned and serviced by qualified personnel. Water make up is activated by level sensors in the primary vessel. The unit is to be fitted with a water meter, and the make-up water volume, duration and frequency is to be logged within the unit. Back flow prevention can be deleted if there is a Cat 5 supply.
3. Standards
   - 3.1. General: To BS EN 13831.
   - 3.2. Domestic heating and hot water supply: In accordance with BS 7074-1.
   - 3.3. Low and medium temperature hot water heating: In accordance with BS 7074-2.
   - 3.4. Chilled water and condenser water: In accordance with BS 7074-3.
4. Format: Fully automatic pre-wired packaged unit on common base plate.
5. Arrangement: Diaphragm expansion tank with air. Diaphragm expansion tank with nitrogen.
6. Duties
   - 6.1. Static head: Refer to equipment schedules
   - 6.2. Plant rating: Refer to equipment schedules
   - 6.3. Operating temperatures
     - 6.3.1. Flow: Refer to equipment schedules
     - 6.3.2. Return: Refer to equipment schedules
   - 6.4. Operating pressure: Refer to equipment schedules
   - 6.5. Motor
     - 6.5.1. Nominal voltage: Refer to equipment schedules
     - 6.5.2. Frequency: 50 Hz.
7. Components: Direct coupled centrifugal pressurization pump. Interconnecting piping and isolating valve. Non-return valve. Pressure control switch. Pressure gauge. Pressure limit switches. Standby pump with auto changeover. Suction tank with ball float valve and overflow connections.
8. Accessories: Air separator. Anti-vibration mountings. Flexible connections. High pressure switch. Hours run meter. Low pressure switch. Manual fill unit for initial filling and routine maintenance. Unit to be fitted with Modbus Module EMCMO to provide full communication in accordance with the
   Modbus protocol.
9. Execution: Pr_65_53_86/630 Installing pressurization units

Pr_65_54_93_05 Automatic air vents ADDED

1. Manufacturer: Spirotech UK Ltd or better and approved.
2. Arrangement: Vertical inlet with integral lockshield isolating valve and check valve.

   The unit must be of brass construction with ½" bsp inlet.

   The outlet connection must be provided with a ½" bsp thread to allow connection of a tail pipe and run to drain in order to comply with NES specification.

   The valve must be hand assembled with a self-closing valve mechanism such that the valve will always fail in the "Safe" position.

   Solid Polycarbonate floats to prevent rupture

   Viton rubber valve seat

   The unit must be engineered to contain a clean water chamber at the top of the unit protected by a stainless steel baffle against dirt contamination of the valve seat.

   To prevent contamination the vent cap mechanism must be constructed such that the valve mechanism cannot open until the water level is 40mm below the outlet of the valve (Air height safety margin).
3. Material: Gunmetal.
4. Connections: Threaded.

See Pr_65_54_93_87 Test points in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_06 Ball valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_08 Butterfly valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_14 Copper alloy check and double check valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_15 Copper alloy gate valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_54_95_16 Copper alloy globe valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_54_95_26 Double regulating valves ADDED

1. Manufacturer: All valves (including PICVs) are to be based on Flocon Valves (contact Dennis 07802 889890) or approved equivalent.
2. Standard: To BS 7350.
3. Arrangement: Globe.
4. Material: Copper alloy. Steel.

5. Connections: Compression to BS EN 1254-2. Flanged to BS EN 1092-3 for copper alloy. Flanged to BS EN 1092-2 for cast iron. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
6. Accessories: Drain plug facility. Independent means for positive isolation on adaptor. Independent means for positive isolation on pressure tapping point.
7. Execution: Pr_65_54_95/620 Installation of double regulating valves

See Pr_65_54_95_27 Draining taps in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_54_95_30 Flow measuring valves ADDED

1. General requirements: Pr_65_54_93_87 Test points
2. Manufacturer: All valves (including PICVs) are to be based on Flocon Valves (contact Dennis 07802 889890) or approved equivalent.
3. Standard: To BS 7350. To BS EN ISO 5167-2.
4. Material: Copper alloy. Steel.
5. Connections: Compression to BS EN 1254-2. Flanged to BS EN 1092-3 for copper alloy. Flanged to BS EN 1092-2 for cast iron. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
6. Accessories: Position indicator. Independent means for positive isolation on pressure tapping point.
7. Execution: Pr_65_54_95/630 Installation of flow measurement devices

See Pr_65_54_95_53 Motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_54_95_63 Pressure independent control valves ADDED

1. Description:

   Ensure modulating actuators are supplied with 24V ac and are positioned by an analogue signal from the BMS. Ensure on/off actuators are supplied with 24V ac open/close signals from digital outputs on the BMS. Actuators are not to draw power from the control signal.

   Provide a 0-10V dc signal to provide positional feedback or indication back to the BMS for all modulating control valves.

   Provide end switches to provide positive open/close position indication back to the BMS for all on/off valves.

   Ensure that the control valves selected for installation are sized for the actual pressure drop of the selected coil/controlled circuit. Select modulating valves to have an authority between 0.5 and 0.6 (except for fan coil units). Select on/off valves to be line size unless there is good reason to be smaller and such reduction is agreed by the Contract Administrator.

   Use valve bodies that are fit for purpose and comply with the following:

   1. Sizes 15-50mm - screwed connections.
   2. Sizes 65mm and above - flanged.

   Ensure that it is possible to manually open all control valves in the event of power failure or failure

of the BMS control signal.

2. Manufacturer: All PICVs are to be based on Flocon Valves (contact Dennis 07802 889890) or better and approved.

   All LTHW secondary heating elements shall utilise thermostatic valves with integrated PICV function as Gampper or better and approved.
3. Temperature range: 6–14ºC / 50–80ºC.
4. Vapour Seal: Vapour seal to be applied to all PICVs on chilled water installations once commissioning has taken place.
5. Actuator: Modulating. On/ off.
6. Accessories: Flushing bypass. Isolating valve. Strainer. Drain.
7. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_75 Safety valves ADDED

1. Description:

   Provide totally enclosed spring-loaded type safety and relief valves to meet the requirements of BS 759, and the appropriate British Standard for the appliance they are connected to, and ensure they are suitable for the temperature requirements specified.

   Install safety and relief valve discharge pipework with a continuous fall to point of discharge, either directly over a floor gulley, or over a floor with a fall to the gulley
2. Standard: To BS EN ISO 4126-1.
3. Connections: Flanged to BS EN 1092-2 for cast iron. Flanged to BS EN 1092-3 for copper alloy. Threaded to BS EN 10226-1.
4. Accessories: Easing lever.
5. Execution: Pr_65_54_95/680 Installation of safety valves

Pr_65_54_95_81 Steel ball valves ADDED

1. Standard: To BS ISO 7121.
2. Material: Carbon steel. Stainless steel.
3. Connections: Flanged to BS EN 1092-2. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
4. Options: Handwheel.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_82 Steel globe valves ADDED

1. Standard: To BS EN 13709.
2. Body ends: Flanged to BS EN 1092-2. Threaded joints to BS EN ISO 228-1. Pressure tight joints threaded to BS EN 10226-1.
3. Operation: Handwheel. Actuator.
4. Body tappings: Required.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_54_95_83 Steel globe stop and check valves ADDED

1. Standard: To BS EN 13709.
2. Body ends: Flanged to BS EN 1092-2. Pressure tight joints threaded to BS EN 10226-1. Threaded joints to BS EN ISO 228-1.
3. Operation: Actuator. Handwheel.
4. Body tappings: Required.
5. Execution: Pr_65_54_95/610 Installation of valves generally

Pr_65_55_76_15 Combined air and dirt separators ADDED

1. Description:

   Supply and install a combined deaerator / dirt separator. Connect the unit at the hottest point in the system provided this is less than 90°C.

   Arrange for the dirt separator discharge valve to have a standard BSP threaded connection to allow flexibility in piping away in the final installed location. Arrange for this to discharge into a suitably-sized tundish and pipe this to discharge as close as possible to a plant-room gulley.

   Provide a unit incorporating a large capacity dirt collection chamber complete with manual drain valve to allow all particles to be flushed quickly and easily to drain.

   Where the static head from the hottest point in the system is over 15 m supply and install a fully automatic vacuum deaerator to remove dissolved air from the system during operation. Ensure that the maximum temperature does not exceed 70°C where this unit is installed. Ensure the unit is capable of producing a sufficiently low pressure to effectively remove all dissolved gases.

   Engineer the unit to contain a clean water chamber at the top of the unit with protection to prevent dirt contamination of the valve seat. Provide the unit with a vent-cap with a gap of sufficient dimension between the water level and the valve seat. Ensure that the unit incorporates automatic air venting, and a drain connection.

   Fit the unit with suitable pump, vessel and controls to reduce the water pressure locally to allow the air to separate and be removed from the water. Ensure the unit(s) is capable of operating on a 230-V or 400-V power supply dependent on the system requirements and conditions and incorporate(s) volt-free contacts for connection to the BMS for operation and fault monitoring.

   Ensure that the unit is rated at 110°C and 10 bar, or specifically manufactured and certified to the requirements of the Pressure Equipment Regulations.

   1.1. General Requirements:

      1. The dirt separation side shall remove all particles of dirt heavier than water, down to 5 microns and less.
      2. The de-aerator shall be able to condition the water by removing all free air and all dissolved gases in the form of microbubbles.
      3. The unit shall be line size and flanged to PN16 for sizes 50mm and above.
      4. The unit shall have a mild steel housing with an internal structure to create a laminar no flow zone at the bottom of the unit. A drain valve shall be fitted at the base for dirt removal while the system remains operational.

5. The unit shall be mounted and situated in the heating system pipework in accordance with the manufacturer's instructions.
6. The unit shall have a standard maximum operating temperature and pressure of 110°C and 10 bar respectively.
7. The pressure drop across the unit shall remain constant regardless of the amount of dirt trapped and should never be liable to clogging.
8. The velocity through the combined unit shall not be in excess of 1.5 m/s.
9. Unit to be as supplied by Spirotech or equal and approved.
10. Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the design team.
11. All equipment to be issued with a full and detailed manual for installation, operating/maintenance and fault finding

2. Manufacturer: Spirotech or better and approved
3. Arrangement: Vertical housing with internal large surface area mechanism to remove microbubbles via coalescence effect.
4. Material: Carbon steel.
5. Connections: Butt weld ends. Flanged.
6. Execution: Pr_65_55_76/640 Installing combined air and dirt separators

See Pr_65_57_96_04 Angle water strainers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_57_96_08 Basket water strainers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_67_22_88 Temperature differential de-aerators ADDED

1. Arrangement: Vertical housing incorporating internal spiral wound copper mesh system. Vertical housing with internal large surface area mechanism to remove microbubbles via coalescence effect.
2. Material: Carbon steel.
3. Connections: Flanged. Threaded.

See Pr_65_67_28_03 Angular expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_67_28_05 Axial expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_67_28_46 Lateral expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_65_30_51 Metal flues and chimneys ADDED

1. Description:

Provide flues of the dimensions detailed on the drawings, subject to confirmation from the boiler manufacturer.

Provide the flue system complete with all necessary steelwork supports, brackets, flashing plates, weathering aprons and cravats required for a complete and weatherproof installation. Allow for the entire run of external flue to be finished in polished stainless steel/factory applied colour finish (colour to be confirmed by the architect)/engineer to specify other finish.

Allow for all brackets, restraints, restraining cables etc. necessary to support the length of the flue above the roof. The roofing trade contractor will provide the necessary fixing eyes on confirmation from the installer of the number and locations required.

Make the connection to each boiler using a removable section immediately above the boiler flue outlet socket to allow for the removal/disconnection of the flue pipe for inspection and/or routine maintenance.

Install all horizontal flue pipe sections with a fall of at least 3º towards the boilers to allow flue condensate to drain through the boilers.

Ensure flues connected to condensing boilers are impervious to the condensate produced.

Provide a low point drain and connect to discharge via 15mm trapped half hard copper pipe over a plant room floor drain. The trap is to be sufficiently large to overcome the flue discharge pressure. Provide all necessary draft diverters, anchors and bellows for efficient operation of the boiler.

Terminate the flue as indicated on the drawings with an open cone shaped discharge nozzle to achieve the required efflux discharge velocity required by the Clean Air Act (Min 8m/s); terminals to be complete with bird guard. Construct the flue so as to satisfy the Building Regulations and the Clean Air Act.

Construct and assemble all flue components in accordance with BS EN 1859.

Allow for the flue system to be made-to-measure to suit site dimensions, and install in accordance with the flue manufacturer’s instructions and recommendations.

Provide boiler flues and ducts with insulated supports and cleaning doors.
Where flues pass through walls provide a metal sleeve for building in by the main contractor, and ensure that the space between the flue and the sleeve is packed with heat resistant material.

The responsibility for the detailed design and performance of the flue system to suit the installed boilers shall be with the installer.

1.1. Concealed Flues:

Comply with all HSE and other related requirements including those regarding the provision of access to concealed flues to facilitate the annual inspection of ALL flue joints

1.2. Condensate Disposal:

Provide a condensate disposal system from the condensing boilers in accordance with the relevant British Standards, codes of practice and manufacturers' instructions and recommendations.

Obtain the approval of the local authority and local water undertaking for the method of condensate disposal.

Provide condensate systems with a permanent connection to a foul drain, a suitable trap to prevent escape of flue gases, and a tundish to provide visual evidence that the condensing operation is being achieved.

Provide frost protection to condensate drains where they are run in exposed positions or are likely to be at risk of freezing.

Install condensate drain in pipework suitable for the acidic nature of the condensate.

2. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

3. Standard: To BS EN 1856-1 or BS EN 1993-3-2.
4. Construction: Twin wall.
5. Insulation: Integral.
6. Material and finish: Stainless steel.
7. Fittings: Adaptors. Bends. Firestop plates. Roof outlet. Storm collar and flashing. Wall brackets. Wall outlet.
8. Execution: Reference to missing clause Installing flues and chimneys; Reference to missing clause Testing flues and chimneys

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18_94 Valve actuators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_50_76_31 Flow in pipe sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_76_47 Liquid temperature sensors ADDED

1. Standards: To BS EN 60730-1 and BS EN 60730-2-9.
2. Application: Pipe mounted immersion. Surface temperature.

3. Range: -10°C to 150°C.
4. Accuracy: ±0.5°C.
5. Equipment interconnectivity
   5.1. Wired: Required.
6. Execution: Pr_75_50_76/675 Installing temperature sensors

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

Pr_80_51_51_37 Heat meters ADDED

1. Description:

   Provide water flow / heat meters to meet the requirements of BSRIA AG9/2001.

   Ensure each device can measure the flow down to 10% of the rated flow of the device and is capable of a pulsed output to the BMS to signify the quantity of water / energy used.

   1.1. General Requirements:

   1. Provide a serial M-bar output (conforming to EN1434-4) which shall allow centralised or remote reading by the BMS
   2. Thermal heat meters as Kamstrup Multical 603 or better and approved.
   3. The M&E Contractor shall liaise with Building Control and obtain Building Control approval of the energy metering for the works. All additional items required by Building Control shall be provided. The submission of the energy metering strategy shall be issued to Building Control for approval prior to any replacement works commencing.
   4. This schedule MUST be read in conjunction with all relevant equipment schedules, specification and drawings.
   5. All heat meters, flow meters and electricity meters shall be fully tested and commissioned. Testing and commissioning procedures shall be agreed prior to the tests being carried out and any ordering of test equipment. This shall be in the form of method statements from the M&E Contractor - describing the set-ups, design parameter criteria, testing and commissioning equipment and methods being proposed.
   6. The M&E Contractor shall produce heating schematics in AutoCAD format to show all heat meters, flow meters and electricity meters. These will be submitted for approval.
   7. Energy metering Operation and Maintenance documentation (shall consist of CAD drawings and an electronic O&M manual made available to the Client on CD-ROM. Provide in Live (Word, Excel and AutoCAD) and PDF Versions: Written descriptions, CAD Drawings, Test documentation, Specific manufacturer's information - Pages of standard manufacturers information that has no relevance to the project will not be accepted. Refer to the Contract for quantities required to be produced and the formats required.
   8. Energy use and sub-metering shall meet Building Regulation and CIBSE TM39 requirements as a minimum.
   9. Staff Training: The M&E Contractor shall include within the tender costs for training the Client's maintenance operative / representative(s) in all aspects of the energy metering installation, systems and their operation. The full and complete understanding of these systems by the Clients' maintenance operative shall be a pre-condition of practical completion. The M&E Contractor shall inform the

Employer's Agent at which stage they feel that this individual should be based on site with them as they complete the project.

10. All meters shall be of suitable construction for their installed location and the environment to which they are exposed.
11. All thermal heat meters shall be linked to a full measuring system. The system shall be hardwired to a central local data collection system.
12. Metering components to include
    a. LCD display (minimum 8 digit read)
    b. Flow probe
    c. Return probe
    d. All necessary wiring – to installed positions.
13. The M&E Contractor shall allow for liaison with the Energy Management Team, Client's maintenance team and the energy meter manufacturer to finalise all energy monitoring requirements, including site visits and attendance of meetings as necessary.
14. The M&E Contractor is to confirm flow rates and pipe sizes etc. prior to ordering equipment.
15. Flow meters to have at least a correct MINIMUM distance of straight pipe before the meter, as required by meter manufacturer.
16. The M&E Contractor shall include for all power wiring, controls wiring, containment and ancillaries to provide a full and complete energy metering installation.
17. Prior to ordering equipment the M&E Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the design team.
18. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.

2. Manufacturer: Thermal heat meters as Kamstrup Multical 603 or equal and approved.
3. Standard: To BS EN 1434-1.
4. Third party certification: Measuring Instruments Directive approved.
5. Format: In line.
6. Display: Remote to BMS
7. Orientation: Horizontal.
8. Temperature sensors: Immersion.
9. Temperature range: 10–130°C. 2–30°C.
10. Ingress protection (minimum) : To BS EN 60529 IP54.
11. Pulsed output: Required.
12. Power supply: Mains 230 V.
13. Accessories: 3 m interconnecting leads to allow remote mounting of meter from pipe.

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_80_77_27_73 Roof equipment supports ADDED

Shared by: Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems

1. Components
   1.1. Support base
      1.1.1. Type: Submit proposals
      1.1.2. Size: Submit proposals

1.1.3. Anti-vibration mats: Required.

1.2. Support frame

1.2.1. Type: Submit proposals

1.2.2. Size: Submit proposals

See Pr_80_77_76_47 Loadbearing pipeline support insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_54 Mineral wool pipe section insulation in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_80_77_76_62 Phenolic foam insulation

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_80_05_10 [M] Centralized all-air conditioning systems

1. Standard: To BS EN 13166.
2. Form:
    - Duct slab
    - Pipe section
3. Thermal conductivity: 0.018 W/m·K at 0°C.
4. Finish: Aluminium.
5. Reaction to fire classification: Class '0'
6. Insulation thickness (minimum): To BS 5422.
7. Insulation Around Pipework Supports:: Insulated pipe support inserts shall be used on all piped services and where the pipe support bracket is fixed over the load bearing insulation of the same material (or compatible with) the insulation on the pipe.

   The primary function of an insulated pipe support insert is to isolate the pipework from the pipe support to limit heat transfer to and from the pipework system, limit thermal bridging and to allow for a continuous vapour barrier to be carried through the support system.

   Where pipework is located externally, the use of insulated pipe support inserts also allows for cladding to be carried continually through the support system, enhancing the weather protection of the overall pipework system.

   Wooden blocks are not permitted on any pipe system.

   Rubber lined clips must not be used.

   For general pipework runs on all piped services (LTHW, BCWS, MCWS, DHWS) Kingspan* insulated pipe support inserts must be used as the 'preferred option' figure 12 of BS 5970:2012.

   The only exception is either side of expansion bellows on the primary and secondary guides where pipe supports are normally installed in conjunction with slide guides to aid axial movement. In this scenario, pipe brackets clipped direct to the pipe should still be used with insulation applied as the 'non-preferred option' figure 13 of BS 5970:2012.

   Insulated pipe supports must be used on all external piped services.

   * Kingspan insulated pipe support inserts or better and approved should be used in preference to other manufacturers as they have a CE marking and achieve a minimum European fire classification of BL-s1,d0 to BS EN 13501-1.
8. Vapour barrier

8.1. Vapour permeability: To BS 5422, clause 5.6.

9. Protection: Pr_80_77_76_95 Valve and flange insulation casing; Pr_80_77_76_95 Valve and flange insulation casing Refer to equipment schedules.
10. Accessories: Pr_80_77_76_94 Valve and flange insulation; Pr_80_77_76_47 Loadbearing pipeline support insulation
11. Items to be insulated:
    - Cover plates
    - Removable access covers
12. Execution: Pr_80_77_76/640 Installing phenolic foam insulation on pipelines; Pr_80_77_76/645 Installing phenolic foam insulation on ductwork; Pr_80_77_76/690 Installing phenolic foam insulation on vessels; Pr_80_77_76/760 Insulation not carried through pipelines supports; Pr_80_77_76/755 Installing at non-loadbearing pipelines supports; Pr_80_77_76/780 Installing vapour barriers

See Pr_80_77_76_94 Valve and flange insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_95 Valve and flange insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_30 Flexible vibration isolation hoses in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_40 Inertia bases in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_60 Pad mountings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_74 Rubber bellows in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

See Pr_20_29_14/620 Installing pipeline supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/620 Installing valve charts and schematics in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/630 Installing valve identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/660 Installing identification on pipework in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_60_50_20/610 Installing accumulators ADDED

1. Position: Install accumulator vertically. Protect from frost.

2. Floor: Adequate to support the filled vessel. Fix legs to floor.
3. Maintenance: Provide 500 mm clearance at the front and 100 mm above.
4. Draining: Allow provision to enable the accumulator to be drained.

Pr_60_55_97/610 Installing dosing equipment ADDED

1. Position: Install where there is a high differential pressure between flow and return pipeline.

See Pr_60_60_08/610 Installing gas and oil-fired boilers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_52_34/630 Installing pressure gauges in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_52_63/610 Pipelines installation generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/615 Installing pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/620 Installing anchors generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/625 Installing slide guides in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/631 Installing copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/680 Installing steel pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/685 Welding steel pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/690 Spacing of pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/710 General inspection and testing in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_53_86/610 Installation of pumps generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_53_86/630 Installing pressurization units ADDED

1. Standards: Low and medium temperature hot water heating systems in accordance with BS 7074-2. Chilled and condenser systems in accordance with BS 7074-3.
2. Location of expansion vessel: In the system return pipeline close to the heat source or chilled water unit.

See Pr_65_53_86/640 Commissioning preparation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_54_93/610 Air bottles ADDED

1. Construction: A vertical extension from pipe.
2. Size: Bore of pipe.
3. Extension pipe: Copper with a manual vent cock located in an easily accessible position.
4. Discharge pipes: Terminate with air cock or needle valve in an accessible position.

See Pr_65_54_95/610 Installation of valves generally in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_54_95/620 Installation of double regulating valves ADDED

1. General requirements: Pr_65_54_95/610 Installation of valves generally
2. Position: Provide 10 diameters of straight pipe upstream of valve and 5 diameters downstream.

Pr_65_54_95/630 Installation of flow measurement devices ADDED

1. General requirements: Pr_65_54_95/610 Installation of valves generally
2. Position: Provide straight length of pipe upstream and downstream.

See Pr_65_54_95/641 Installing motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_54_95/680 Installation of safety valves ADDED

1. General requirements: Pr_65_54_95/610 Installation of valves generally
2. Inlet connection: As short as possible; diameter no smaller than the outlet bore.
3. Discharge lines: Rise vertically. Fit with small bore drain points to prevent the accumulation of water.

Pr_65_55_76/640 Installing combined air and dirt separators ADDED

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

See Pr_65_57_96/650 Installing strainers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_67_28/620 Installing expansion compensators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/605 Installing control components in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/610 Installing valve actuators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/660 Installing flow sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/625 Installing foil faced mineral wool insulation on pipelines in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Pr_80_77_76/640 Installing phenolic foam insulation on pipelines

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

Pr_80_77_76/645 Installing phenolic foam insulation on ductwork

1. General requirements: Pr_80_77_76/610 Installing insulation and protection products generally
2. Ducts
   2.1. Rectangular: Apply slabs.
   2.2. Circular: Apply circular duct insulation. Apply pipe sections.
   2.3. Flat oval: Apply slabs and pipe sections.
3. Joints: Close butt slabs or section and seal with 100 mm wide Class '0' foil tape.
4. Duct supports: Use rigid phenolic foam inserts at supports on rectangular ducts. Use phenolic foam crocodile strips on circular ducts.

Pr_80_77_76/690 Installing phenolic foam insulation on vessels

1. General requirements: Pr_80_77_76/610 Installing insulation and protection products generally
2. Application: Install pre-formed segments or pre-slotted foil faced insulation around the diameter of the vessel. Lay with staggered joints.
3. Joints: Seal joints and gaps around protrusions with jointing compound.
4. Finish: Secure with aluminium banding.
5. Access: Allow for removal of access covers.

See Pr_80_77_76/720 Installing sheet aluminium protection in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/740 Installing at valves and flanges in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/750 Installing at loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/755 Installing at non-loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/760 Insulation not carried through pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_94/610 Cast in situ bases in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94/620 Installation of flexible hoses and rubber bellows in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_60_40_37/620 Installing water based heating systems ADDED

1. Standard: To BS EN 14336.

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

1. Testing: Water tightness test in accordance with BS EN 14336, Annex A. Pressure testing in accordance with BS EN 14336, Annex B. Procedure for filling and pressure testing in accordance with BSRIA BG 29/2012.
2. Notice (minimum): 5 working days.
3. Pressure: 1.5 times working pressure.
4. Inspection and witnessing: In accordance with the procedure in BSRIA BG 29/2012.
5. Duration of test: 2 h.

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

1. Pre-commission Flushing, Cleaning and Hydraulic Testing Methodology:
    1. In order to minimise effluent creation and environmental impact, system and pipework cleaning shall be to BSRIA BG 29-2020 section 6, Closed-loop Pre-treatment Cleaning (CPC).
    2. Temporary or permanent bypass loops shall be provided across all boilers, chillers, heat exchangers, coils, automatic control valves or any other component liable to blockage or damage during the flushing and cleaning process.
    3. Where sections of the pipework systems are required to be pre-operationally cleaned separately, all necessary by-pass connections and loops shall be provided to ensure full circulation throughout the section to be cleaned. Adequate facilities will be provided for the connection of temporary circulation pumps, where applicable.
    4. Raw mains water shall not be used to fill or enter any system at any time. Any water used to fill systems, including requirements for pressure testing and cleaning, shall be pre-treated using prefabricated filling apparatus designed to kill and remove microorganisms and shall be derived from the boosted water supply which incorporates a medical grade biological barrier and U/V disinfection unit.

5. The filling apparatus shall automatically dose treatment chemicals on a proportional basis that are compatible with the system metallurgy, at levels agreed with the Water Treatment Specialist, to minimise pipework corrosion and microbiological activity. These chemicals shall be designed to work under both static and dynamic conditions. Confirmation of the suitability of the chemicals will be obtained from the pipework and plant manufacturers.
6. The filling apparatus shall incorporate fail-safe mechanisms that will prevent the accidental introduction of untreated water, unauthorised adjustment of treatment levels, and will shut down in the event of power or equipment failure.
7. At all stages of filling, the fill water shall be tested to ensure adequate chemical dosing and microbiological control. On-site chemical and microbiological tests shall be undertaken with calibrated digital instrumentation and this will include a photometer, for the determination of chemical levels, and an ATP bioluminometer for microbiological levels. Off-site analysis will be undertaken by UKAS accredited laboratories.
8. Once a circuit is full and pressure tested there shall be no exchange of system water for raw town mains. If, for any reason, draining of a previously whetted circuit is necessary then it shall be refilled with treated water via the pre-treatment apparatus.
9. Before system cleaning commences, the pipework installation, including facilities for chemical dosing, air venting and draining, shall be complete and fully operable. Any appropriate non-hydraulic integrity and pressure tests shall have been completed.
10. Wherever practicable the systems shall be cleaned on a full flow closed loop basis to minimise water usage and effluent discharge. This shall be undertaken using temporary high efficiency multi-media filtration equipment.
11. This equipment shall be temporarily installed on the common system return in order that all parts of the system can be cleaned at velocities, as detailed in BSRIA BG 29 - latest edition. .
12. The temporary cleaning equipment shall be connected to the system by hard piping or with high pressure stainless steel flanged hoses.
13. Flow rates, flushing velocities and system manipulation shall be carried out in accordance with BSRIA BG 29 - latest edition. .
14. Final water quality parameters, system cleaning procedures and system cleanliness shall be in accordance with BSRIA BG 29 - latest edition.
15. All strainers shall be monitored, inspected and cleaned, as necessary, throughout and upon completion of the cleaning process. Following the final clean of the strainers, the 'clean' full flow working pressure drop of all strainers shall be measured, witnessed and recorded.
16. Installations shall not be drained, either in part or full, after cleaning and final dosing has been completed, without the prior written consent of the specialist water treatment contractor, as this may invalidate the cleaning process and may require complete system re-cleaning.

1.1. Water Treatment Specialist: The systems shall be cleaned in accordance with the Hydrosphere® CPC standard procedures or better and approved.

2. Preliminary checks:: Thoroughly inspect pipework. Complete pressure tests before cleaning.
3. Flushing: In accordance with BSRIA BG 29/2012.
4. Cleaning: In accordance with BSRIA BG 29/2012 and BSRIA BG 50/2013.
5. Waste products: Neutralize, and dispose of to drain. Preferably direct to manhole.

Ss_60_40_37/670 Installing water treatment for heating systems ADDED

1. Treatment: Closed circuit systems in accordance with BSRIA BG 50/2013.
2. Water sampling: In accordance with BS 8552.

System completion

Ss_60_40_37/810 Commissioning water heating systems ADDED

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): One week.

Ss_60_40_37/830 Commissioning boiler plant ADDED

1. Pre-commissioning: In accordance with CIBSE Commissioning Code B.
2. Commissioning: In accordance with CIBSE Commissioning Code B.
3. Notice (minimum): One week.

Ss_60_40_37/840 Performance testing ADDED

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.
   - 4.2. Number: Two.
   - 4.3. Duration of loan: One week.
5. Reports: Submit on completion.

Ss_60_40_37/845 Demonstrations ADDED

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

Ss_60_40_37/850 Inspection and test records ADDED

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

Ss_60_40_37/860 Documentation ADDED

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 & electronic

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 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 ADDED

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

Ss_60_40_37/880 Servicing and maintenance ADDED

1. Requirement: Undertake for 12 months after completion.

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_40_33_45
[M] Kitchen & concession extract ventilation systems ADDED

Systems

Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems ADDED

1. Description:
   1.1. Application Systems:

The kitchen extract installation generally comprises / includes for the following:

1. EAHU.0.C.01.A & B
2. EAHU.0.C.02.A & B
3. EAHU.0.C.03
4. EAHU.0.C.04
5. EAHU.0.D.01
6. EAHU.0.D.02
7. EAHU.3.A.01
8. EAHU.3.C.01
9. EAHU.3.C.02
10. EAHU.3.C.03
11. EAHU.4.A.01
12. EAHU.4.D.01
13. Ductwork run to just within the demise of the catering area, as indicated on the drawings, for future extension by the catering specialist.
14. Black-out finish on all ductwork, plant and ancillaries routed through areas where visible to the public within the building
15. Access panels to DW/177 for cleaning.
16. Ductwork, flexible connections to the fan unit, shut-off dampers, dampers, including, attenuators, grilles, ambient terminals, supports, bracketry and all other fittings required to make a complete and working installation.

1.2. General: All kitchens and concessions as noted above are served by a single ecology air handling unit complete with manufacturers integral controls (touch screen), panel / bag filters, HEPA filters, carbon filter and associated motorised shut-off damper as detailed on the schedules, exhausting through the facade.

Intake and exhaust atttenuators are to be melonex lined as detailed on the equipment schedules.

The main kitchen ecology units are provided with an additional run-around-coil serving its associated supply AHU. Make-up air to each kitchen and concession is provided by a local dedicated supply air handling unit with run-around-coil.

Kitchen extract ductwork to have smooth internal surface (BW11 or equal and approved)

The extract ductwork running from the extract point to the UV-C filtration will be fire rated (inc thermal insulation) to 300°C for 1 hour.

All extract fan units must be selected to comply with specific fan power threshold to meet Part L compliance.

The contractor must include for calculating the external pressure drop for each fan set based on his installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractor's calculations for engineers approval, the contractor will be held responsible for replacement motor / fan unit at their own expense. Any fan that is under-performing during commissioning will be replaced with correct unit at the contractors expense.

Prior to ordering equipment the Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

The fan unit will be provided complete with manufacturers integral controller for fan speed adjustment, shut-off damper open / close operation. Each controller must be marked by the contractor to indicate the correct speed setting position following commissioning.

1.3. Catering Fit-Out Contractors Scope of Works: The contractor shall install ductwork from the associated ventilation plant to just within the catering area as indicated on the design drawings. Extension of the ductwork from this position shall be by the catering specialist fit-out contractor and sits outside of the contractors scope of works.

Each extract canopy will be specified by the catering consultant and installed by the specialist fit-out contractor and sits outside of the contractors scope of works.

The extract canopy, associated fire suppression (ansul) and UV filtration will be specified by the catering consultant and sits outside of the contractors scope of works.

2. System performance: Ss_65_40_33/210 Design of ventilation systems; Ss_65_40_33/240 Ductwork design; Ss_65_40_33/250 Fan performance; Ss_65_40_33/260 Attenuator performance
3. Room extract air terminal devices: Kitchen canopy and all associated primary grease / odour filtration (UV treatment) to be specified by the catering consultant as part of their scope of works. This scope of works includes for additional odour control measures within the ecology air handling plant.
4. Air ductwork and accessories
   4.1. Ductwork: Pr_65_65_25_14 Circular sheet metal ductwork and fittings; Pr_65_65_25_30 Fire resisting ductwork and fittings; Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings
   4.2. Accessories: Pr_65_65_23_20 Duct access panels; Pr_30_59_57_07 Bird guards; Pr_65_65_24_78 Shut off dampers
5. Thermal insulation on extract air ductwork: Pr_80_77_76_53 Mineral wool duct slab insulation
6. Vibration isolation mountings: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_84 Spring isolators; Pr_80_77_94_42 Isolation hangers
7. Acoustic treatment: Pr_65_67_78_12 Circular attenuators; Pr_65_67_78_72 Rectangular attenuators
8. Extract fans: Pr_60_65_03_87 Ecology extract air handling units
9. External exhaust air terminals: Pr_30_59_48_04 Aluminium louvre panel units

10. Accessories: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps
11. Controls: Ss_75_70_52_28 [M] Extract ventilation control systems
12. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
13. Testing: Pr_65_65_25/785 Air leakage testing of medium pressure ductwork; Pr_65_65_25/790 Air leakage testing of plant items
14. Execution: Ss_65_40_33/630 Installing ductwork on air handling units; Ss_65_40_33/650 Cleaning of kitchen extract ductwork systems
15. System completion: Ss_65_40_33/810 Commissioning of air distribution systems; Ss_65_40_33/820 Performance testing; Ss_65_40_33/830 Inspection and test records; Ss_65_40_33/840 Demonstrations; Ss_65_40_33/850 Documentation for ventilation systems; Ss_65_40_33/860 Spares and consumables; Ss_65_40_33/870 Maintenance

Ss_75_70_52_28 [M] Extract ventilation control systems ADDED

Shared by: Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description:

   Refer to clause Ss_75_70_52_94 (ventilation control systems) for details / specification
2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Start and stop control: Ss_75_70_52/205 Hand off auto switch; Pr_75_51_17_89 Time switches (integral to BMS outstations)
4. Extract fan control strategies: Ss_75_70_52/272 Constant volume extract fan control strategy
5. Equipment: Pr_75_50_18_21 Damper actuators; Pr_75_50_18_51 Mechanical services control panels
6. Sensors: Pr_75_50_76_03 Air temperature sensors; Pr_75_50_76_68 Pressure sensors
7. Equipment interconnectivity: Wired.
8. Cables: As Specialist's recommendations.
9. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
10. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals
11. Rewireable installations: Required.
12. Concealed installations: Required.
13. Control equipment power supply: Mains supply.
14. 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_65_40_33/210 Design of ventilation systems

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Design: Complete the design of the ventilation systems.

2. Method: In accordance with BS EN ISO 52016-1. In accordance with CIBSE Applications Manual AM 11.
3. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_65_40_33/240 Ductwork design

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Air velocity
   1.1. Standard: As CIBSE Guide B2.
2. Ductwork cleaning
   2.1. Standard: In accordance with BESA Technical Report TR/19.

Ss_65_40_33/250 Fan performance

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Standard: In accordance with BS 6583. In accordance with BS EN 16798-3.
2. Flow rate: Refer to equipment schedules
3. System pressure: Refer to equipment schedules
4. Operation: Continuous.
5. Specific fan power: Refer to equipment schedules
6. Classification: SFP - Refer to equipment schedules

Ss_65_40_33/260 Attenuator performance

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Performance requirements
   1.1. Standards: To BS EN ISO 7235 and BS EN ISO 11691.
   1.2. Insertion loss: Refer to equipment schedules. Final selections by the contractor are to conform with the acoustic specialist's requirements

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/272 Constant volume extract fan control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_94 [M] Ventilation control systems

1. Equipment to be controlled: Constant volume extract fan interlocked with associated supply fan and hand/off/auto switch hardwired to motor.
2. Additional start and stop control: Associated supply fan failure. Fire alarm interface

3. Fan control
   3.1. Normal operation: Enable fan and start on receipt of damper open signal.
   3.2. Fan operation: Proved when extract air pressure switch or air velocity switch is made. If condition is not met within failure time, generate a fan failure alarm and disable the fan.
4. Shut down: Disable fan.

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_30_59_48_04 Aluminium louvre panel units

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description: External facade louvres are specified by the architect under their scope of works

Pr_30_59_57_07 Bird guards

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description: Bird guards associated with louvred facade panels are specified by the architect under their scope of works

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Standard: To BS 1710. To BS EN 12101-7 for smoke extract ductwork. To BS EN 13779.
2. Identification type: Self-adhesive plastics or transfers.
3. Shape and size: Direction of flow indicated by a triangle of appropriate colour.
4. Execution: Pr_40_10_57/650 Installing ductwork identification

Pr_60_60_36_74 Run-around coils

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems and Pr_60_65_03_87 Supply and return air handling units

1. Standard: To BS EN 1216.
2. Duty
   2.1. Number of coil rows: Refer to equipment schedules
   2.2. Supply air volume: Refer to equipment schedules

2.3. Exhaust air volume: Refer to equipment schedules
2.4. Air temperature
2.4.1. Supply: Refer to equipment schedules
2.4.2. Exhaust: Refer to equipment schedules
2.5. Maximum static pressure: Refer to equipment schedules
3. Fluid: Water and ethylene glycol mix.
4. Materials: Solid drawn copper tubes with aluminium fins.
5. Tube wall thickness (minimum): 0.7 mm.
6. Fin thickness (minimum)
6.1. Aluminium: 0.4 mm.
6.2. Copper: 0.3 mm.
7. Fin pitch (maximum): 330 fins/m.
8. Thermal expansion: Allow for movement.
9. Draining and venting: Provide draining and venting devices.
10. Access doors for maintenance: Hinged, airtight and watertight.
11. Pump
11.1. Type: Close-coupled centrifugal pump and electric motor unit with anti-vibration mountings. Provide sealed expansion vessel.
11.2. Fixing: Supply for fixing to building structure. Support externally from casing on brackets.
11.3. Pressure gauge: Fit in the pump discharge connection.
12. Accessories: Matching ductwork flanges. Matching pipeline flanges.
13. Execution: Pr_60_60_36/610 Installing drain traps; Pr_60_60_36/630 Supports

Pr_60_65_03_87 Ecology extract air handling units ADDED

1. Description:
    1. All AHUs to be provided with manufacturers matching variable speed controller
    2. The electrical contractor shall provide a separate electrical feed to all motor fan compartments - to allow maintenance to be carried out without the fan running. The AHU manufacturer shall provide a suitable terminal block for this item.
    3. Contractor must ensure / confirm spatial fit prior to proposing any alternative manufacturer.
    4. Scheduled design external static pressures are provisional only and are subject to confirmation by contractor prior to placing the order.
    5. AHU Flexible joints shall be provided at all fan inlet and outlet connections; should be equal in cross- section to the points of connection; and should not be longer than 200mm or shorter than 100mm.
    6. Motorised dampers to be rigid with square connections fitted with end and edge seals of a flexible material and with minimal play in linkages. Leakage on shut-off to be less than 2%
    7. Supply and handover to client one complete set of SPARE filters (supplied by the AHU manufacturer) for each and every AHU filter
    8. Post-commissioning and prior to practical completion the Mechanical Contractor shall carry out a clean of all AHU filters and demonstrate their condition
    9. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.
    10. The electrical input for all fans shall be confirmed in the Contractor's technical submission.
2. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved

alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

3. Factory Testing & Witnessing: One of each type of air handling unit shall be offered for factory inspection, load / acoustic testing and witnessing to the client and the Consultant for approval prior to delivery to site of any part of the order . The contractor is to include for all costs (including travel arrangements) associated with the factory inspection/witnessing for 5no. client team representatives.
4. Standard: To BS EN 13053.
5. Duty
   - 5.1. Air volume
     - 5.1.1. Extract: Refer to equipment schedules
   - 5.2. External resistance: Refer to equipment schedules
   - 5.3. Sound power level: Refer to equipment schedules
6. Casing construction
   - 6.1. Standard: To BS EN 1886.
   - 6.2. Casing class: D1.
   - 6.3. Leakage class of casing: L1.
   - 6.4. Filter bypass leakage: To BS EN 1886, section 7.
   - 6.5. Thermal performance of casing
     - 6.5.1. Thermal transmittance: T2.
     - 6.5.2. Thermal bridging: TB2.
   - 6.6. Acoustic insulation of casing: To BS EN 1886, section 9.
   - 6.7. Mechanical safety: To BS EN 1886, section 11.
   - 6.8. Material: Galvanized sheet steel.
   - 6.9. Finish: Painted.
7. Components
   - 7.1. Dampers
     - 7.1.1. Purpose: To BS EN 13053, Category B - Sections for flow control. To BS EN 13053, Category A - On-off sections.
   - 7.2. Filters: Pr_65_57_02_02 Activated carbon air filters; Pr_65_57_02_66 Panel air filters; Pr_65_57_02_07 Bag air filters; Pr_65_57_02_37 High efficiency particle arrestor (HEPA) air filters
   - 7.3. Heat recovery
     - 7.3.1. Heat recovery equipment: Pr_60_60_36_74 Run-around coils
   - 7.4. Extract fan
     - 7.4.1. Fan type: Pr_65_67_29_12 Centrifugal fans
   - 7.5. Attenuators: Pr_65_67_78_12 Circular attenuators; Pr_65_67_78_72 Rectangular attenuators
8. Accessories: Access panels. Anti-vibration mountings. Flexible connectors.
9. Execution: Pr_60_65_03/610 Installing air handling units; Pr_60_65_03/615 Access; Pr_60_65_03/620 Coil installation generally; Pr_60_65_03/630 Installing hot water coils; Pr_60_65_03/645 Installing fans; Pr_60_65_03/650 Services connections; Pr_60_65_03/655 Isolation of air handling units; Pr_60_65_03/660 Support for air handling units; Pr_60_65_03/665 Pre-commissioning of coils

Pr_65_52_34_22 Differential pressure gauges

1. Arrangement: Dial. Inclined manometer.
2. Gauge markings: Positions equivalent to ‘Filter Dirty’ and ‘Filter Clean’ conditions.

3. Accessories: Pressure differential switch.
4. Execution: Pr_65_52_34/660 Installing pressure gauges

Pr_65_52_34_50 Manometers

1. Arrangement: Dial.
2. Gauge markings: Positions equivalent to ‘Filter Dirty’ and ‘Filter Clean’ conditions.
3. Accessories: Pressure differential switch.
4. Execution: Pr_65_52_34/660 Installing pressure gauges

Pr_65_57_02_02 Activated carbon air filters ADDED

1. Standard: Performance to BS EN ISO 16890-1.
2. Duty
   2.1. Air flow rate: refer to equipment schedules
3. General: Provide absorbent bed filled with uniform thickness of activated carbon granules constructed to prevent settlement. Provide bonded carbon cells to prevent pinholing.
4. Media type: Reactivation possible.
5. Casing: Provide casing with removable panels.
6. Accessories: Pr_65_52_34_50 Manometers; Pr_65_52_34_22 Differential pressure gauges
7. Execution: Pr_65_57_02/640 Installing filters

Pr_65_57_02_07 Bag air filters

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Standards
   1.1. Performance: To BS EN ISO 16890-1.
   1.2. Testing: To Eurovent 4/11: Energy efficiency classification of air filters for general ventilation purposes.
2. Duty
   2.1. Face velocity: Refer to equipment schedules
   2.2. Initial filter pressure drop: Refer to equipment schedules
3. Final filter pressure drop: 450 Pa.
4. Filter class: Refer to equipment schedules
5. Flammability: Non-flammable for duration of recommended working life.
6. Access: Side.
7. Filter mounting frames
8. Accessories: Pr_65_52_34_22 Differential pressure gauges; Pr_65_52_34_50 Manometers
9. Execution: Pr_65_57_02/640 Installing filters

Pr_65_57_02_37 High efficiency particle arrestor (HEPA) air filters ADDED

1. Standard: To BS EN 1822-1.
2. Use of conditioned space: Kitchen exhaust
3. Duty
   3.1. Maximum air flow rate: Refer to equipment schedules
4. Filter media: HEPA filter media - Group H.

5. Filter class: Refer to equipment schedules
6. Filter casing: Provide with gasket fitted to casing.
7. Filter material: Carbon steel with corrosion resistant coating. Stainless steel.
8. Flammability: Non-flammable for duration of recommended working life.
9. Access:
10. Filter frame material: Coated steel.
11. Accessories: Pr_65_52_34_22 Differential pressure gauges; Pr_65_52_34_50 Manometers
12. Execution: Pr_65_57_02/640 Installing filters

Pr_65_57_02_66 Panel air filters

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Standards
    1.1. Performance: To BS EN ISO 16890-1.
    1.2. Testing: To Eurovent 4/11: Energy efficiency classification of air filters for general ventilation purposes.
2. Filter type: Disposable – synthetic media panel.
3. Final filter pressure drop: 250 Pa.
4. Conditions: Ambient.
5. Flammability: Non-flammable for duration of recommended working life.
6. Accessories: Pr_65_52_34_22 Differential pressure gauges; Pr_65_52_34_50 Manometers
7. Execution: Pr_65_57_02/640 Installing filters

Pr_65_65_23_20 Duct access panels

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description: Install access openings in accordance with this specification, additionally where shown on the drawings, and to access all dampers and additionally as necessary to internally clean all sections of the supply and extract ductwork and ventilation plant.
2. Location of Access Panels for Inspection/Servicing and/or Internal Cleanliness:
    - Control dampers: Both sides
    - Fire dampers: Both sides
    - Heating/cooling/re-claim coils: Both sides
    - Attenuators (rectangular): Both sides
    - Attenuators (circular): Both sides
    - Filter sections: Both sides
    - Air turning vanes: Both sides
    - Changes of direction: one-panel to suit
    - In-duct fans / devices: Both sides
    - Inlet / exhaust louvres: one side to suit
    - intermediate cleaning panels: To suit frequency specified in BESA TR19, DW144 and DW172

Other than in the locations shown above, intermediate access panels should be

installed by the specialist cleaning contractor as a minimum every 15m in horizontal ductwork systems for the purpose of normal usage but not greater than 1m from the throat of a square 90° bend.

Access panels should normally be positioned as close as practicably possible to the item to be cleaned (0.5 m maximum).

For access requirements for kitchen extract systems see BESA specification BESA TR19 Grease

3. Material: Galvanized sheet steel.

Pr_65_65_24_78 Shut off dampers

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Standard: To BS EN 1751.
2. Casing leakage: B.
3. Control method: Electric and electronic.
4. Execution: Pr_65_65_24/750 Access to dampers for resetting and maintenance

Pr_65_65_25_14 Circular sheet metal ductwork and fittings

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description:

   The contractor is to conform to comply with the following requirements:

   1. The Contractor shall employ a ductwork cleaning specialist prior to the installation of the system to advise and implement a ductwork cleaning regime on all air systems, in accordance with BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems', all other relevant BSRIA, CIBSE and HSE standards / guidance documents.
   2. Provide flexible connections at building expansion joints.
   3. All visible ductwork shall be cleaned externally (including ductwork with Hammerclad finish) prior to hand-over.
   4. Leakage testing required for all ductwork systems as follows:
      a. Class A - Low Pressure: 10% of each system to be randomly selected for testing
      b. Class B - Medium Pressure: 100% of each system shall be tested
   5. Leakage testing shall be carried out as the work proceeds and prior to the application of thermal insulation (where applied). All riser and plant area ductwork is to be subjected to a 100% test.

6. Provide ductwork systems and access doors in accordance with BESA specification DW144 using J6 rated flanging throughout.
7. Provide ductwork systems and access doors in accordance with BESA specification DW172 (kitchen ventilation systems) using J6 rated flanging throughout.
8. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.
9. The ductwork will be subjected to a range of witnessed factory leakage tests for a range of sizes and types of ductwork installation and materials, allow for a minimum of 6 separate tests. Contractor to include for travel costs for up to 2no people to attend the testing.
10. All circular ductwork will be required to have suitable flanges factory fitted and not fitted at site.
11. All circular joints are to be further made and suitably sealed using suitable high velocity jointing tape.
12. Each aspect of the ventilation installation is to be benchmarked before installation begins.
13. A sample of each galvanised component is to be provided for approval.
14. The successful ductwork contractor will be required to work closely and manage all interfaces with the facade contractor to ensure a successful installation to the engineers satisfaction.
15. The ductwork contractor shall provide a full design calculation check to ratify the air performance in the engineers design.
16. The successful ductwork contractor will liaise and interface with the structural engineer to provide all down weights and loadings for the ductwork installation and ventilation equipment.
17. The minimum acceptable levels for sheet metal gauges specified within DW144 will not be used for all ductwork.
18. The ductwork contractor will provide a comprehensive technical submission with their tender complete with all certification of conformity, and a full set of marked up drawings showing detailed scope of inclusions.
19. The ductwork contractor will include for sufficient vacuum tests to prove the cleanliness of all ductwork systems.
20. The ductwork contractor will provide such additional information and detail with their tender submission demonstrating their specific understanding of the completion of a development of this nature together specific project examples.

2. Manufacturer: Ductwork is to be supplied, manufactured, installed and tested by ES Group Ltd (01323 845492) or better and approved.
3. Standards: To BESA DW/144, BS EN 1506 and BS EN 12237.
4. Classification: Class B. (+75Pa) medium pressure. All ducts to be pressure tested.
5. Internal Cleanliness of Ventilation System: With reference to BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems, the following levels are to be achieved for each applicable system:

5.1. Clean Plantrooms:

Ventilation systems serving the following (or similar) plantrooms:

- Low voltage switchrooms
- Medium voltage switchrooms
- High voltage switchrooms
- UPS rooms
- SER rooms
- Data centres
- Potable domestic water plantrooms

Cleanliness Quality Class: HIGH

Acceptable dust accumulation level (supply): <0.3 g/m²

Acceptable dust accumulation level (extract): <0.9 g/m²

5.2. Front of House / Public / Occupied Areas: Cleanliness Quality Class: HIGH

Acceptable dust accumulation level (supply): <0.3 g/m²
Acceptable dust accumulation level (extract): <0.9 g/m²

5.3. Standard Plantrooms:

Ventilation systems serving the following (or similar) plantrooms:

- Non-potable domestic water plantrooms
- Fire plantrooms
- Ventilation plantrooms

Cleanliness Quality Class: MEDIUM

Acceptable dust accumulation level (supply): <0.6 g/m²

Acceptable dust accumulation level (extract): <1.8 g/m²

5.4. General Storage Areas: Cleanliness Quality Class: LOW

Acceptable dust accumulation level (supply): <0.9 g/m²
Acceptable dust accumulation level (extract): <1.8 g/m²

5.5. Location of Access Panels for inspection/Servicing and Internal Cleanliness: Refer to clause Pr_65_65_23_20 for further details

6. Microbiological Contamination: Comply with the microbiological aspects of ventilation hygiene as detailed within CIBSE TM26.

Surface sampling microbial limits are as follows:

Category Low:
Colony Forming Units (CFU per 10cm²): equating to less than 10.

Category Medium:
Colony Forming Units (CFU per 10cm²): equating to 10 to 19.

Category High :
Colony Forming Units (CFU per 10cm²): equating to 20 and above.

Should the microbial counts from a particular general area (such as the AHU) indicate localised microbial contamination, ie more than 50% of samples in the “high” category, then the cleaning of

that area is to be undertaken.

Cleaning of the entire system will be a requirement where, on average, more than 25% of the samples are in the “high” category.

7. Material: Aluminium.
8. Construction: Spirally wound. Straight seamed.
9. Regulating dampers
   9.1. Standard: As BESA DW/144.
   9.2. Regulating function: Balancing. Control.
   9.3. Operation: Manual. Automatic. Provide extended spindle for mounting actuator.
   9.4. Material: To match ductwork.
10. Access openings
   10.1. Purpose: Inspection. Cleaning. Maintenance.
   10.2. Sizes: To BS EN 12097.
11. 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_25/680 Ductwork support, special; 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_25/790 Air leakage testing of plant items; Pr_65_65_25/785 Air leakage testing of medium pressure ductwork

Pr_65_65_25_30 Fire resisting ductwork and fittings

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems and Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems

1. Description:

   The contractor is to comply with the following requirements:

   1. The Contractor shall employ a ductwork cleaning specialist prior to the installation of the system to advise and implement a ductwork cleaning regime on all air systems, in accordance with BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems', all other relevant BSRIA, CIBSE and HSE standards / guidance documents.
   2. Provide flexible connections at building expansion joints.
   3. All visible ductwork shall be cleaned externally (including ductwork with Hammerclad finish) prior to hand-over.
   4. Leakage testing required for all ductwork systems as follows:
      a. Class A - Low Pressure: 10% of each system to be randomly selected for testing
      b. Class B - Medium Pressure: 100% of each system shall be tested
   5. Leakage testing shall be carried out as the work proceeds and prior to the application of thermal insulation (where applied). All riser and plant area ductwork is to be subjected to a 100% test.
   6. Provide fire-rated ductwork, where required and detailed (FR) to meet BSEN1366 parts 1,8 and 9 by Flameshield constructed using J6 rated flanging technology and also in compliance with BSEN.1587 and BSEN.12107
   7. Provide ductwork systems and access doors in accordance with BESA specification DW144 using J6 rated flanging throughout.
   8. Provide ductwork systems and access doors in accordance with BESA specification DW172 (kitchen ventilation systems) using J6 rated flanging throughout.

9. The M&E Contractor must refer to the Fire Engineering Consultant's Fire Strategy Report and be fully compliant with its content.
10. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.
11. Fire rated ductwork and rated insulation to achieve EN.1366 Parts 1 & 8 and EN.13501-3 Standards, alongside BS.476 Part 24 and ISO.6944 (1985) All fire rated ductwork is to be subjected to a 100% test.
12. The ductwork will be subjected to a range of witnessed factory leakage tests for a range of sizes and types of ductwork installation and materials, allow for a minimum of 6 separate tests. Contractor to include for travel costs for up to 2no people to attend the testing.
13. All circular ductwork will be required to have suitable flanges factory fitted and not fitted at site.
14. All circular joints are to be further made and suitably sealed using suitable high velocity jointing tape.
15. Each aspect of the ventilation installation is to be benchmarked before installation begins.
16. A sample of each fire rated component is to be provided for approval.
17. The successful ductwork contractor will be required to work closely and manage all interfaces with the facade contractor to ensure a successful installation to the engineers satisfaction.
18. The ductwork contractor will provide a full design calculation check to ratify the air performance in the engineers design.
19. The successful ductwork contractor will liaise and interface with the structural engineer to provide all down weights and loadings for the ductwork installation and ventilation equipment.
20. A suitable mock-up of completed fire rated ductwork and insulation will be required to be constructed at the ductwork contractors factory for approval. Contractor to include for travel costs for up to 2no people to attend the testing.
21. The ductwork contractor is to include the manufacture of all fire rated attenuator casings and for installing the specified attenuator pods at their own factory.
22. The minimum acceptable levels for sheet metal gauges specified within DW144 will not be used for all ductwork.
23. The ductwork contractor will provide a comprehensive technical submission with their tender complete with all certification of conformity, and a full set of marked up drawings showing detailed scope of inclusions.
24. The ductwork contractor will include for sufficient vacuum tests to prove the cleanliness of all ductwork systems.
25. The ductwork contractor will provide such additional information and detail with his tender submission demonstrating his specific understanding of the completion of a development of this nature together with specific project examples.

2. Manufacturer: Ductwork is to be supplied, manufactured, installed and tested by ES Group Ltd (01323 845492) or better and approved.
3. Standard
   - 3.1. Ductwork: In accordance with ASFP Fire resisting ductwork – classified according to BS EN 13501, Parts 3 and 4 – European version (Blue book).
   - 3.2. Testing: To BS EN 1366-1.
4. Classification
   - 4.1. Standard: To BS EN 13501-3.
   - 4.2. Integrity class: EI 60. EI 120. as defined by fire compartmentation drawings. Refer to system schematics

Class B. (+75Pa) medium pressure. All ducts to be pressure tested.

5. Internal Cleanliness of Ventilation System: With reference to BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems, the following levels are to be achieved for each applicable system:

5.1. Clean Plantrooms:

Ventilation systems serving the following (or similar) plantrooms:

- Low voltage switchrooms
- Medium voltage switchrooms
- High voltage switchrooms
- UPS rooms
- SCR rooms
- Data centres
- Potable domestic water plantrooms

Cleanliness Quality Class: HIGH

Acceptable dust accumulation level (supply): <0.3 g/m²

Acceptable dust accumulation level (extract): <0.9 g/m²

5.2. Front of House / Public / Occupied Areas: Cleanliness Quality Class: HIGH

Acceptable dust accumulation level (supply): <0.3 g/m²
Acceptable dust accumulation level (extract): <0.9 g/m²

5.3. Standard Plantrooms:

Ventilation systems serving the following (or similar) plantrooms:

- Non-potable domestic water plantrooms
- Fire plantrooms
- Ventilation plantrooms

Cleanliness Quality Class: MEDIUM

Acceptable dust accumulation level (supply): <0.6 g/m²

Acceptable dust accumulation level (extract): <1.8 g/m²

5.4. General Storage Areas: Cleanliness Quality Class: LOW

Acceptable dust accumulation level (supply): <0.9 g/m²
Acceptable dust accumulation level (extract): <1.8 g/m²

5.5. Location of Access Panels for inspection/Servicing and Internal Cleanliness: Refer to clause Pr_65_65_23_20 for further details.

6. Microbiological Contamination: Comply with the microbiological aspects of ventilation hygiene as detailed within CIBSE TM26.

Surface sampling microbial limits are as follows:

Category Low:
Colony Forming Units (CFU per 10cm²): equating to less than 10.

Category Medium:
Colony Forming Units (CFU per 10cm²): equating to 10 to 19.

Category High :
Colony Forming Units (CFU per 10cm²): equating to 20 and above.

Should the microbial counts from a particular general area (such as the AHU) indicate localised microbial contamination, ie more than 50% of samples in the “high” category, then the cleaning of that area is to be undertaken.

Cleaning of the entire system will be a requirement where, on average, more than 25% of the samples are in the “high” category.

7. Execution: Pr_65_65_25/610 Air ductwork generally; Pr_65_65_25/645 Installing fire and smoke extract ductwork; Pr_65_65_25/670 Ductwork support for vapour seal continuity; Pr_65_65_25/680 Ductwork support, special; Pr_65_65_25/730 Fire rated ductwork sleeves and collars

Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description:

   The contractor is to conform to comply with the following requirements:

   1. The Contractor shall employ a ductwork cleaning specialist prior to the installation of the system to advise and implement a ductwork cleaning regime on all air systems, in accordance with BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems', all other relevant BSRIA, CIBSE and HSE standards/guidance documents.
   2. Provide flexible connections at building expansion joints.
   3. All visible ductwork shall be cleaned externally (including ductwork with Hammerclad finish).
   4. Leakage testing required for all ductwork systems as detailed above. The tests shall be carried out as the work proceeds and prior to the application of thermal insulation (where applied). All riser and plant area ductwork is to be subjected to a 100% test.
   5. Provide ductwork systems and access doors in accordance with BESA specification DW144 using CGF flanging throughout.
   6. Provide ductwork systems and access doors in accordance with BESA specification DW172 (kitchen ventilation systems) using CGF flanging throughout.
   7. All equipment to be issued with a full and detailed manual for installation, operating/maintenance and fault finding.

8. The ductwork will be subjected to a range of witnessed factory leakage tests for a range of sizes and types of ductwork installation and materials, allow for a minimum of 6 separate tests. Contractor to include for travel costs for up to 2no people to attend the testing.
9. All circular ductwork will required to have suitable flanges factory fitted and not fitted at site.
10. All circular joints are to be further made and suitably sealed using suitable high velocity jointing tape.
11. Each aspect of the ventilation installation is to be benchmarked before installation begins.
12. A sample of each galvanised component is to be provided for approval.
13. The successful ductwork contractor will be required to work closely and manage all interfaces with the facade contractor to ensure a successful installation to the engineers satisfaction.
14. The ductwork contractor will provide a full design calculation check to ratify the air performance in the engineers design.
15. The successful ductwork contractor will liaise and interface with the structural engineer to provide all down weights and loadings for the ductwork installation and ventilation equipment.
16. The minimum acceptable levels for sheet metal gauges specified within DW144 will not be used for all ductwork.
17. The ductwork contractor will provide a comprehensive technical submission with their tender complete with all certification of conformity, and a full set of marked up drawings showing detailed scope of inclusions.
18. The ductwork contractor will include for sufficient vacuum tests to prove the cleanliness of all ductwork systems.
19. The ductwork contractor will provide such additional information and detail with his tender submission demonstrating his specific understanding of the completion of a development of this nature together specific project examples.

2. Manufacturer: Ductwork is to be supplied, manufactured, installed and tested by ES Group Ltd (01323 845492) or better and approved.
3. Standards: To BESA DW/144, BS EN 1505 and BS EN 1507.
4. Classification: Class B. (+75Pa) medium pressure. All ducts to be pressure tested.
5. Internal Cleanliness of Ventilation System: With reference to BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems, the following levels are to be achieved for each applicable system:
   5.1. Clean Plantrooms: With reference to BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems, the following levels are to be achieved for each applicable system:
   5.2. Front of House / Public / Occupied Areas: Cleanliness Quality Class: HIGH

   Acceptable dust accumulation level (supply): <0.3 g/m²
   Acceptable dust accumulation level (extract): <0.9 g/m²
   5.3. Standard Plantrooms:

   Ventilation systems serving the following (or similar) plantrooms:

   - Non-potable domestic water plantrooms
   - Fire plantrooms
   - Heating/chilled water pump plantrooms

- Ventilation plantrooms

Cleanliness Quality Class: MEDIUM

Acceptable dust accumulation level (supply): <0.6 g/m²

Acceptable dust accumulation level (extract): <1.8 g/m²

5.4. General Storage Areas: Cleanliness Quality Class: LOW

Acceptable dust accumulation level (supply): <0.9 g/m²
Acceptable dust accumulation level (extract): <1.8 g/m²

5.5. Location of Access Panels for inspection/Servicing and Internal Cleanliness: Refer to clause Pr_65_65_23_20 for further details

6. Microbiological Contamination: Comply with the microbiological aspects of ventilation hygiene as detailed within CIBSE TM26.

Surface sampling microbial limits are as follows:

Category Low:
Colony Forming Units (CFU per 10cm²): equating to less than 10.

Category Medium:
Colony Forming Units (CFU per 10cm²): equating to 10 to 19.

Category High :
Colony Forming Units (CFU per 10cm²): equating to 20 and above.

Should the microbial counts from a particular general area (such as the AHU) indicate localised microbial contamination, ie more than 50% of samples in the “high” category, then the cleaning of that area is to be undertaken.

Cleaning of the entire system will be a requirement where, on average, more than 25% of the samples are in the “high” category.

7. Material: Aluminium.
8. Regulating dampers
   8.1. Standard: To BESA DW/144.
   8.2. Regulating function: Control. Balancing.
   8.3. Operation: Automatic. Provide extended spindle for mounting actuator. Manual.
9. Access openings
   9.1. Purpose: Inspection. Cleaning. Maintenance.
   9.2. Sizes: To BS EN 12097.
10. 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_25/700 Test holes in ductwork; Pr_65_65_25/720 Weatherproofing ductwork penetrations; Pr_65_65_25/785 Air

leakage testing of medium pressure ductwork; Pr_65_65_25/790 Air leakage testing of plant items; Pr_65_65_25/795 Air leakage testing of low pressure ductwork

Pr_65_67_29_12 Centrifugal fans

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Description:
    1. The design has been based on the manufacturers as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
2. Standards
    2.1. Performance: To BS EN ISO 5801.
    2.2. Configuration category: Refer to system schematics
    2.3. Mechanical safety: To BS EN ISO 12499.
    2.4. Electrical safety: To BS EN 60335-1 and BS EN 60335-2-80.
    2.5. Dimensions: To BS EN ISO 13351.
3. Duty
    3.1. Air volume: Refer to equipment schedules
    3.2. Resistance: Refer to equipment schedules
    3.3. Fan speed: Refer to equipment schedules
    3.4. External static resistance: Refer to equipment schedules
    3.5. Sound power level: Refer to equipment schedules
4. Motor and drive: Refer to equipment schedules
5. Inspection doors: Fit airtight removable doors in scroll and cover.
6. Accessories: Flexible connections. Motorized shutters. Speed controller. Stand.
7. Execution: Pr_65_67_29/610 Installing fans generally

Pr_65_67_78_12 Circular attenuators

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Application:
    - Extract
    - Supply
2. Performance standards : To BS EN ISO 7235 and BS EN ISO 11691.
3. Duty
    3.1. Insertion loss: Refer to equipment schedules
    3.2. Air volume: Refer to equipment schedules
    3.3. Permissible pressure loss: Refer to equipment schedules
4. Casing material: Metal.
5. Lining material: Inert, fire proof, inorganic and non- hygroscopic. Melonex lined
6. Duct connections: Refer to equipment schedules and system schematics
7. Markings: Show direction of air flow on silencer.

Pr_65_67_78_72 Rectangular attenuators

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems , Ss_65_40_33_90 [M] Toilet extract ventilation systems , Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Application: Extract. Supply.
2. Performance standards: To BS EN ISO 7235 and BS EN ISO 11691.
3. Duty
   3.1. Insertion loss: Refer to equipment schedules
   3.2. Air volume: Refer to equipment schedules
   3.3. Permissible pressure loss: Refer to equipment schedules
4. Casing material: Metal.
5. Lining material: Inert, fire proof, inorganic and non-hygroscopic. Melonex lined
6. Duct connections: Refer to equipment schedules and system schematics
7. Markings: Show direction of air flow on silencer.

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_18_21 Damper actuators

Shared by: Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems , Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems , Ss_75_70_52_94 [M] Ventilation control systems , Ss_75_70_52_93 [M] Variable volume air conditioning control systems and Ss_75_70_52_80 [M] Smoke and heat detection extract control systems

1. Actuator type: Electric.
2. Operation: On/off.
3. Ancillaries:
   - Feedback connection
   - Position indicator
4. Execution: Pr_75_50_18/616 Installing damper actuators

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_80_77_76_53 Mineral wool duct slab insulation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_76 Self-adhesive insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_95 Valve and flange insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply 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: Equilateral triangle, 150 mm length of side, with one apex pointing in the direction of flow.
4. Information:
    - Space served by the duct and associated plant
    - Air being conveyed, direction of flow, destination of the air
    - Location or designation of plant which treats the air.

Pr_60_60_36/610 Installing drain traps

Shared by: Pr_60_60_36_88 Thermal wheels and Pr_60_60_36_62 Plate recuperators

1. Air break: Locate between trap outlet and drainage system.
2. Traps under suction: Install the outlet below the inlet a depth equivalent to at least 1.5x working pressure.
3. Traps under positive pressure: Install inlet and outlet at same level.

Pr_60_60_36/630 Supports

Shared by: Pr_60_60_36_88 Thermal wheels and Pr_60_60_36_62 Plate recuperators

1. Fixings: Support heat recovery devices independently of ductwork.

Pr_60_65_03/610 Installing air handling units

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Standard: In accordance with BS EN 13053.
2. Component assembly
    2.1. Sealing: Provide gaskets between air handling unit sections to prevent air leakage from casing.
    2.2. Site drilling of air handling unit: Not permitted.

Pr_60_65_03/615 Access

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Access space: Position air handling units to allow space for maintenance and access.

Pr_60_65_03/620 Coil installation generally

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Venting and draining: Set out pipelines to and from the coils to allow venting and draining of the coils and piping.
2. Support: Do not support pipelines and valves on coil connections.
3. Access: Allow space to inspect and maintain the coils on both sides.

Pr_60_65_03/630 Installing hot water coils

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

Pr_60_65_03/645 Installing fans

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Blow through units: Arrange section to allow uniform velocity profile downstream.
2. Accessories: Flexible connection between fan discharge and casing spigot.

Pr_60_65_03/650 Services connections

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Entry points: Seal around electrical cable and pipeline entry points to prevent air leakage.
2. Flexible cables: Provide between fan motor and local isolator.

Pr_60_65_03/655 Isolation of air handling units

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Electrical connections: Provide means of isolating air handling units electrically.
2. Pipe connections: Provide means of isolating pipelines to air handling units.
3. Steam: Provide means of isolating steam to humidifier when access door is opened.

Pr_60_65_03/660 Support for air handling units

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Method: Submit proposals

Pr_60_65_03/665 Pre-commissioning of coils

Shared by: Pr_60_65_03_86 Supply air handling units and Pr_60_65_03_87 Supply and return air handling units

1. Preparation: Remove protective covering. Check frost protection and drain if heat is not available in freezing conditions.
2. Cleaning and chemical treatment: Use chemicals compatible with the materials in the coils.

Pr_65_52_34/660 Installing pressure gauges

1. General: Fix external to unit to allow easy observation, within 3 m of filter.
2. Pressure differential switch: Connected to provide visual or audio warning of filter blocked condition.

Pr_65_57_02/640 Installing filters

1. Mounting: Clamp securely against sealing gasket to prevent leaks.
2. Edge seals: Prevent air bypassing filters. Seals must remain effective after removal and replacement of cells.
3. Filter frames
    3.1. Fixings: Securely fasten frames to ductwork walls.
    3.2. Gaps around frames: Seal with mastic sealant.

Pr_65_65_24/750 Access to dampers for resetting and maintenance

Shared by: Pr_65_65_24_29 Fire and smoke dampers

1. Position: Provide access to damper mechanisms on fire dampers; smoke dampers; combined smoke and fire dampers, and volume control dampers through access doors, suspended ceilings, etc. Where more than one fire damper is installed in a frame provide access to all fire dampers.
2. Fire links: Provide access for replacement.

Pr_65_65_25/610 Air ductwork generally

Shared by: Pr_65_65_25_77 Smoke extract ductwork

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.

Pr_65_65_25/645 Installing fire and smoke extract ductwork

Shared by: Pr_65_65_25_77 Smoke extract ductwork

1. Standard: Install fire resisting ductwork in accordance with ASFP Fire resisting ductwork European version (Blue book) and ASFP TGD 018. Install smoke extract ductwork in accordance with BS EN 12101-7.

2. Hangers and supports: In accordance with BSRIA BG 10/2010.

Pr_65_65_25/670 Ductwork support for vapour seal continuity

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

Pr_65_65_25/680 Ductwork support, special

Shared by: Pr_65_65_25_77 Smoke extract ductwork

1. Method of support: Submit proposals

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

Shared by: Pr_65_65_25_77 Smoke extract ductwork

1. Position: In accordance with CIBSE Commissioning Code Series A and BESA DW/144.

Pr_65_65_25/720 Weatherproofing ductwork penetrations

Shared by: Pr_65_65_25_77 Smoke extract ductwork

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

Pr_65_65_25/730 Fire rated ductwork sleeves and collars

Shared by: Pr_65_65_25_77 Smoke extract ductwork

1. Standard: In accordance with ASFP Fire resisting ductwork – tested to BS 476 Part 24. Volume 2 of 2 – product data sheets (Blue book). In accordance with ASFP Fire resisting ductwork – classified according to BS EN 13501 Parts 3 and 4 – European version (Blue book).
2. Position: As required to suit fire compartmentation lines
3. Material: To match ductwork.

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_25/785 Air leakage testing of medium pressure ductwork

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Standard: To BESA DW/144 and BESA DW/143.
2. Extent: 100% of the ductwork system.
3. Test pressure: To BESA DW/144, Table 22.
4. Documentation: Air leakage test sheet.
5. Report
    5.1. Format: Electronic. Paper copy.

5.2. Submit: On completion.

5.3. Number of copies: One

Pr_65_65_25/790 Air leakage testing of plant items

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Standard: To BESA DW/144.
2. Procedure: Include in-line plant with certificate of conformity for pressure class and air leakage classification for system under test.
3. Report
   3.1. Format: Electronic.
   3.2. Submit: On completion.
   3.3. Number of copies: One

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% of each ductwork system.
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: One

Pr_65_67_29/610 Installing fans generally

Shared by: Pr_65_67_29_89 Twin centrifugal fans , Pr_65_67_29_52 Mixed flow fans , Pr_65_67_29_44 Jet fans , Pr_65_67_29_62 Plug fans and Pr_65_67_29_64 Powered smoke and heat exhaust ventilators

1. Fixing: Use fixing points provided. Do not strain the fan structure when bolts are tightened.
2. Alignment: Install fan to allow optimum air flow path.

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_18/616 Installing damper actuators

1. Standard: In accordance with HVCA DW144.
2. Mounting: Ensure weight of actuator is supported to prevent damper casing distorting.
3. Access: Allow space for maintenance.
4. Interconnection: To central control panel.
5. Cable type: As specified by controls specialist
6. Cable containment: Pr_65_70_11_30 Flexible conduit

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/660 Installing foil faced mineral wool insulation on ductwork in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/715 Installing self adhesive cladding and jacketing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/720 Installing sheet aluminium protection in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/770 Insulation carried through ductwork supports in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Ss_65_40_33/630 Installing ductwork on air handling units

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Air discharge: Connect ductwork to allow air to straighten as it leaves the air handling unit.

Ss_65_40_33/650 Cleaning of kitchen extract ductwork systems ADDED

1. Cleaning: In accordance with BESA Technical Report TR/19.
2. Specialist: Approved specialist ductwork cleaning contractors
3. Method of test: Deposit thickness test (DTT). Visual inspection.
4. Method of cleaning: Submit proposals
5. Post clean verification of cleanliness report
    5.1. Information: System cleaned. Pre- and post-clean measurements. Pre- and post-clean photographic records. COSHH data on chemicals used, where applicable. Recommendations for future testing and cleaning. Details of system showing access panels and test locations. Details of uncleaned or inaccessible areas. Cleaning works completed certificate.
    5.2. Format: Electronic. Paper copy.
    5.3. Submit: On completion.
    5.4. Number of copies: One

System completion

Ss_65_40_33/810 Commissioning of air distribution systems

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation 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): One week.

Ss_65_40_33/820 Performance testing

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation 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.
    4.2. Number : Two.
    4.3. Duration of loan: One week.
5. Reports: Submit on completion.

Ss_65_40_33/830 Inspection and test records

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Reports
    1.1. Construction phase: System design is commissionable. Post-installation. System cleanliness. 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 Demonstrations

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

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

Ss_65_40_33/850 Documentation for ventilation systems

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract 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: 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: 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.
    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

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Filters
    1.1. Filter media: Supply two sets of filters, the first for use before commissioning and the second for final commissioning.

1.2. Retaining clips and rubber gaskets: Two sets for each type of filter.

1.3. Cleaning solution: Supply coating solution for one complete cleaning of metal plate filters.

2. Detectors: Supply two of each type.

3. Air terminal device keys: Supply a set for adjusting each type of grille and diffuser damper.

Ss_65_40_33/870 Maintenance

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_33_50 [M] Mechanical extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Servicing and maintenance: Undertake for 12 months after completion.

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_40_33_50
[M] Mechanical extract ventilation systems ADDED

Systems

Ss_65_40_33_50 [M] Mechanical extract ventilation systems ADDED

1. Description:

The mechanical extract installation generally comprises / includes for the following:

1. Compactor store extract fan system
2. Black-out finish on all services distribution, plant and ancillaries routed through areas where they would be visible to the public, within the building
3. Ductwork (including fire -rated where identified on the drawings), flexible connections to each fan unit, shut-off dampers, dampers, including fire, fire/smoke dampers, attenuators, grilles, ambient terminals, supports, bracketry and all other fittings required to make a complete and working installation.

1.1. General - applicable to all detailed systems: All external ductwork is to be suitably weather treated in accordance with this specification. Refer to equipment schedules.

Flexible ductwork connections to be made to the intake and exhaust spigot connections of each fan unit.

Fire dampers, fire/smoke actuator operated dampers to be provided through all compartment walls, with VCDs located on each branch, all as detailed on the schematic and GA plans. Provide VCDs as opposed-blade multi-leaf type designed to give close control of airflow evenly across the face of the terminal with minimum noise regeneration.

Each fan unit will be provided with common fault volt free contacts to enable a healthy/fault indication of the fan unit on the BMS. Refer to clause Ss_75_70_52_94 and schematic for further details.

Each fan controller unit will be provided with hard-wired fire alarm interface to shut-down in the event of fire alarm activation.

All extract fan units must be selected to comply with specific fan power threshold to meet Part L compliance.

The contractor must include for calculating the external pressure drop for each fan set based on their installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement motor/fan unit at their own expense. Any fan that is under-performing during commissioning will be replaced with correct unit at the contractors expense.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system

proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

1.2. Compactor Store Extract Fan System: The compactor store shall be served by an in-line extract fan to extract foul air from the compactor store.

The extract air shall be ducted to L02 and exhausted to atmosphere.

The fan unit will be provided complete with manufacturers integral controller for fan speed adjustment. The controller must be marked by the contractor to indicate the correct speed setting position following commissioning.

Thermal insulation is not required to the ductwork distribution through external spaces but shall be provided where the ductwork passes through conditioned spaces.

2. System performance: Ss_65_40_33/210 Design of ventilation systems; Ss_65_40_33/240 Ductwork design; Ss_65_40_33/250 Fan performance; Ss_65_40_33/260 Attenuator performance
3. Room extract air terminal devices: Pr_70_65_04_03 Air grilles
4. Air ductwork and accessories
   4.1. Ductwork: Pr_65_65_25_14 Circular sheet metal ductwork and fittings; Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings
   4.2. Accessories: Pr_65_65_23_20 Duct access panels; Pr_30_59_57_07 Bird guards; Pr_65_65_24_29 Fire and smoke dampers; Pr_65_65_25_32 Flexible ductwork; Pr_65_65_24_78 Shut off dampers
5. Thermal insulation on extract air ductwork: Pr_80_77_76_53 Mineral wool duct slab insulation; Pr_80_77_76_62 Phenolic foam insulation
6. Vibration isolation mountings: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_84 Spring isolators; Pr_80_77_94_42 Isolation hangers
7. Acoustic treatment: Pr_65_67_78_12 Circular attenuators; Pr_65_67_78_72 Rectangular attenuators
8. Extract fans: Pr_65_67_29_12 Centrifugal fans; Pr_65_67_29_52 Mixed flow fans
9. External exhaust air terminals: Pr_30_59_48_04 Aluminium louvre panel units
10. Accessories: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps
11. Controls: Ss_75_70_52_94 [M] Ventilation control systems; Ss_75_70_52_28 [M] Extract ventilation control systems
12. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
13. Testing: Pr_65_65_25/785 Air leakage testing of medium pressure ductwork; Pr_65_65_25/790 Air leakage testing of plant items
14. Execution: Ss_65_40_33/630 Installing ductwork on air handling units; Ss_65_40_33/640 Ductwork systems cleaning
15. System completion: Ss_65_40_33/810 Commissioning of air distribution systems; Ss_65_40_33/820 Performance testing; Ss_65_40_33/830 Inspection and test records; Ss_65_40_33/840 Demonstrations; Ss_65_40_33/850 Documentation for ventilation systems; Ss_65_40_33/860 Spares and consumables; Ss_65_40_33/870 Maintenance

See Ss_75_70_52_28 [M] Extract ventilation control systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Ss_75_70_52_94 [M] Ventilation control systems REVISED

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

1. Description:

1.1. General Requirements - AHUs: All shut off dampers shall be monitored for fully open and closed positions.

Extract systems incorporating air recirculation or any method of heat reclaim shall each have a duct return air temperature sensor input.

Where pre-heat and reheat coils are provided on an AHU a duct air temperature sensor shall be provided after each pre-heat coil and the coils valve modulated in order to maintain a constant off-coil temperature as set by a numeric point (nominally 11°C to 18°C).

Where variable speed drives exist velocity probes shall be provided on each AHU to measure the total supply air flow from the AHU. This flow rate shall be displayed on the BMS graphic panel and on a digital read-out unit at the AHU. CMR Ltd probes (or approved equivalent) and displays shall be provided.

The space temperature set point of each zone shall be set by a numeric point with user setting limits of +/- 2°C.

Where zone or local reheat coils do not exist the supply air temperature set point off each AHU shall be variable and set by a numeric point whose value is calculated based upon the space temperature set point and the average or return air temperature for the zone. A duct air temperature sensor shall be provided to monitor the supply air temperature off each AHU and the heating or cooling coil control valve modulated in order to maintain the variable supply air set point.

12 hour and 24 hour areas served by a common AHU shall have shut off dampers provided on the 12 hour supply ductwork operated by means of a BMS time schedule, the fan speed shall also reduce.

On start up of an individual AHU the dampers are to open, the supply fan be enabled on, soft started via variable speed drive. Air flow must be established by the differential pressure switch before the heating or cooling is enabled.

Where multiple AHUs could start up simultaneously, either after a mains failure or in accordance with BMS time schedules then their start up shall be staggered by BMS programmed time delays in order to reduce the instantaneous electrical current drawn.

1.1.1. Fans: Each supply and extract fan motor shall be enabled by a separate digital output from the BMS system.

When there are duty and standby supply and extract fan motors their duty selection shall be by a numeric point having automatic weekly duty changeover.

In the event of a lead fan motor failure the duty shall automatically changeover to the standby fan motor.

The required speed of dual speed fans shall be controlled by means of a BMS time schedule to set the fan to off, half or full speed.

The required speed of variable speed fans shall be controlled by means of a BMS time schedule to set the actual extract air volume to that of design for various stages of occupancy i.e. off, set back, occupied.

A common fault output from each variable speed drive unit shall be monitored as a BMS input and configured to alarm when on.

A three position OFF/AUTO/MANUAL selector switch shall be provided to each set of fan motors (on BMS panel) with run and trip display lamps on the motor control panel. Each switch is to be monitored for 'out of auto' status with an alert being relayed to the head-end.

The fan unit will be provided complete with manufacturers integral controller for fan speed adjustment. The controller must be marked by the contractor to indicate the correct speed setting position following commissioning.

A supply fan motor trip input shall be provided from the overload contacts of each fan motor and configured to alarm when on.

An extract fan motor trip input shall be provided from the overload contacts of each fan motor and configured to alarm when on.

Variable speed drive units shall be as supplied by Messrs. Danfoss Limited (or approved equivalent). A common fault output from each variable speed drive unit shall be monitored as a BMS input and configured to alarm when on.

1.1.2. Frost Coils: A duct air temperature sensor shall be provided after each frost coil and the frost coils modulated in order to maintain a constant off-coil temperature as set by a numeric point (nominally 5°C). On/off control shall not be used.

A manually resettable frost thermostat shall be provided after each frost coil (nominally set at 4°C to 6°C).

Operation of the frost stat shall be monitored and configured to alarm when on.

If the frost stat operates and the AHU concerned serves critical areas then the plant must continue to run, if however the AHU serves general areas then the supply fan should be switched off until conditions return to normal and the stat is reset. An indicator lamp shall be provided on the motor control panel to indicate that the stat has tripped.

1.1.3. Pressure Control: A differential pressure switch shall be provided after each supply fan and connected as an input to monitor air flow conditions. These inputs are to be configured to alarm when the supply fan is enabled and air flow has failed.

A differential pressure switch shall be provided after each extract fan and connected as

an input to monitor air flow conditions. These inputs are to be configured to alarm when the supply fan is enabled and air flow has failed.

A differential pressure switch shall be provided across each bank of primary (panel) and secondary (bag) filters to monitor clean / dirty conditions. These inputs are to be configured to alarm when dirty and air flow is on.

A differential pressure switch shall be provided across each bank of carbon filters to monitor clean / dirty conditions. These inputs are to be configured to alarm when dirty and air flow is on.

A differential pressure switch shall be provided across each bank of HEPA filters to display and monitor the actual pressure drop across the filter(s). This differential pressure input shall be configured to alarm when outside of design values and air flow is established. The pressure switches shall be as manufactured by CMR Ltd or approved equivalent.

Where room pressure control is used an analogue differential pressure switch shall be provided across each room to display and monitor the actual room differential pressure. The display shall be complete with a warning notice at each room stating the normal pressure to be maintained.

The differential pressure input shall be configured to alarm after a time delay when outside of design values and air flow is established. The alarm shall be local, external to the room concerned and also at the BMS front end. The pressure switches shall be as manufactured by CMR Ltd or better and approved equivalent.

1.1.4. Automatic Controls: All air handling units, both supply and extract units are to be provided with manufacturers integral open protocol controls system which will deliver the controls logic and sequence of operation as defined within this specification.

The system must be capable of complete interface with the site-wide installation to ensure seamless transfer and visibility of all control points, set-points, faults, alarms etc on the main head-end, including browser access. The specialist controls contractor must liaise with the air handling unit manufacturer to agree and fully understand the method of communication to ensure complete compatibility between the two systems.

The interface between the AHUs integral controls system and the site-wide BMS is within the controls specialist scope of works.

1.2. Air Handling Unit with DX Heat Pump & Thermal Wheel Heat Recovery:

1.2.1. List of Applicable AHUs: 16no Hall AHUs located at L05

1.2.2. System Operation:

1.2.2.1. System Basis of Design:

Event Types

In accordance with the Architects design the following event types have been considered within the basis of design for the Hall AHUs:

- End Stage Seated - 18,777 people total
- End Stage Ice Terrace Seated - 18,381 people total
- Centre Stage Seated - 20,733 people total

- End Stage Standing - 20,619* people total
- Centre Stage Standing - 24,113* people total

*Figures are based upon 0.4m²/person.

Ambient Conditions:

Heating:

- Dry-bulb Temperature: -4°C
- Relative Humidity: 100%

Cooling:

- Dry-bulb Temperature: 29°C
- Wet-bulb Temperature: 19°C

Event Calendar Periods

"Summer" Events (Concerts, Performances, etc):

- January-December

"Winter" Events (Ice pad related events):

- October-March

Internal Temperature Set-Points

"Summer" Events:

- 22°C (+2°C/-4°C)

"Winter" Events:

- 18° (±2°C)

Internal Heat Gain Allowances

1. Sensible Loads
   a. Stage Power & Lighting
      i. 640kW
   b. Occupants
      i. Seating = 70W/Person
      ii. Standing = 80W/Person
      iii. Dancing = 100W/Person
2. Latent Loads
   a. Occupants
      i. Seating = 35W/Person
      ii. Standing = 80W/Person
      iii. Dancing = 160W/Person

For the purposes of "worst case" psychrometric calculations, a maximum occupancy of 24,113 has been allowed, with with the following breakdown:

- Seated = 14,845 people
- Standing = 4,634 people
- Dancing = 4,634 people

Supply Air Temperatures

"Summer" Events

- 14°C - 16°C db (based upon 29°C ambient up to worst case single event day of 32°C ambient)

"Winter" Events

- 11°C db

Return Air Temperature to AHU

It has been calculated that the worst case return air temperature that will be experienced by the AHUs is 28°C. This temperature has been used as the basis of design for the AHU selections.

In order to accommodate the peak return temperature (28°C) a "boost" damper has been incorporated into the design of each AHU, to provide additional air flow to the condenser coils of up to 5m³/s.

As the return air temperature approaches 28°C, this "boost" damper will open and the extract side fans will ramp up to provide the additional airflow.

The Basis of Design manufacturer has based their calculations on an ambient temperature of up to 32°C. Based on this ambient, the "Summer" Event mode supply air temperature of 16°C shall be achieved.

1.2.2.2. Unit performance and evaluation: **Performance**

AHU performances for airflow, pressure, filtration, noise, heating duty, cooling duty, energy recovery by thermal wheel and energy recovery by run around coil shall be as stated on the manufacturers data sheets.
The AHU manufacturer shall provide detailed design data and mode of operations to demonstrate correct and adequate individual component selection and overall system performance in each mode of operation.

Evaluation

The AHU manufacturer shall provide evidence of the following.
Equivalent systems that have been in operation for no less than three years.
References for no less than two sites and / or end users where equipment has been installed.

1.2.2.3. Unit construction: **Base Frame**

The unit base frame shall be a continuous full-length perimeter-based frame rail to form a unitised assembly and the unit shall be delivered to site in one piece.
The unit base frame shall be constructed from 300mm dipped galvanised steel.
The base frame shall be capable of supporting the full weight of the unit as stated on the manufacturers data sheet +10%.
Lifting eyes shall be fitted to the base frame to allow lifting and siting of the unit.
Lifting eyes will be removable and be removed once installation is complete.
The base frame and lifting eyes shall be independently load tested and certified, copies of the certification will be supplied by the AHU manufacturer.

Structural Frame & Internal Floors

The unit construction will conform with standard BS EN 1886.
The structural frame of the unit shall be manufactured from 50mm extruded aluminium penta-post (EN AW 6060).
Connecting joints and corners shall be black nylon (PA6).
Top and bottom section frames shall be constructed independently of each other so that the top of the bottom AHU section and the bottom of the top AHU sections have independent 50mm penta-post supports.
Access floors shall be finished in chequer plate capable of withstanding loads of no less than 1.5 kN/m^2

Roof Structure & Rainwater Drainage

Unit shall be fitted with a pitched roof structure with drainage gutters on both the access side and non-access side of the unit.
The roof pitch shall be no less than 1:50.
Drainpipes will be fitted to the guttering to take the water from the gutter to ground level.
Gutters and drain piping will be constructed from BS EN 10088-3 304 stainless steel in RAL9018 papyrus white painted powder coating.
Flat roof structures and designs where there is potential for water to collect on the unit will not be accepted.

Unit Panels

Panels shall be 50mm thick double skin with the inner skin finished in goosewing grey plastisol and the inner skin finished in 1.2mm galvanised steel.
Panels shall be filled with flame retardant mineral wool insulation with a minimum density of 100kg/m^3

BS EN 1886 Standards

Units will be constructed and tested to BS EN 1886 as follows.
Leakage L2 (Unit as Supplied).
Thermal Transmittance T2
Mechanical Strength D2
Thermal Bridging TB3

Locks, Hinges & Handles

All panels will be hinged. Lift off panels will not be accepted.
All hinges shall be capable of supporting the panel weight +10%, manufacturer will demonstrate compliance with this in their technical submission.
All panels shall be secured closed using double or triple interlocked lockable handles and levers.
Locks shall be keyed alike for all units on the project.

Where high voltage switchgear is located in control panels a door interlocking isolator will be fitted as an additional safety measure.

1.2.2.4. Unit components:

Fans

All fans shall be EC Blue C-Pro type variable speed plug fans manufactured by Zeihl Abegg.

Fans will meet or exceed IE5 (Ultra-Premium) efficiency rating.

No external variable speed drives for fans will be accepted.

Fans shall include modbus RTU interface for controls communication with the unit main controller. Analogue and digital enable, run, fault signals will not be accepted as they will not satisfy the control and monitoring requirements of the unit.

Fan assembly will be fitted into the AHU utilising Zeihl Abegg GR spider mounting frames and plates.

Fan assembly will be fitted with Zeihl Abegg inlet ring complete with factory fitted pressure tapping.

Fan design selections shall be made at maximum speed of no more than 85%, the manufacturer will supply copies of the Zeihl Abegg fan selections as part of the final technical submission.

Dampers

Dampers shall be manufactured to and meet the standard EN 1751:2003 Class 3.

Frame construction shall be from extruded aluminium (EN AW 6060 T6).

Damper blades shall be insulated, blade construction shall be from polyurethane.

Gearing mechanisms shall be polypropylene contained within a maintenance free sealed housing.

Blade gasket type shall be TPV-E.

Drive shaft shall be 12mm x 12mm square hot dipped galvanised steel to standard EN 10346.

Drive shaft will have a cut slot on the end for damper position indication.

Damper Drive Motors

Drive motors shall be maintenance free fully modulating type controlled directly from the AHU controller by analogue signal.

Dampers and motors shall be fully enclosed within the AHU, no externally mounted damper motors will be accepted.

Motors shall be sized for the damper manufacturers torque value, for the damper it will operate +10%.

The manufacturers shall demonstrate correct sizing of the damper motors in the final technical submission.

Motors will read back actual position to the AHU controller by analogue signal.

Motors will automatically shut off at their fully open or closed end position.

Heat Recovery

Heat recovery shall be by variable speed rotary heat exchanger.

The wheel will utilise a pulley and belt drive system.

Drive belt will be Fenner Power Twist link belt. Welded belt or perforated rubber belts with metal links will not be accepted.

Speed control of the drive motor will be via variable speed drive.

The variable speed drive will also positively monitor wheel rotation, wheel speed and motor load.

Control of the wheel speed will be via analogue signal from the AHU controller.

The wheel controller will output a digital signal to the AHU controller on fault.

The wheel controller shall be capable of being reset from the AHU controller without manual intervention.

DX Refrigerant Heat Recovery System

The DX heat recovery system shall consist of an air to refrigerant coil located in the supply path of the AHU linked to the primary DX cooling circuit. The coil located in the supply path will provide supply air reheat function in cooling mode.

DX Refrigerant Heat Recovery Coil

Coils shall be multi-row slab constructed of 3/8” copper tube with aluminium fins, all aluminium shall be blue fin epoxy coated.

Coil frame construction shall be from grade BS EN 10088-3 304 stainless steel.

Coil design and selection shall incorporate the largest possible surface area to lowest possible air side pressure drops.

The AHU manufacturer shall provide detailed coil design data to demonstrate correct and adequate coil selection.

DX Refrigerant Heat Recovery Injection Valve

The AHU shall be fitted with a modulating three-way hot gas injection valve (MTW) to regulate refrigerant flow between the discharge side of the DX cooling circuit and the DX refrigerant heat recovery coil.

The MTW will be controlled by the AHU primary controller to give fully proportional control of the valve opening and closing.

The MTW will be fitted with a 42mm stepper motor providing 6,386 steps of resolution.

Air Source Heat Pump (ASHP) Circuits

Heating and cooling will be provided by way of integral air source heat pump.

The heat pump system will be designed, manufactures, fully integrated and packaged by the air handling unit manufacturer utilising component parts. Third party equipment such as heat pump condensing units, controls and valves will not be accepted.

The heat pump circuits will be controlled directly by the AHU controller, demand control via third party controllers will not be accepted.

ASHP Heat Exchange Coils

Coils shall be multi-row slab constructed of 3/8” copper tube with aluminium fins, all aluminium shall be blue fin epoxy coated.

Coils shall be furnished complete with reinforced manifolds.

Manifolds shall be constructed from refrigeration grade copper.

Coil frame construction shall be from grade BS EN 10088-3 304 stainless steel.

Coil design and selection shall incorporate the largest possible surface area to ensure high sensible heat ratios and lowest possible air side pressure drops.

The AHU manufacturer shall provide detailed coil design data to demonstrate correct and adequate coil selection.

ASHP Coil Condensate Drains

Coil heat exchangers will be mounted directly in their own coil drain pan.

Coil drain pans will be constructed of stainless steel with dual 1” bsp female threaded outlets to the access side of the AHU.

Drain pans will be sufficiently oversized to ensure all condensate is captured and there is no carry over or overspill into the AHU.

The AHU manufacturer will provide full details of external drainage requirements including sizes of any traps required to ensure correct drainage of condensate to waste.

ASHP Compressor

The compressor shall be selected from the VZH (Gen 3) range of scroll compressors as manufactured by Danfoss.

To limit the amount of circuits, refrigerant contained within the system and optimise system part load efficiency, hybrid manifolding of the compressors shall be applied.

Capacity control of each refrigerant circuit shall be fully proportional between 10% and 100%, a minimum circuit capacity above 10% will not be accepted.

Compressors shall have dynamic oil balance facility complete with optical oil sensor to ensure correct oil levels are maintained in all compressors at all times.

ASHP Compressor Drive

The compressor drive shall be selected to match the connected compressors, the drive will be manufactured by Danfoss.

The compressor drive shall have the capability to connect directly to the AHU controller via RS485 data bus.

The compressor drive will manage all compressors connected to a circuit and will optimise compressor capacity to meet the demand of the system.

The drive will constantly monitor key compressor parameters and report any abnormalities to the AHU controller over the RS485 data bus.

Electronic Expansion Valve

Electronic expansion valves shall be manufactured by Carel and be fully compatible with the AHU controller.

The expansion valve driver shall be ‘plug and play’ and be fully controlled and configured from the AHU local controller without the need for additional hardware and / or software.

Target superheat for the valve and controller shall be adjustable from the AHU local controller.

The expansion valve driver will constantly monitor both the superheat and subcooling of the DX circuit and adjust the expansion valve position to achieve the target superheat setting.

A fully operational visual illustration of the DX circuit including current superheat, suction temperature, suction pressure, percentage opening of the expansion valve and valve number of pulses open shall be viewable from the AHU local controller.

The electronic expansion valve shall be fitted with an Ultracap backup module to ensure closure of the expansion valve during loss of mains power.

Sensors, Controls & Line Components

The DX circuit will be fitted with but not limited to the following sensors and controls:

- Suction pressure transducer
- Suction temperature sensor
- Discharge pressure transducer
- Discharge temperature sensor
- Failsafe low pressure switch (directly connected to compressor drive)
- Heat pump / cooling changeover reversing valve
- Liquid line solenoid shut off valve
- Hot gas line solenoid shut off valve
- Liquid receiver solenoid shut off valve
- Liquid line filter drier
- Liquid line sight glass / moisture indicator
- Liquid line non-return valves

Refrigerant

The DX circuits shall utilise R410a refrigerant.

System design shall be optimised to keep refrigerant charges to a minimum without compromising on system performance and efficiency.

Refrigerant Charge Monitoring

The AHU controller will as standard have the capability to constantly monitor the refrigerant circuit conditions to determine any loss of refrigerant.

Should the charge monitoring function detect an abnormality in the refrigerant circuit condition then it will immediately activate the AHU pump down cycle, indicate a ‘Refrigerant Charge Abnormality’ alarm on the local controller and notify any connected BMS systems.

An abnormality will be judged under one or more of the following conditions:

- Low suction pressure
- High discharge temperature
- High suction superheat

The refrigerant charge monitoring shall meet the requirements of BRE POL 01 (NC 2018) section 7.

Refrigerant Pump Down

The ASHP DX circuit will have the facility to automatically pump down it's refrigerant without the need for any manual intervention.

On activation of a 'Refrigerant Charge Abnormality' alarm the system will automatically activate the refrigerant pump down cycle.

Remaining refrigerant in the system will be pumped into a vessel fitted within the AHU.

Once pump down is completed the system will automatically seal the vessel at the inlet and outlet.

Pumping refrigerant into an external container, system pipework or complete unit will not be accepted.

The pump down system shall meet the requirements of BRE POL 01 (NC 2018) section 7

Low Watt Density Heater

Where low watt density heaters are installed, they will provide back-up heat (recirc / warm up & defrost).

Control of the heater output will be via a proportional thyristor controller.

The heater will be protected by an overheat thermostat which will directly cut the power to the thyristor via a contactor in the event of any element overheating.

Controls & Interfaces

The AHU will have its own integral controls and will be fully capable of running stand alone separate from any external BMS or third-party control system.

Controls will be manufactured by Carel. The AHU manufacturer will be an approved Carel OEM with direct employed capability for software writing, testing and development.

Third party and / or externally sourced controls / software solutions will not be accepted.

AHU control panels will be manufactured as part of the AHU and be contained within the footprint of the AHU. Externally sourced control panels mounted externally on the AHU will not be permitted.

Third party and / or externally sourced controls / software will not be accepted.

The AHU manufacturer will be required to demonstrate compliance with the above as part of their final technical submission.

Main AHU Controller

The main AHU controller will be from the PCO5+ range of controls manufactured by Carel.

The controller will perform all processes and functions within the AHU.

The controller will have 32 bit, on board microprocessor and flash memory as standard.

The controller shall have digital, analogue, RS485 and IP I/O capability.

The controller will come complete with USB port and be capable of downloading and uploading software to / from USB flash drive.

Controllers requiring the use of a PC computer or other external device to download / upload software will not be accepted.

The controller will have the capability to communicate with other units via it's own private network (pLAN) completely separate from any BMS or other control network.

The controller will have plug and play native capability to control such items as electronic expansion valves.

The controller will have the capability to communicate with external BMS systems by way of IP or RS485 connection.

The controller will have the capability to communicate with BACNET, LonWorks or Modbus BMS networks.

Local Control User Interface

The AHU local controller will be a pGD1 semi graphic user interface.

The controller will have a display screen with a resolution of no less than 132 x 64 pixels.

In the event of an alarm the controller will give a visual indication by way of flashing red alarm indicator as well as an audible alarm.

The controller will be externally mounted on the AHU at a height easily accessible from ground level.

The IP rating of the controller will be no less than IP65.

The controller will be able to perform all operational, diagnostic and programming functions of the system.

Access to the controller menus will be password protected at the following levels.

User - General user operation.

Service – Maintenance and service engineering functions.

Manufacturer – High level parameters.

Manufacturer Remote Service Intervention

The AHU will be capable of sending an alarm notification by email to the AHU manufacturers monitoring bureau.

The system will have the capability for the manufacturer to remotely access the AHU for control and diagnostics purposes.

All operational data and parameters within the AHU controller will be accessible by the AHU manufacturer remotely.

Connection to the AHU will be by the manufacturers own autonomous secure GSM network, units will not be accessible by site LAN, WAN or BMS networks.

The AHU manufacturer will provide remote monitoring and service intervention services as standard, inclusive for the duration of the manufacturer's warranty. Services thereafter will be continued on a chargeable basis should it be client require.

1.2.2.5. Fire shutdown: The unit shall have hard wired volt free terminals available for connection to the building fire alarm system.
The connection will be normally closed – open on fire.
On fire the unit will immediately cease all operations and all dampers will close.
The unit will have the facility for the unit reset to be manual or automatic (software selectable) when the fire signal returns to normal.
The external fire signal shall have a dedicated switching relay for each AHU, looping or cross connecting of the fire signal will not be accepted.

1.2.2.6. Fire Smoke Extract & Purge Mode:

The unit shall be capable of providing cold smoke extract and / or air purging of the stadium bowl.

Smoke extract and purge modes will be activated by the AHU on receipt of command over the BMS network.

Smoke extract mode shall be programmable through the AHU local keypad to operate as follows.

- Extract Only
- Extract and Make Up
- Make Up Only

1.2.2.7. Connection of External Power & Control Wiring: An external connection point will be provided for connection of external power and control wiring.
The connection point enclosure will be constructed from BS EN 10088-3 304 stainless steel and finished in RAL9018 papyrus white painted powder coating.
The external connection point will allow for glanding of cables from below and connection to screwed terminals within the connection point.
The connection point will have a door interlocked mains isolator.
No penetration of the unit casing will be permitted for cable entry.
No running of power and / or control cables directly into the AHU control panel will be permitted.

1.2.2.8. Factory Witness Testing:

The manufacturer shall carry out unit testing at the factory in the presence of 5 number project key stakeholders as nominated by the client and / or project manager.

The contractor shall make all due allowance for travel costs for 5 number representatives to attend the testing.

One of each model and / or type of unit will be tested.

The outline test criterial will be but not limited to the following.

Compliance with specification for unit construction and leakage by way of deflection test and air leakage test in accordance with BS EN 1886.

Compliance with performance specification as follows.

- Design air volume achieved at design external static pressure.
- Unit specific fan power within design at design air volume and external static pressure.
- Design heating performance achieved at an external ambient of 7ºc.
- Design cooling performance achieved at an external ambient of 28ºc.
- Acoustic panel noise breakout test in normal operational mode at 12m^3/s.
- Demonstration of unit functionality in accordance with approved des of ops.
- Demonstration of unit functionality with external BMS connection.
- Demonstration of unit safety systems, primarily fire shut down.

A detailed FWT method statement will be submitted by the AHU manufacturer for approval as part their final technical submission.

1.2.2.9. Manufacturer Support & Competency: The AHU manufacturer shall be able to demonstrate they have the required competence and resource in-house to manufacture, commission and support the equipment supplied.
The AHU manufacturer shall carry out all design and manufacture in-house. Subcontract or third-party manufacture / design will not be acceptable.
The AHU manufacturer shall be registered with REFCOM or an equivalent industry body and ensure full compliance with current F-Gas legislation.

1.2.2.10. End User Training & Support: The AHU manufacturer will provide sufficient training to end user facilities engineers to enable them to have sufficient knowledge to effectively and efficiently operate the AHU equipment.
The AHU manufacturer will also have the capability to provide service and maintenance support should the end user require this in the future.

1.2.3. Power: Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.3. Outside Air Supply Only Air Handling Unit With Run-Around-Coil Heat Recovery:

1.3.1. List of Applicable AHUs: Supply air AHU to main commissary kitchen

1.3.2. System Operation: The AHU shall be provided with integral manufacturers open protocol control software.

The plant shall be enabled to run when the catering extract system is enabled to provide

make-up air.

When the enable signal is received the sequence of operation shall be as follows.

The fresh air dampers shall be motored open the supply fan shall then be enabled, once flow has been established the fresh air inlet temperature and exhaust air outlet temperature shall be checked.

The supply air temperature from the unit shall be allowed to float between pre-set minimum and maximum values initially set as 16.0°C minimum and 30.0°C maximum (adjustable). This temperature shall be set by the requirements of the internal averaging room temperature sensors.

The supply fans will be variable speed inverter controlled units to facilitate accurate commissioning set to operate at a fixed speed. The inverters are to be located either integral to each AHU or integral to the mechanical control panel.

1.3.3. Winter Operation: If the Fresh air is cooler than the required pre-set supply air temperature, initially set at 21.0°C (adjustable) and the exhaust air is warmer than the fresh air, the run around coil system shall be enabled. The discharge temperature from the run around coil within the supply unit shall then be checked and additional heating shall be provided by integral DX coil.

If the fresh air is cooler than the pre-set supply air temperature, and the exhaust air is cooler than the fresh air the run around coil shall be held off and the supply air temperature shall be controlled by integral DX coil**.**

1.3.4. Summer Operation: If the fresh air is warmer than the pre-set supply air temperature, and the exhaust air is cooler than the fresh air the run-around-coil shall be enabled. The discharge temperature from the run-around-coil shall then be checked and the supply air temperature controlled by the integral DX coil.

If the fresh air is warmer than the pre-set supply air temperature, and the exhaust air is warmer than the fresh air the-run-around coil shall be held off and the supply air temperature shall be controlled by the integral DX coil.

Upon plant shut down the supply fans shall be disabled and the run-around-coil system shall be disabled.

1.3.5. Control and Monitoring Functions: The following control and monitoring functions shall be required for the Air handling plant:
Supply fan enable
Supply fan failure
Fresh air motorised damper control
DX coil operation
Filter dirty indication
Run-around-coil pump enable
Run-around-coil pump fault
Supply fan speed
Extract fan speed
Fresh air temperature
Exhaust air temperature
Supply air temperature
Run-around-coil air discharge temperature

1.3.6. Power: Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.4. Kitchen Extract Ecology Units with Run-Around-Coil:

1.4.1. List of Applicable Units:

1. EAHU.0.C.01.A
2. EAHU.0.C.02.A
3. EAHU.0.C.03
4. EAHU.0.C.04
5. EAHU.0.D.01
6. EAHU.0.D.02
7. EAHU.3.A.01
8. EAHU.3.C.01
9. EAHU.3.C.02
10. EAHU.3.C.03
11. EAHU.4.A.01
12. EAHU.4.D.01

1.4.2. System Operation:

Each ecology extract fan unit is locally controlled using a manufacturers integral controller (including touch screen) which is to be interfaced with the BMS to read and access all points.

The manufacturers controller is to have the following functionality:

- Fan speed regulation based on filter dirty condition
- Filter dirty condition (panel / bag and carbon)
- Fan flow failure
- Interface capability with on-site BMS to read and access all control points

When the enable signal is received from the BMS, the sequence of operation shall be as follows:

- motorised shut-off damper for the supply AHU shall be opened
- motorised shut-off damper for the ecology extract shall be opened
- supply AHU shall be enabled once the damper open position has been proven
- ecology extract fan unit shall be enabled once the damper open position has been proven

Upon plant shut down the supply AHU and kitchen extract fan shall be disabled and the motorised shut-off damper will close.

The ecology extract units will be enabled under the dictates of the BMS timeclock control schedule, initially set 08:00 to 23:00.

1.4.3. Winter Operation:: If the fresh air is cooler than the required pre-set supply air temperature, initially set at 14.0°C (adjustable) and the exhaust air associated with the run-around-coil is warmer than the fresh air, the run around coil system shall be

enabled.

If the fresh air is cooler than the pre-set supply air temperature, and the remote exhaust air is cooler than the fresh air, the run-around-coil shall be held off.

Upon plant shut down the extract fan shall be disabled, the motorised fresh air dampers shall be closed and the run-around-coil system shall be disabled.

The run-around-coil system shall be disabled when the ambient temperature rises above 12°C.

1.4.4. Control and Monitoring Functions:

The following control and monitoring functions shall be required for each ecology extract unit:

- Shut-off damper position
- Extract fan enabled
- Extract fan flow failure
- Run-around-coil pump enable
- Run-around-coil pump fault
- Filter dirty
- Fan speed
- Interlocked with associated supply AHU such that supply and extract must operate together.

1.4.5. Power: Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.5. MVHR Units:

1.5.1. List of Applicable Units: Refer to schematics and schedules.

1.5.2. System Operation: The MVHR units are locally controlled using a manufacturers controller which is to be interfaced with the BMS for enabled/disable timeclock control signal and common fault alarm.

When the enable signal is received from the BMS the shut-off dampers will open and the supply unit shall be enabled and upon plant shut down the supply unit shall be disabled and the shut-off dampers will close.

The MVHR units will be enabled under the dictates of the BMS timeclock control schedule, initially set 08:00 to 23:00

CO2 sensors located in the return air section of the MVHR ductwork shall monitor the CO2 levels and modulate the fans to maintain CO2 levels <1500ppm.

1.5.3. Control and Monitoring Functions:

The following control and monitoring functions shall be required for each MVHR:

- Fresh air intake shut-off damper
- Exhaust shut-off damper
- Supply fan enabled
- Supply fan flow failure

- Return air fan enabled
- Return air fan flow failure
- Filter dirty indication
- Bypass status
- Return air temperature sensor
- Supply air temperature sensor

1.5.4. Power: Power to each MVHR unit is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.6. General In-Line Extract Fan Units::

1.6.1. System Operation: Each extract fan unit is provided as an in-line duct mounted unit complete with manufacturers controller comprising on/off and speed control adjustment.

The fan unit will be enabled under the dictates of the BMS timeclock control schedule and will be provided with 0-15 minute adjustable run-on-timer facility.

1.7. General In-Line Extract Fans (refuse / bin stores):

1.7.1. System Operation: Each extract fan unit is provided as an in-line duct mounted unit complete with manufacturers controller comprising on/off and speed control adjustment.

The operation of each fan motor shall be monitored via a differential pressure switch (DPS) with visual indication on control panel fascia of 'FLOW FAILURE' and 'FLOW PROVEN' for each motor.

The fan unit will be enabled under the dictates of the BMS timeclock control schedule, initially set to run continuously.

1.7.2. Control and Monitoring Functions:

The following control and monitoring functions shall be required for each extract fan unit:

- extract fan enabled
- extract fan flow failure
- Volt free BMS contacts to relay a common fault condition to the BMS

1.7.3. Power: Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.8. Level GF Atrium Toilet Extract Ventilation Installation:

1.8.1. System Operation:

The 4no toilet extract fan units serving toilet areas directly off of the Level GF atrium are to be provided as twin fan duty / standby, with auto-changeover unit complete with the manufacturers auto-changeover controller with on/off and speed control adjustment and the following functionality:

- normal extract rate at 10ACH
- set-back extract rate at 6ACH
- duty fan enabled
- duty fan flow failure
- standby fan enabled
- standby fan flow failure

- auto-changeover facility.
- volt free BMS contacts to relay a common fault condition to the BMS

Upon duty fan failure there shall be automatic changeover to the standby fan under the dictates of the manufacturers controller.

The fan unit will be enabled under the dictates of the BMS timeclock control schedule, initially set 07:00 to 23:00

During time periods where the atrium is expected to be heavily occupied the fans shall be controlled to provide the normal extract rate of 10ACH.

Prior to and following programmed normal extract rate periods, the fans shall be operated at their set-back rate of 6ACH for a period of 2 hours (adjustable)

The BMS shall be capable of setting the fans to work at either the set-back or normal extract rates as required.

1.8.2. Control and Monitoring Functions:

The following BMS control and monitoring functions shall be required for the extract fan unit:

- Extract fan unit enabled
- Enable normal extract rate
- Enable set-back extract rate
- Volt free BMS contacts to relay a common fault condition to the BMS

1.8.3. Power: Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.9. Induction & Impulse Jet Fans:

1.9.1. System Operation: The manufacturers purpose made control system is to be utilised to facilitate control of these fans under both normal and fire mode operation.

For day-to-day normal operation the control system enables the fans to run at a background capacity and continues to monitor the levels of pollutants within the Loading Bay. In the event that elevated levels of pollutants / emissions are detected and the threshold set point has been reached, the system will ramp up the fans to run at an increased speed to aid is dispersal and dilutions of the pollutants.

Under fire conditions (signal from the fire alarm has been received, the ventilation rates for all fans are increased to maximum.

The system will revert back to day-to-day operation once the fire alarm system has been reset.

The manufacturer's control system must be capable of complete interface with the site-wide installation to ensure seamless transfer and visibility of all control points, set-points, faults, alarms etc on the main head-end, including browser access. The specialist controls contractor must liaise with the fan manufacturer to agree and fully understand the method of communication to ensure complete compatibility between the two systems.

The interface between the fan units integral controls system and the site-wide BMS is within the controls specialist scope of works.

1.9.2. Control and Monitoring Functions:

The following BMS control and monitoring functions shall be required for the extract fan unit:

- on/off control
- fan flow failure
- fan speed
- Pollution/emission level - low
- Pollution/emission level - threshold level exceeded
- Volt free BMS contacts to relay a common fault condition to the BMS

1.9.3. Power: Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.10. Smoke Extract Systems:

1.10.1. List of Application Systems:

1. Level 03 serving Concourses
2. Level 02 serving the Atrium
3. Level 05 serving the Main Hall

1.10.2. General Requirements: All above smoke extract systems and their associated mechanical supply make-up fans must all be automatic in operation (hard-wired). Each smoke extract fan set will operate automatically under the dictates of smoke detection and fire alarm activation occur within any of the areas that the specific unit serves.

The operation of each fan motor shall be monitored via a differential pressure switch (DPS) with visual indication on control panel fascia of 'FLOW FAILURE' and 'FLOW PROVEN' for each motor.

1.10.3. Fire Fighting Lobby Smoke Extract Systems: Refer to clause Ss_65_40_80_80/1.1 for details related to the control methodology of these 4no. systems.

1.10.4. Main Halll Smoke Extract Systems:

The main auditorium smoke extract system comprises 7no separate duty/standby fan sets.

The sequence of operation is as follows:

- Hall fire alarm system activated
- Duct mounted (acoustic) fire/smoke dampers open
- Damper open proven contact signal provided
- 7no smoke extract duty fans sets initiated
- 16no Hall AHU's located at Level 05 shut down
- Doors to Hall are opened in accordance with the fire engineers strategy.

1.10.5. Basement Smoke Extract Systems:

The Level GF smoke extract system comprises 1no separate duty/standby fan set with fire/smoke dampers provided to each room served as well as for balancing purposes. The smoke extract system utilises day-to-day extract ductwork and diverts this air path to the smoke extract fans, isolating the general AHU extract system in the process.

The sequence of operation is as follows:

- Fire alarm system activated in any single room at basement
- AHU extract ventilation system will be disabled
- Fire/smoke dampers located on duct branches for balancing purposes are all to motor open
- Fire/smoke dampers located on final room terminal branches are all to motor close
- Fire/smoke damper/s serving the individual room where fire detection activated will motor open
- Bypass fire/smoke dampers will operate to isolate the AHU and divert extract air path to the smoke extract fan set
- Dampers open/closed proven contact signal provided for all dampers
- Smoke extract duty fan set initiated
- Level 00 AHU supply air fan initiated for provision of make-up air

Upon fire alarm reset, the above sequence will run in reverse and the ventilation system will revert to normal auto day-to-day mode.

1.10.6. Loading Bay Smoke Extract System:

The service yard smoke extract system comprises 2no dedicated duty / standby smoke extract fan systems with fire/smoke dampers provided and dual function capability; (i) fire mode and (ii) service yard pollution / emission control.

The system will be energised to serve the service yard continuously in order to exhaust polluted air to atmosphere via the ventilation turret at high level, Level 01.

The normal sequence of operation for each smoke extract system is as follows:

- Fire/smoke dampers serving the access road car park and service yard will motor open
- Stage 1 smoke extract fans will run at a lower speed to exhaust polluted air should the lower ppm threshold be exceeded
- Stage 2 smoke extract fans will run at a high speed to exhaust polluted air should the upper ppm threshold be exceeded

The fire mode sequence of operation is as follows:

- Fire alarm system activated in the service yard
- Fire/smoke damper(s) serving the service yard will motor open
- Dampers open/closed proven contact signal provided for all dampers
- Smoke extract duty fan sets initiated

Upon fire alarm reset, the above sequence will run in reverse and the ventilation system will revert to normal auto day-to-day mode.

1.10.7. Control and Monitoring Functions:

Each smoke extract fan unit is provided as a duty/standby unit complete with auto-changeover unit complete with controller with the following functionality:

- on/off/auto control - duty fan
- on/off/auto control - standby fan
- fan flow failure - duty fan
- fan flow failure - standby fan
- auto-changeover facility
- fault condition
- motorised fire/smoke damper open - for each damper
- motorised fire/smoke damper closed - for each damper
- motorised fire/smoke damper position indicator - for each damper
- volt free BMS contacts to relay a common fault condition to the BMS

Upon duty fan failure there shall be automatic changeover to the standby fan under the dictates of the manufacturers controller.

Each fan unit will be enabled under the dictates of the fire alarm installation and will only engage if smoke is detected within the demise served.

1.10.8. Power: A generator backup up secondary power supply is to be provided to serve all smoke extract fan systems as well as corresponding fire/smoke dampers.

Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.11. Motorised Fire / Smoke Dampers: Motorised fire/smoke damper installed in any system other than the life-safety smoke extract systems detailed above will automatically close under the dictates of the fire alarm installation using hard-wired interface. The dampers will fail-safe to the close position under loss of power.

1.11.1. Control and Monitoring Functions:

Each fire/smoke damper is provided with controller with the following functionality:

- fault condition
- motorised fire/smoke damper open - for each damper
- motorised fire/smoke damper closed - for each damper
- motorised fire/smoke damper position indicator - for each damper
- volt free BMS contacts to relay a common fault condition to the BMS

1.11.2. Fire Brigade Override Control (MFSDs): The fire brigade require full override control of all individual fire/smoke dampers to open/close units under their direction and will

accept override control facilitated by BMS software driven protocols from the head-end facilities computer.

1.11.3. Power: A generator backup up secondary power supply is to be provided to serve all fire/smoke dampers.

Power is derived from a local isolator provided by the electrical sub-contractor. Final connections between the isolator and fan unit will form part of the controls specialists' scope of works.

1.12. Operation of Ventilation Plant Under Fire Mode Conditions:

1.12.1. General Requirements: In the event of smoke or fire being detected and the fire alarm system being activated all ventilation plant including supply and extract fans shall close down. Interface to fire alarm system will be direct hard wired and not software driven. The electrical contractor is responsible for the hard-wired interface to each mechanical control panel and / or AHU(s) and MVHR(s) with final terminations undertaken by the controls specialist.

A signal shall be sent to all mechanical control panels (including those integral to AHUs) to indicate status of the plant being in fire mode.

A signal shall also be sent to the main fire alarm panel(s) to indicate that all ventilation plant is in fire mode and shut down.

In all shut down scenarios above, the plant shall remain disabled until the fire alarm system has been reset and the alarm cleared or the firemans override switch has been enabled.

1.12.2. Fire Brigade Override Control (smoke fans): Provide override on/off/auto control panel serving each individual smoke extract fan system as detailed above to be located within security control room or adjacent to the main fire alarm panel.

on:
duty fan set (and make-up supply fans) runs continuously irrespective of the status of the fire alarm installation and/or local smoke detectors.

off:
duty/standby fan set (and make-up supply fans) is idle and smoke extract is not provided irrespective of the status of the fire alarm installation and/or local smoke detectors.

auto:
duty fan set (and make-up supply fans) runs automatically if the fire alarm installation and/or local smoke detectors is activated and shuts down once the fire alarm installation has been fully reset.

Provide override on/off/auto control panel serving each individual make-up supply fan system to be located within security office - on/off/auto as defined above. Refer to clause Ss_65_40_80_80 for details of all individual make up supply systems.

Controls specialist must submit a drawing of the security control smoke extract and make-up supply air control override panel for fire-brigade approval. The panel must not

be fabricated prior to approval being confirmed. Controls specialist will be responsible for all abortive costs should an unapproved panel layout / design be manufactured.

2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Start and stop control: Ss_75_70_52/204 Fan overrun; Ss_75_70_52/205 Hand off auto switch; Ss_75_70_52/206 Low inside air temperature interlock for building fabric and contents protection; Ss_75_70_52/207 Low temperature interlock signals for plant protection; Ss_75_70_52/210 Optimum start and stop heating; Pr_75_51_17_89 Time switches (integral to BMS outstations)
4. Damper control strategies: Ss_75_70_52/246 Full outside air damper control strategy; Ss_75_70_52/247 Mixing damper control strategy
5. Heating coils control strategies: Ss_75_70_52/250 Low temperature hot water pre-heat coil and frost protection strategy; Ss_75_70_52/252 Low temperature hot water heating coil control strategy
6. Heat recovery devices control strategies: Ss_75_70_52/253 Fixed plate heat exchanger control strategy; Ss_75_70_52/254 Run around coil control strategy; Ss_75_70_52/255 Thermal wheel, fixed speed with bypass damper, control strategy
7. Supply fan control strategies: Ss_75_70_52/265 Constant volume supply fan control strategy
8. Extract fan control strategies: Ss_75_70_52/272 Constant volume extract fan control strategy
9. Filter control strategies: Ss_75_70_52/284 Air filter with pressure sensor control strategy
10. Supply air temperature control strategies: Ss_75_70_52/285 Constant air volume system, zone temperature control of primary supply air temperature control strategy
11. Equipment: Pr_75_50_18_21 Damper actuators; Pr_75_50_18_51 Mechanical services control panels
12. Sensors: Pr_75_50_76_03 Air temperature sensors; Pr_75_50_76_68 Pressure sensors
13. Equipment interconnectivity: Wired.
14. Cables: As Specialist's recommendations.
15. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
16. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals
17. Rewireable installations: Required.
18. Concealed installations: Required.
19. Control equipment power supply: Mains supply.
20. 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

See Ss_65_40_33/210 Design of ventilation systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/240 Ductwork design in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/250 Fan performance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/260 Attenuator performance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/204 Fan overrun

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

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

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/206 Low inside air temperature interlock for building fabric and contents protection

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

1. Low inside air temperature signal
    1.1. Operation: Start all heating plant serving zone registering condition.
    1.2. Activation set point: 14°C
    1.3. Termination set point: Normal plant operation.
2. Priority: Independent of low outside temperature.

See Ss_75_70_52/207 Low temperature interlock signals for plant protection in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Ss_75_70_52/210 Optimum start and stop heating in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_52/246 Full outside air damper control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

1. Dampers: Inlet and exhaust air.
2. Control: Open/closed.
3. Shutdown period: Close dampers.
4. Operation: Open dampers on a plant operation signal. When fully open make damper end switch.
5. Fan failure signal: Close dampers.

Ss_75_70_52/247 Mixing damper control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

1. Dampers: Outside air, exhaust air and recirculation. Recirculation opens when outside air and exhaust air close and vice versa.
2. Shutdown: Position dampers in full recirculation position, recirculation fully open and outside and exhaust air fully closed.
3. Operation
    3.1. Full recirculation position: On signal for fan overrun, boost, optimum start heating or low zone temperature condition.
    3.2. Full outside air position: On signal for optimum cooling start, night cooling and when external temperature is 2°C below internal temperature.

4. Modulating control
    4.1. Minimum fresh air supply: Refer to equipment schedules

Ss_75_70_52/250 Low temperature hot water pre-heat coil and frost protection strategy

1. Equipment to be controlled: Low temperature hot water (LTHW) pre-heat coil, PICVs and three port valves as indicated on the system schematics
2. Freeze protection thermostat: Operated through control panel.
3. Operation
    3.1. Normal: Modulate three port valve under PI control to maintain off-coil temperature set point. Prove fan operation.
    3.2. Off-coil temperature set point: +5°C
    3.3. Boost, optimum start heating, low return temperature and low outside temperature: Fully open three port valve.
    3.4. Shut down or fan failure: Three port valve on full bypass.

Ss_75_70_52/252 Low temperature hot water heating coil control strategy

Ss_75_70_52/253 Fixed plate heat exchanger control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems

1. Equipment to be controlled: Fixed plate heat exchanger, face and bypass dampers.
2. Operation: Enable face and bypass dampers when the supply fan is operating except for night cooling and fan overrun operation. Open the face damper on shut down or during night cooling.
3. Dampers
    3.1. Operation: Enable face and bypass dampers when the supply fan is operating
    3.2. Required condition: Supply air temperature set point.
4. Sequence: During plant operating periods sequence the face and bypass dampers first to provide supply temperature set point control. Use other plant for temperature control when the face damper is either fully opened or closed.

Ss_75_70_52/254 Run around coil control strategy

1. Equipment to be controlled: Constant speed run around coil pump. Run around coil.
2. Operation: Enable run around coil pump when the supply fan is operating except for night cooling and fan overrun operation. Disable run around coil pump and position valve to bypass the supply air coil on shut down or during night cooling.
3. Start condition
    3.1. Operation: Operate the run around coil pump when the temperature differential between the outside air and return air is greater than set value
4. Pump and damper control
    4.1. Operation: Override the control if the fluid temperature entering the exhaust air coil drops below a set point of 2°C. Position the valve to bypass the supply air coil until the pump is proved by a fluid pressure of 2 kPa. Use a PI signal to control the bypass valve to provide the required condition Use a PI signal to control the variable speed pump to provide the required condition.
    4.2. Required condition: Supply air temperature set point.
5. Pump failure: Initiate an alarm signal if not proved within 3 minutes of start.
6. Sequence: During plant operating periods sequence the run around coil system first to provide supply temperature set point control. Use other plant for temperature control when the run around coil system is not operating.

Ss_75_70_52/255 Thermal wheel, fixed speed with bypass damper, control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

1. Equipment to be controlled: Fixed speed thermal wheel, face and bypass dampers.
2. Operation: Enable thermal wheel when the supply fan is operating except for night cooling and fan overrun operation. Disable thermal wheel and close bypass damper on shut down or during night cooling.
3. Start condition
    3.1. Operation: Operate the thermal wheel when the temperature differential between the outside air and return air is greater than set value
4. Dampers
5. Wheel speed
    5.1. Maximum speed: Do not rotate wheel faster than setting.
    5.2. Setting: to meet design capacities set at commissioning
6. Sequence: During plant operating periods sequence the thermal wheel first to provide supply temperature set point control. Use other plant for temperature control when the thermal wheel is not rotating or when it is at its maximum speed.

Ss_75_70_52/265 Constant volume supply fan control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems

1. Equipment to be controlled: Constant volume supply fan, hand/off/auto switch hardwired to motor and to extract fan fail.
2. Additional start and stop control: Associated extract fan failure. Fire alarm interface
3. Normal operation: Enable fan and start on receipt of damper open signal.
4. Fan
    4.1. Operation: Proved when supply air pressure switch or air velocity switch is made. If condition is not met within failure time, generate a fan failure alarm and disable the fan.
5. Shut down: Disable fan.

See Ss_75_70_52/272 Constant volume extract fan control strategy in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Ss_75_70_52/284 Air filter with pressure sensor control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems and Ss_75_70_52_93 [M] Variable volume air conditioning control systems

1. Air filters: Monitor cleanliness by measuring differential pressure across filters using sensors.
2. Dirty filter warning signal: When pressure switch is made. When differential pressure has risen above 300 Pa. When pressure differential is above the pressure set point scheduled to the fan speed - 100 Pa for a 1 V fan speed control signal and 500 Pa for a 10 V fan speed control signal.

Ss_75_70_52/285 Constant air volume system, zone temperature control of primary supply air temperature control strategy

Shared by: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems

1. Shutdown: Supply air temperature control inactive.
2. Optimum start, boost or night cooling: Supply air temperature control inactive.
3. Normal operation or low zone temperature condition

3.1. Operation: Modulate the supply air temperature to maintain the respective space air temperature subject to upper and lower supply air temperature set points.

4. Sequence: Operate heat recovery devices before air heater coil. Use mixing dampers to provide free cooling before air cooling coil.
5. High/low temperature warning
   5.1. Operation: Generate a warning signal if supply air temperature rises above high limit or drops below low limit
   5.2. High limit: 30°C
   5.3. Low limit: 12°C

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_30_59_48_04 Aluminium louvre panel units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_30_59_57_07 Bird guards in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_23_20 Duct access panels in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_65_24_29 Fire and smoke dampers

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description:

   Install fire dampers and damper installation frames in ductwork passing through all fire-rated structures and additionally where shown on the drawings. Install fire stopping between the ductwork installation frame and the structure. Where required as part of the fire strategy for the building, install automatic fire and smoke dampers.

   Provide all necessary fire and fire / smoke dampers as necessary to comply with the architects fire compartmentation drawings.

   All fire compartments that connect to corridors, concourses or public areas are to be protected by motorised fire / smoke dampers and not fusible link fire dampers.

   All duct terminations within the Loading Bay are to be provided with 1hr fusible link fire dampers

All duct terminations (to louvres) on the venue facade are to be provided with 2 hour fusible link fire dampers

Ensure modulating actuators are supplied with 24V AC and are positioned by an analogue signal from the BMS. Ensure on/off actuators are supplied with 24V AC open/close signals from digital outputs on the BMS.

Fit dampers with actuator feedback position indication and a direction reversing switch. Fit auxiliary switches as an indication to remote devices. If damper assemblies are greater than $1m^2$, electrically connect the damper motors as master/slave units.

If damper motors are required to fail open or closed, or provide an instantaneous open to closed or closed to open reaction, use a spring return mechanism, activated by a break in the electrical supply, connected to the motor.

1.1. General Requirements:

1. Provide access doors to all fire dampers and ensure that sufficient access to the fire / smoke dampers is maintained.
2. Fire and fire / smoke dampers to have blades out of air-stream.
3. Single plate type fire dampers are NOT acceptable.
4. Intumescent fire / smoke dampers are NOT acceptable.
5. Provide links to fuse at 74°C and designed to ensure rapid closure on release, BS 5588: Part 9 refers.
6. Agree all fire precautions with the relevant Fire Authority.
7. Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this system including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the design team.
8. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.

2. Standard
   2.1. Fire dampers: To BS EN 15650.
   2.2. Test: To BS EN 1366-2.
   2.3. Classification: To BS EN 13501-3.
   2.4. Aerodynamic performance: To BS EN 1751 and BS EN ISO 5135.
3. Arrangement: Folding curtain blades out of air stream. Multi-blade.
4. Classification: Refer to fire compartmentation drawings
5. Accessories: External visual indication of fire damper blade position. Microswitches for status indication.
6. Fusible links
   6.1. Fusing temperature: 72°C.
7. Execution: Pr_65_65_24/725 Installing fire and smoke control dampers; Pr_65_65_24/750 Access to dampers for resetting and maintenance

See Pr_65_65_24_78 Shut off dampers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_14 Circular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_65_25_32 Flexible ductwork

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description: Flexible ductwork must not exceed 750mm in length.
2. Standard: To BESA DW/144.
3. Flexible ductwork: Acoustic. Insulated non-metallic. Insulated metallic.
    3.1. Maximum Length: Not to exceed 750mm
4. Material: Aluminium. Aluminium and polyester laminate encapsulating high tensile steel wire helix.

See Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29_12 Centrifugal fans in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_67_29_52 Mixed flow fans

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

1. Description:
    1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

2. Standards
    2.1. Performance: To BS EN ISO 5801.
    2.2. Configuration category: Refer to system schematics
    2.3. Mechanical safety: To BS EN ISO 12499.
    2.4. Electrical safety: To BS EN 60335-1 and BS EN 60335-2-80.
    2.5. Dimensions: To BS EN ISO 13351.
3. Duty
    3.1. Air volume: Refer to equipment schedules
    3.2. Resistance: Refer to equipment schedules
    3.3. Fan speed: Refer to equipment schedules
    3.4. External static resistance: Refer to equipment schedules
    3.5. Sound power level: Refer to equipment schedules
4. Operation: Refer to equipment schedules and system schematics
5. Motor and drive: Matched to fan.
6. Inspection doors: Fit airtight removable inspection doors giving access to drive motors and other components requiring regular servicing or maintenance.
7. Accessories: Flexible connections. Speed controller. Motorized shutters.
8. Execution: Pr_65_67_29/610 Installing fans generally

See Pr_65_67_78_12 Circular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_78_72 Rectangular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_65_04_03 Air grilles

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems , Ss_65_40_94_10 [M] Loading bay extract systems , Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Description:

   Install grilles, diffusers and associated plenum boxes as scheduled in locations shown on the design drawings and in accordance with this specification.

   Use concealed fixing wherever possible for neatness.

   Provide all grilles and diffusers with a polyester powder-coated finish in a colour agreed by the Architect.

   The contractor shall select the grilles and diffusers such that noise levels due to regenerated noise do not exceed those specified. Note that where more than one grille is present in the room, the combined total of regenerative noise from each grille should not exceed that value stated.

   Include for any changes in section between the ductwork sizes on the drawing and the final connection sizes of the grilles and diffusers.

   Support plenum boxes separately from the structure and not from the ceiling grid. Internally paint all plenum boxes with a matt black finish.

   The contractor shall note that the index pressure drop on which the fan units have been selected is based on the scheduled grilles. The contractor shall verify the final fan pressure drop(s) based on the selected grilles and diffusers and re-select the fan unit(s) as necessary.

   Prior to placing any order for grilles, diffusers and plenums, obtain details of the ceiling construction and ensure that each proposed selection is compatible with the ceiling.

The contractor must confirm the size of all linear grilles from on site dims prior to ordering

2. Manufacturer: The design has been based on the manufacturers as noted within the equipment schedules or better and approved. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
3. Standards
   3.1. Mixed flow applications: To BS EN 12238.
   3.2. Displacement flow applications: To BS EN 12239.
   3.3. Sound power levels: To BS EN ISO 5135.
4. Application:
   - Extract
   - Supply
5. Duty
   5.1. Air volume: Refer to equipment schedules
   5.2. Size: Refer to equipment schedules
   5.3. Sound power level: Refer to equipment schedules
6. Shape: Refer to equipment schedules
7. Grille type: Refer to equipment schedules
8. Position: Refer to equipment schedules
9. Finish: RAL colour as specified by architect
10. Accessories: Pr_70_65_04/680 Location of grille or diffuser blanking plates; Pr_70_65_04_04 Air plenum boxes
11. Execution: Pr_70_65_04/650 Installing grilles; Pr_70_65_04/690 Support of air terminal units in ceiling grids

Pr_70_65_04_04 Air plenum boxes

Shared by: Pr_70_65_04_02 Air diffusers , Pr_70_65_04_86 Swirl air diffusers and Pr_70_65_04_48 Linear air diffusers

1. Manufacturer: The design has been based on the manufacturers as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
2. Duty
   2.1. Air volume: Refer to equipment schedules
   2.2. Spigot size: Refer to equipment schedules
   2.3. Spigot position: Refer to equipment schedules
3. Configuration: Refer to equipment schedules and system schematics
4. Construction: Sturdy and rigid with circular inlet spigots of 65 mm minimum length.
5. Fixing: Incorporate means for fixing to, or suspending from, building or other construction.

See Pr_75_50_18_21 Damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_80_77_76_47 Loadbearing pipeline support insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_53 Mineral wool duct slab insulation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_62 Phenolic foam insulation in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76_76 Self-adhesive insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_94 Valve and flange insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_95 Valve and flange insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/650 Installing ductwork identification in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_65_24/725 Installing fire and smoke control dampers

1. Standard: To BS EN 12101-8. In accordance with BESA DW/145. In accordance with ASFP Volume 1: EN fire dampers. (Grey book).

See Pr_65_65_24/750 Access to dampers for resetting and maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/610 Air ductwork generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/640 Installing sheet metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/670 Ductwork support for vapour seal continuity in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/680 Ductwork support, special in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/690 Drainage of ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/700 Test holes in ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/720 Weatherproofing ductwork penetrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/785 Air leakage testing of medium pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/790 Air leakage testing of plant items in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/795 Air leakage testing of low pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29/610 Installing fans generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_65_04/610 Installing air terminal devices

Shared by: Pr_70_65_04_86 Swirl air diffusers , Pr_70_65_04_48 Linear air diffusers and Pr_70_65_04_02 Air diffusers

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_04/650 Installing grilles

1. General requirements: Pr_70_65_04/610 Installing air terminal devices
2. Method: Concealed with rear bracket. Concealed with spring clip. Concealed with sub-frame.

Pr_70_65_04/680 Location of grille or diffuser blanking plates

Shared by: Pr_70_65_04_02 Air diffusers , Pr_70_65_04_86 Swirl air diffusers and Pr_70_65_04_48 Linear air diffusers

1. Position: Where needed to restrict projection of air flow from section of grille or diffuser.

Pr_70_65_04/690 Support of air terminal units in ceiling grids

Shared by: Pr_70_65_04_02 Air diffusers and Pr_70_65_04_86 Swirl air diffusers

1. Standard: To BESA DW/144.
2. Position: Agree final position of air terminals before installation.

See Pr_75_50_18/616 Installing damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/640 Installing phenolic foam insulation on pipelines in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/645 Installing phenolic foam insulation on ductwork in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/660 Installing foil faced mineral wool insulation on ductwork in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/690 Installing phenolic foam insulation on vessels in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/715 Installing self adhesive cladding and jacketing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/720 Installing sheet aluminium protection in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/740 Installing at valves and flanges in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/750 Installing at loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/755 Installing at non-loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/760 Insulation not carried through pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/770 Insulation carried through ductwork supports in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_65_40_33/630 Installing ductwork on air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Ss_65_40_33/640 Ductwork systems cleaning

Shared by: Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems and Ss_65_40_33_90 [M] Toilet extract ventilation systems

1. Standards: In accordance with BESA Technical Report 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. Faults identified that may impact future hygiene. Additional works carried out. COSHH data on chemicals used where applicable. Recommendations for future testing and cleaning.
     - 2.2.2. Format: Electronic. Paper copy.
     - 2.2.3. Submit: On completion.
     - 2.2.4. Number of copies: One

System completion

See Ss_65_40_33/810 Commissioning of air distribution systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/820 Performance testing in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/830 Inspection and test records in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/840 Demonstrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/850 Documentation for ventilation systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/860 Spares and consumables in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/870 Maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_40_33_51
[M] Mechanical supply and extract ventilation systems

REVISED

Systems

Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

REVISED

1. Description:

The mechanical supply and extract ventilation installation generally comprises / includes for the following:

1. Concourse / Toilet / general ventilation MVHRs
2. Level 03 general ventilation AHUs
3. Level 01 Back Stage lounge ventilation system
4. Ductwork (including fire-rated where identified on the drawings and / or required by the fire consultants report), flexible connections to each fan unit, shut-off dampers, dampers, including fire, fire/smoke dampers, attenuators, grilles, ambient terminals, supports, bracketry and all other fittings required to make a complete and working installation.

1.1. General - applicable to all detailed systems:

Flexible ductwork connections to be made to the intake and exhaust spigot connections of each fan / MVHR / AHU.

Fire dampers (inc. fire/smoke actuator operated) to be provided through all compartment walls, with VCDs located on each branch as required for commissioning and balancing of the systems.

Each fan / MVHR / AHU will be provided with common fault volt free contacts to enable a healthy/fault indication of the fan unit on the BMS. Refer to Ss_75_70_52_94 and schematic for further details. Each fan / MVHR / AHU shall be provided with the manufacturers open protocol control system complete with BMS interface. Prior to fabrication of each unit the manufacturer must liaise directly with the automatic controls specialist to ensure seamless compatibility of systems.

The contractor must include for calculating the external pressure drop for each fan / MVHR /AHU set based on their installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement motor/fan unit at their own expense.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

Each fan controller unit will be provided with hard-wired fire alarm interface to shut-down in the event of fire alarm activation.

1.2. MVHR Systems:

Each MVHR unit serves to provide tempered fresh air to the concourse area occupied areas as detailed on the drawings, schematics and schedules.

The units will comprise filters, heat recovery heat exchanger and will be provided with room and atmospheric side attenuation.

The contractor must include to replace all MVHR filters with new modules at Practical Completion.

Fresh air inlet and exhaust ductwork from the MVHR is to be provided with thermal insulation.

The fan controller unit will be provided with fire alarm interface to shut-down in the event of fire alarm activation.

Each MVHR will be formed of a one-piece unit and shall be constructed with double skinned Aluzinc panels on an aluminium Pentapost frame with integral acoustic mineral fibre ensuring low breakout noise levels.

Each MVHR unit shall comprise the following:

- supply and extract fans
- high efficiency counter-flow plate heat exchanger matrix
- supply and extract filters
- full 100% automatic heat exchanger bypass
- condensate drip tray (a condensate pump is installed in the unit and has an alarm function (for BMS connection). If the water level in the condensate tray exceeds a maximum level, the alarm contact will open. This contact is internally connected to the heat exchanger bypass actuator, and the unit will automatically be placed into bypass mode, preventing further condensate production.)

The unit will also be provided complete with manufacturers controller for fan speed adjustment control and fan flow failure indication to the BMS located adjacent to the unit. The controller must be marked by the contractor to indicate the correct speed setting position following commissioning.

1.3. Associated Fan Coil Units Systems: Areas as detailed on the drawings are provided with conditioned air using fan coil units (VRF) as detailed under clause Ss_60_40_17_94.

1.4. Kitchen Supply Ventilation: Each kitchen is served from a dedicated supply AHU / AHU deck terminating as a capped-off duct at high level within the demised area ready for extension by the catering specialist fit-out contractor.

Each supply make-up unit is provided with a run-around-coil to facilitate heat recovery with the associated ecology extract air handling unit in addition to integral heat pump for tempering of the supply air temperature.

1.5. Catering Fit-Out Contractors Scope of Works: Each extract canopy will be specified by the catering consultant and installed by the specialist fit-out contractor and sits outside of the contractors scope of works.

The contractor shall provide capped ductwork connections from the ventilation units to an area within the demise as indicated on the drawings. Future extension of ductwork and connection to the canopies shall be by the specialist fit-out contractor.

The extract canopy, associated fire suppression (ansul) and UV filtration will be specified by the catering consultant and sits outside of the contractors scope of works.

2. System performance: Ss_65_40_33/210 Design of ventilation systems; Ss_65_40_33/240 Ductwork design; Ss_65_40_33/250 Fan performance; Ss_65_40_33/260 Attenuator performance
3. Location of plant: Refer to GA plans and schematics
4. Type of system: Single duct, variable volume.
5. External air intake: Pr_30_59_48_04 Aluminium louvre panel units
6. Air filters: Pr_60_65_03_86 Supply air handling units; Pr_65_57_02_66 Panel air filters; Pr_65_57_02_07 Bag air filters
7. Heat recovery: Pr_60_60_36_74 Run-around coils
8. Air handling units: Pr_60_65_03_86 Supply air handling units
9. Supply fans: Pr_65_67_29_12 Centrifugal fans; Pr_65_67_29_52 Mixed flow fans
10. Acoustic treatment: Pr_65_67_78_12 Circular attenuators; Pr_65_67_78_72 Rectangular attenuators
11. Air ductwork and accessories
    11.1. Ductwork: Pr_65_65_25_14 Circular sheet metal ductwork and fittings; Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings; Pr_65_65_25_30 Fire resisting ductwork and fittings
    11.2. Accessories: Pr_65_65_23_20 Duct access panels; Pr_30_59_57_07 Bird guards; Pr_65_65_24_29 Fire and smoke dampers; Pr_65_65_25_32 Flexible ductwork; Pr_65_65_24_78 Shut off dampers
12. Thermal insulation on supply air ductwork: Pr_80_77_76_53 Mineral wool duct slab insulation; Pr_80_77_76_62 Phenolic foam insulation
13. Vibration isolation mountings: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_84 Spring isolators; Pr_80_77_94_42 Isolation hangers
14. Room supply air terminal devices: Pr_70_65_04_02 Air diffusers; Pr_70_65_04_86 Swirl air diffusers; Pr_70_65_04_03 Air grilles
15. Accessories: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps
16. Controls: Ss_75_70_52_94 [M] Ventilation control systems
17. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
18. Testing: Pr_65_65_25/785 Air leakage testing of medium pressure ductwork; Pr_65_65_25/790 Air leakage testing of plant items
19. Execution: Ss_65_40_33/630 Installing ductwork on air handling units; Ss_65_40_33/640 Ductwork systems cleaning
20. System completion: Ss_65_40_33/810 Commissioning of air distribution systems; Ss_65_40_33/820 Performance testing; Ss_65_40_33/830 Inspection and test records; Ss_65_40_33/840 Demonstrations; Ss_65_40_33/850 Documentation for ventilation systems; Ss_65_40_33/860 Spares and consumables; Ss_65_40_33/870 Maintenance

See Ss_75_70_52_94 [M] Ventilation control systems in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

System performance

See Ss_65_40_33/210 Design of ventilation systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/240 Ductwork design in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/250 Fan performance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/260 Attenuator performance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/204 Fan overrun in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/206 Low inside air temperature interlock for building fabric and contents protection in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/207 Low temperature interlock signals for plant protection in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Ss_75_70_52/210 Optimum start and stop heating in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/246 Full outside air damper control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/247 Mixing damper control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/250 Low temperature hot water pre-heat coil and frost protection strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/252 Low temperature hot water heating coil control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/253 Fixed plate heat exchanger control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/254 Run around coil control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/255 Thermal wheel, fixed speed with bypass damper, control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/265 Constant volume supply fan control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/272 Constant volume extract fan control strategy in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52/284 Air filter with pressure sensor control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/285 Constant air volume system, zone temperature control of primary supply air temperature control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_30_59_48_04 Aluminium louvre panel units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_30_59_57_07 Bird guards in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_60_60_36_62 Plate recuperators

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems and Pr_60_65_03_87 Supply and return air handling units

1. Duty
    1.1. Supply air volume: Refer to equipment schedules
    1.2. Exhaust air volume: Refer to equipment schedules
    1.3. Air temperature
        1.3.1. Supply: Refer to equipment schedules
        1.3.2. Exhaust: Refer to equipment schedules
2. Finish: Manufacturers standard
3. Heat transfer plates: Aluminium foil.
4. Access doors for maintenance: Hinged, airtight and watertight.
5. Accessories: Face and bypass dampers.
6. Execution: Pr_60_60_36/610 Installing drain traps; Pr_60_60_36/630 Supports

See Pr_60_60_36_74 Run-around coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_60_60_36_88 Thermal wheels

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems , Ss_65_80_05_10 [M] Centralized all-air conditioning systems and Pr_60_65_03_87 Supply and return air handling units

1. Duty
    1.1. Number of coil rows: Refer to equipment schedules
    1.2. Supply air volume: Refer to equipment schedules
    1.3. Exhaust air volume: Refer to equipment schedules
    1.4. Air temperature

1.4.1. Supply: Refer to equipment schedules
1.4.2. Exhaust: Refer to equipment schedules

2. Rotor: Non-hygroscopic.
3. Access doors for maintenance: Hinged, airtight and watertight.
4. Accessories: By-pass damper.
5. Execution: Pr_60_60_36/610 Installing drain traps; Pr_60_60_36/630 Supports

Pr_60_65_03_86 Supply air handling units

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems and Ss_65_80_05_10 [M] Centralized all-air conditioning systems

1. Description:
    1. All AHUs to be provided with manufacturers matching variable speed controller
    2. The electrical contractor shall provide a separate electrical feed to all motor fan compartments - to allow maintenance to be carried out without the fan running. The AHU manufacturer shall provide a suitable terminal block for this item.
    3. The contractor must ensure / confirm spatial fit prior to proposing any alternative manufacturer.
    4. Scheduled design external static pressures are provisional only and are subject to confirmation by the contractor prior to placing the order.
    5. AHU Flexible joints shall be provided at all fan inlet and outlet connections; should be equal in cross- section to the points of connection; and should not be longer than 200mm or shorter than 100mm.
    6. Motorised dampers to be rigid with square connections fitted with end and edge seals of a flexible material and with minimal play in linkages. Leakage on shut-off to be less than 2%
    7. Supply and handover to client one complete set of SPARE filters (supplied by the AHU manufacturer) for each and every AHU filter
    8. Post-commissioning and prior to practical completion the Mechanical Contractor shall carry out a clean of all AHU filters and demonstrate their condition
    9. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.
    10. The electrical input for all fans shall be confirmed in the Mechanical Contractor's technical submission.
2. Manufacturer: The design has been based on the manufacturers as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
3. Factory Testing & Witnessing: One of each type of supply air handling unit (supply only & supply air with mixing box) shall be offered for factory inspection, load / acoustic testing and witnessing to the client and the Consultant for approval prior to delivery to site of any part of the order. The contractor is to include for all costs (including travel arrangements) associated with the factory inspection / witnessing for 5no. client team representatives.
4. Standard: To BS EN 13053.
5. Duty
    5.1. Air volume: Refer to equipment schedules
    5.2. External resistance: Refer to equipment schedules
    5.3. Sound power level: Refer to equipment schedules
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: D1.
6.4. Leakage class of casing: L1.
6.5. Filter bypass leakage: To BS EN 1886, section 7.
6.6. Thermal performance of casing
6.6.1. Thermal transmittance: T2.
6.6.2. Thermal bridging: TB2.
6.7. Acoustic insulation of casing: To BS EN 1886, section 9.
6.8. Mechanical safety: To BS EN 1886, section 11.
6.9. Material: Galvanized sheet steel.
6.10. Finish: Painted.
6.11. Air handling unit feet: Feet under each section
6.12. Special requirements: Double skin floor with internal framework to support weight of two persons, tools and equipment.
Non-slip floor surface.
Weatherproof bulkhead luminaire and switches.
Access doors which can be operated from inside and outside.

7. Arrangement: Refer to equipment schedules
8. Method of support: As per manufacturers standards
9. Anti-vibration mountings: Internal spring isolators for fan(s)
10. Components
10.1. Dampers
10.1.1. Purpose: To BS EN 13053, Category B – Sections for flow control. To BS EN 13053, Category A – On-off sections.
10.1.2. Damper control: Motorized.
10.1.3. Damper type: Multi-blade damper, opposed blade.
10.1.4. Material: Aluminium.
10.1.5. Ancillaries: Locking device. Position indicator.
10.2. Filters: Pr_65_57_02_66 Panel air filters; Pr_65_57_02_07 Bag air filters
10.3. Re-heaters:
10.4. Cooling coils: Pr_60_65_37_72 Refrigerant cooling coils
10.5. Heat recovery
10.5.1. Heat recovery equipment: Pr_60_60_36_62 Plate recuperators; Pr_60_60_36_88 Thermal wheels. Refer to equipment schedules
10.6. Fans
10.6.1. Fan type: Pr_65_67_29_12 Centrifugal fans; Pr_65_67_29_62 Plug fans
10.7. Attenuators: Pr_65_67_78_72 Rectangular attenuators(integral to AHU where indicated in the equipment schedules)
11. Flexible connections: To BESA DW/144.
12. Access
12.1. General: Provide access openings and covers complete, including opening devices.
12.2. Seal: To prevent excessive air leakage.
12.3. Seal durability: For normal maintenance operations over at least 10 years.
12.4. Access type: Hinged doors.
12.5. Access clear width (minimum): 400 mm.
12.6. Opening device: Interlock door handles. Key-operated door locks.
12.7. Components requiring access:

- Air control dampers
- Primary filters
- Secondary filters
- Preheater coils
- Cooling coils
- Heating coils
- Fans
- Variable duty fans.

13. Direction of airflow: Refer to system schematics
14. Execution: Pr_60_65_03/610 Installing air handling units; Pr_60_65_03/615 Access; Pr_60_65_03/620 Coil installation generally; Pr_60_65_03/625 Installing cooling coils; Pr_60_65_03/630 Installing hot water coils; Pr_60_65_03/645 Installing fans; Pr_60_65_03/650 Services connections; Pr_60_65_03/655 Isolation of air handling units; Pr_60_65_03/660 Support for air handling units; Pr_60_65_03/665 Pre-commissioning of coils; Pr_60_65_03/680 Air leakage testing; Pr_60_65_03/685 Testing

Pr_60_65_37_72 Refrigerant cooling coils

Shared by: Pr_60_65_03_87 Supply and return air handling units

1. Standard: To BS EN 1216.
2. Refrigerant: Refer to equipment schedule
3. Coils
   3.1. Requirement: Provide each section with its own thermostatic expansion valve and isolating inlet solenoid valve.
4. Protection: Fit blank caps to pipe connections after manufacture.
5. Access doors for maintenance: Provide
6. Accessories: Matching ductwork flanges. Antifreeze thermostat.
7. Execution: Pr_60_65_37/610 Installing heating and cooling coils generally; Pr_60_65_37/630 Installing eliminator plates

See Pr_65_52_34_22 Differential pressure gauges in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_52_34_50 Manometers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_57_02_07 Bag air filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_57_02_66 Panel air filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_23_20 Duct access panels in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24_29 Fire and smoke dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24_78 Shut off dampers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_14 Circular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_30 Fire resisting ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_32 Flexible ductwork in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29_12 Centrifugal fans in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29_52 Mixed flow fans in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Pr_65_67_29_62 Plug fans

Shared by: Pr_60_65_03_87 Supply and return air handling units

1. Standards
   1.1. Performance: To BS EN ISO 5801.
   1.2. Mechanical safety: To BS EN ISO 12499.
   1.3. Electrical safety: To BS EN 60335-1 and BS EN 60335-2-80.
   1.4. Dimensions: To BS EN ISO 13351.
2. Fan blades: Backward curved.
3. Duty
   3.1. Air volume: Refer to equipment schedules
   3.2. External static resistance: Refer to equipment schedules
   3.3. Sound power level: Refer to equipment schedules
4. Accessories: Speed controller. Flow measurement points. Air flow sensors.
5. Execution: Pr_65_67_29/610 Installing fans generally

See Pr_65_67_78_12 Circular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_78_72 Rectangular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_65_04_02 Air diffusers

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems and Ss_65_80_05_10 [M] Centralized all-air conditioning systems

1. Manufacturer: The design has been based on the manufacturers as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
2. Standards
   2.1. Mixed flow applications: To BS EN 12238.
   2.2. Sound power levels: To BS EN ISO 5135.
3. Application:
   - Extract
   - Supply
4. Duty
   4.1. Air volume: Refer to equipment schedules
   4.2. Size: Refer to equipment schedules
   4.3. Sound power level: Refer to equipment schedules
5. Diffuser: Refer to equipment schedules
6. Shape: Refer to equipment schedules
7. Position: Refer to GA plans
8. Finish: RAL colouir as specified by the architect
9. Accessories: Pr_70_65_04/680 Location of grille or diffuser blanking plates; Pr_70_65_04_04 Air plenum boxes
10. Execution: Pr_70_65_04/620 Installing circular and rectangular diffusers; Pr_70_65_04/690 Support of air terminal units in ceiling grids

See Pr_70_65_04_03 Air grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_04 Air plenum boxes in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Pr_70_65_04_32 Floor-mounted air plenum boxes

1. Duty
   1.1. Air volume: Refer to equipment schedules
   1.2. Spigot size: Refer to equipment schedules
   1.3. Spigot position: Refer to equipment schedules
2. Construction: Sturdy and rigid with circular inlet spigots of 65 mm minimum length. Provide box base and reinforcement able to withstand casting into floor slab.
3. Fixing: Incorporate means for fixing to slab, or ties for casting into a floor slab.

Pr_70_65_04_86 Swirl air diffusers

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems and Ss_65_80_05_10 [M] Centralized all-air conditioning systems

1. Standards
   1.1. Mixed flow applications: To BS EN 12238.
   1.2. Sound power levels: To BS EN ISO 5135.
2. Duty
   2.1. Air volume: Refer to equipment schedules
   2.2. Size: Refer to equipment schedules
   2.3. Sound power level: Refer to equipment schedules
3. Application: Supply.

4. Arrangement: Adjustable.
5. Diffuser:
    - Circular
    - Linear high induction
    - Square
    - Refer to equipment schedules
6. Position: Refer to GA plans
7. Material: Aluminium.
8. Finish: RAL colour / finish as specified by the architect.
9. Accessories: Pr_70_65_04/680 Location of grille or diffuser blanking plates; Pr_70_65_04_04 Air plenum boxes; Pr_70_65_04_32 Floor-mounted air plenum boxes
10. Execution: Pr_70_65_04/640 Installing floor mounted swirl diffusers; Pr_70_65_04/620 Installing circular and rectangular diffusers; Pr_70_65_04/690 Support of air terminal units in ceiling grids

See Pr_75_50_18_21 Damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_80_77_76_47 Loadbearing pipeline support insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_53 Mineral wool duct slab insulation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_62 Phenolic foam insulation in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76_76 Self-adhesive insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_94 Valve and flange insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_95 Valve and flange insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/650 Installing ductwork identification in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36/610 Installing drain traps in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36/630 Supports in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/610 Installing air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/615 Access in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/620 Coil installation generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_60_65_03/625 Installing cooling coils

Shared by: Pr_60_65_03_87 Supply and return air handling units

1. Airflow: Evenly distributed over face area of coil.
2. Air velocity: Ensure it is below level at which moisture carryover occurs.
3. Condensate drain lines
   - 3.1. Trap: Provide to prevent flooding.
   - 3.2. Fall: 10 mm/m.
   - 3.3. Discharge: To a tundish or other form of air break.
   - 3.4. Clean-out plugs: Fit at each change of direction in the drain line.
   - 3.5. Size: At least that of the drain pan connection.

See Pr_60_65_03/630 Installing hot water coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/645 Installing fans in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/650 Services connections in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/655 Isolation of air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/660 Support for air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/665 Pre-commissioning of coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_60_65_03/680 Air leakage testing

Shared by: Pr_60_65_03_87 Supply and return air handling units

1. Testing: In accordance with BS EN 1886.

Pr_60_65_03/685 Testing

Shared by: Pr_60_65_03_87 Supply and return air handling units

1. Test location: Factory.
2. Tests: Functional test on electrical equipment.
3. Test results: Submit on completion.

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: Support coils independently of ductwork.

Pr_60_65_37/630 Installing eliminator plates

1. General: Fit to allow removal from coil casing.

See Pr_65_52_34/660 Installing pressure gauges in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_57_02/640 Installing filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24/725 Installing fire and smoke control dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24/750 Access to dampers for resetting and maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/610 Air ductwork generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/640 Installing sheet metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/645 Installing fire and smoke extract ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/670 Ductwork support for vapour seal continuity in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/680 Ductwork support, special in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/690 Drainage of ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/700 Test holes in ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/720 Weatherproofing ductwork penetrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/730 Fire rated ductwork sleeves and collars in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/785 Air leakage testing of medium pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/790 Air leakage testing of plant items in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/795 Air leakage testing of low pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29/610 Installing fans generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04/610 Installing air terminal devices in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Pr_70_65_04/620 Installing circular and rectangular diffusers

1. General requirements: Pr_70_65_04/610 Installing air terminal devices
2. Method: Hidden screw. Spring edge clip.

Pr_70_65_04/640 Installing floor mounted swirl diffusers

1. General requirements: Pr_70_65_04/610 Installing air terminal devices
2. General: Fit flush with finished floor.
3. Method: Back collar. Floor grille with jacks. Lay in core. Core and trim ring and cover plate.

See Pr_70_65_04/650 Installing grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/680 Location of grille or diffuser blanking plates in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/690 Support of air terminal units in ceiling grids in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18/616 Installing damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/640 Installing phenolic foam insulation on pipelines in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/645 Installing phenolic foam insulation on ductwork in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/660 Installing foil faced mineral wool insulation on ductwork in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/690 Installing phenolic foam insulation on vessels in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/715 Installing self adhesive cladding and jacketing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/720 Installing sheet aluminium protection in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/740 Installing at valves and flanges in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/750 Installing at loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/755 Installing at non-loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/760 Insulation not carried through pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/770 Insulation carried through ductwork supports in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_65_40_33/630 Installing ductwork on air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/640 Ductwork systems cleaning in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

System completion

See Ss_65_40_33/810 Commissioning of air distribution systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/820 Performance testing in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/830 Inspection and test records in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/840 Demonstrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/850 Documentation for ventilation systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/860 Spares and consumables in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/870 Maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_40_33_90
[M] Toilet extract ventilation systems ADDED

Systems

Ss_65_40_33_90 [M] Toilet extract ventilation systems ADDED

1. Description:

The toilet extract installation generally comprises / includes for the following:

1. Atrium GF toilets system (3no. systems)
2. Inline UV filtration on the exhaust air ducts from GF toilets
3. Ductwork, flexible connections to each fan unit, shut-off dampers, dampers, including fire dampers, attenuators, grilles, ambient terminals, supports, bracketry and all other fittings required to make a complete and working installation.

1.1. Eurovent Certification: All fans exceeding 1,500 l/s design duty must be manufactured/procured from Eurovent certified manufacturers/suppliers. The contractor will be responsible for all costs (including re-stocking charges) associated with replacing non-Eurovent certified fans with compliant units.

Smaller capacity fan units up to and including 1,500 l/s can be selected from non Eurovent certified manufacturers subject to approval of the consulting engineer (via technical submittals).

1.2. General Requirements: Thermal insulation is not required to the ductwork distribution.

Flexible ductwork connections to be made to the intake and exhaust spigot connections of each fan unit.

Fire dampers to be provided through all compartment walls, with VCDs located on each branch, all as detailed on the schematics.

Each fan unit will be provided with common fault volt free contacts to enable a healthy/fault indication of the fan unit on the BMS. Refer to Ss_75_70_52_94 and schematic for further details.

Each fan controller unit will be provided with hard-wired fire alarm interface to shut-down in the event of fire alarm activation.

The contractor must include for calculating the external pressure drop for each fan set based on their installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement motor / fan unit at their own expense.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system

proposal submission for this system including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

All extract fan units must be selected to comply with specific fan power threshold to meet Part L compliance.

1.3. Toilet Extract System: All toilet extract fan units comprise a twin fan (auto-changeover) unit with associated motorised shut-off damper located as detailed on the drawings. ATS to be provided as part of the mechanical package for connection by the electrical contractor.

The toilet core is provided with ducted extract and make up air.

Extract air shall be drawn from the toilet areas as generally indicated on the design drawings and schematics.

Make up air to the toilets is to be provided by duct-mounted air transfer fans. These air transfer fans shall draw air from the adjacent atrium into the toilet area. The air transfer fans shall be linked to operate simultaneously with the toilet extract fans, and be controlled to deliver 95% of the extract air rate such as to maintain a negative pressure within the toilet area.

All toilet extract and air transfer fans shall be provided with attenuators and acoustic housing / wrapping as required to achieve the internal noise criteria, as stipulated by others.

Provide all cross talk attenuators as required to maintain the internal noise criteria, as stipulated by others.

The fan unit will be provided complete with manufacturers integral controller for fan speed adjustment and shut-off damper open/close operation.

The controller must be marked by the contractor to indicate the correct speed setting position following commissioning.

1.3.1. UV Air Filtration: All ground floor toilet extract systems shall be provided within in-line UV filtration systems in the exhaust section of the ductwork.

The UV filter shall provide mitigation of foul smells from the toilet extract system prior to discharge to atmosphere.

The contractor shall ensure that the UV system is selected to match the ventilation flow rates of the individual system served.

The UV filters shall be installed in accordance with the manufacturers requirements and recommendations.

2. System performance: Ss_65_40_33/210 Design of ventilation systems; Ss_65_40_33/240 Ductwork design; Ss_65_40_33/250 Fan performance; Ss_65_40_33/260 Attenuator performance

3. Room extract air terminal devices: Pr_70_65_04_03 Air grilles; Pr_30_59_94_06 Air transfer grilles
4. Air ductwork and accessories
   4.1. Ductwork: Pr_65_65_25_14 Circular sheet metal ductwork and fittings; Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings
   4.2. Accessories: Pr_65_65_23_20 Duct access panels; Pr_30_59_57_07 Bird guards; Pr_65_65_24_29 Fire and smoke dampers; Pr_65_65_25_32 Flexible ductwork; Pr_65_65_24_78 Shut off dampers
5. Thermal insulation on extract air ductwork: Pr_80_77_76_53 Mineral wool duct slab insulation
6. Vibration isolation mountings: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_84 Spring isolators; Pr_80_77_94_42 Isolation hangers
7. Acoustic treatment: Pr_65_67_78_12 Circular attenuators; Pr_65_67_78_72 Rectangular attenuators
8. Extract fans: Pr_65_67_29_89 Twin centrifugal fans
9. External exhaust air terminals: Pr_30_59_48_04 Aluminium louvre panel units
10. Accessories: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps
11. Controls: Ss_75_70_52_28 [M] Extract ventilation control systems
12. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
13. Testing: Pr_65_65_25/785 Air leakage testing of medium pressure ductwork; Pr_65_65_25/790 Air leakage testing of plant items
14. Execution: Ss_65_40_33/630 Installing ductwork on air handling units; Ss_65_40_33/640 Ductwork systems cleaning
15. System completion: Ss_65_40_33/810 Commissioning of air distribution systems; Ss_65_40_33/820 Performance testing; Ss_65_40_33/830 Inspection and test records; Ss_65_40_33/840 Demonstrations; Ss_65_40_33/850 Documentation for ventilation systems; Ss_65_40_33/860 Spares and consumables; Ss_65_40_33/870 Maintenance

See Ss_75_70_52_28 [M] Extract ventilation control systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

System performance

See Ss_65_40_33/210 Design of ventilation systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/240 Ductwork design in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/250 Fan performance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/260 Attenuator performance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/272 Constant volume extract fan control strategy in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_30_59_48_04 Aluminium louvre panel units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_30_59_57_07 Bird guards in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_30_59_94_06 Air transfer grilles ADDED

1. Manufacturer:
    1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

2. Standard: To BS EN 13141-1.
3. Third party certification: Two independent grilles fixed either side of the door.

4. Colour: RAL colour as specified by architect
5. Execution: Pr_30_59_94/610 Fasteners for hardware

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_23_20 Duct access panels in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24_29 Fire and smoke dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24_78 Shut off dampers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_14 Circular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_32 Flexible ductwork in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_67_29_89 Twin centrifugal fans ADDED

1. Description:

1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

2. Standards
   - 2.1. Performance: To BS EN ISO 5801.
   - 2.2. Configuration category: To BS EN ISO 5801, category A. To BS EN ISO 5801, category B. To BS EN ISO 5801, category C. To BS EN ISO 5801, category D.
   - 2.3. Electrical safety: To BS EN 60335-1 and BS EN 60335-2-80.
3. Duty
   - 3.1. Air volume: Refer to equipment schedules
   - 3.2. Resistance: Refer to equipment schedules
   - 3.3. Fan speed: Refer to equipment schedules
   - 3.4. Sound power level: Refer to equipment schedules
4. Operation: Twin with automatic changeover.
5. Position: Refer to GA plans
6. Electrical supply: Refer to equipment schedules
7. Accessories
   - 7.1. Access panel: Hinged casing. Removable panel.
   - 7.2. Controls: Speed controller to match fan, with on/ off and auto-changeover.
   - 7.3. Silencer: Refer to equipment schedules
8. Execution: Pr_65_67_29/610 Installing fans generally

See Pr_65_67_78_12 Circular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_78_72 Rectangular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04_03 Air grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_04 Air plenum boxes in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18_21 Damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_80_77_76_53 Mineral wool duct slab insulation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_76 Self-adhesive insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_95 Valve and flange insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

Pr_30_59_94/610 Fasteners for hardware ADDED

1. Colour and finish: To match hardware.

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/650 Installing ductwork identification in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24/725 Installing fire and smoke control dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24/750 Access to dampers for resetting and maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/610 Air ductwork generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/640 Installing sheet metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/670 Ductwork support for vapour seal continuity in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/680 Ductwork support, special in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/690 Drainage of ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/700 Test holes in ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/720 Weatherproofing ductwork penetrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/785 Air leakage testing of medium pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/790 Air leakage testing of plant items in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/795 Air leakage testing of low pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29/610 Installing fans generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04/610 Installing air terminal devices in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/650 Installing grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/680 Location of grille or diffuser blanking plates in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/690 Support of air terminal units in ceiling grids in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18/616 Installing damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/660 Installing foil faced mineral wool insulation on ductwork in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/715 Installing self adhesive cladding and jacketing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/720 Installing sheet aluminium protection in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/770 Insulation carried through ductwork supports in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_65_40_33/630 Installing ductwork on air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/640 Ductwork systems cleaning in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

System completion

See Ss_65_40_33/810 Commissioning of air distribution systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/820 Performance testing in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/830 Inspection and test records in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/840 Demonstrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/850 Documentation for ventilation systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/860 Spares and consumables in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_65_40_33/870 Maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_40_80_80
[M] Smoke and heat exhaust ventilation systems ADDED

Systems

Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems ADDED

1. Description:

The smoke and heat exhaust ventilation installation comprises / includes for the following systems:

1. Fire fighting lobby smoke extract system complete with associated staircore AOV (4no. systems)
2. Level GF south smoke extract system
3. Atrium smoke extract system
4. Level 03 north concourse smoke extract system
5. Level 03 east concourse smoke extract system
6. Level 03 south concourse smoke extract system
7. Level 03 west concourse smoke extract system
8. Main Hall smoke extract system
9. All associated ductwork, dampers, fan unit, bracketry and associated components / cabling for the above systems to be fire rated at 300°C for 1hr

Refer to clause Ss_65_40_94_10 for details of the loading bay extract and smoke extract ventilation system.

All fan units / systems comprise duty / standby fans as detailed on the system schematics.

All smoke extract ductwork associated with the above systems are to be fire-rated (included thermal insulation) rated at 300°C/1hr.

1.1. Fire Fighting Stair Core Smoke Extract System:

1.1.1. General Requirements:

A smoke extract system is to be provided comprising duty / standby fan set located at the head of each smoke extract shaft. The fan sets will come complete with secondary generator power supply to facilitate automatic smoke extract under the dictates of the fire detection system (on activation).

Each ATS is to be provided as part of the mechanical contractor's package, for connection by the electrical contractor.

The smoke extract system comprises fire rated builderswork shafts.

The contractor must include for calculating the external pressure drop for each fan set based on his installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity

in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement of the motor / fan unit at their own expense.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

The entire smoke extract system is to be designed, controlled and installed by Colt or an approved certified BRE equivalent.

1.1.2. System Design Parameters: The mechanical smoke ventilation system should be designed in accordance with BS.9991 and BS EN 12101 Part 6. Additional guidance on these systems may also be found in the Smoke Control Association guide.

The aim of the mechanical smoke ventilation system is to return the fire fighting lobby to tenable conditions within 120 seconds of coming into operation during means of escape and to also keep the staircase free of smoke during firefighting operations.

The aim of the mechanical smoke ventilation system is to provide equivalent or better conditions in the lobby / corridor and stairs than the natural ventilation system (BS.9991 Section 26.2.5)

1.1.3. Smoke Extract Fans: The axial fans should be variable volume smoke extract fans and comply with the requirements of classification E 300°C for 2 hours in accordance with BS.7346 Part 2 (EN.12101 part 3). The fans should be in series with a duty and standby fan with a minimum extraction rate achieved on the lowest floor served by the smoke shaft.

Each fan assembly should be connected to the smoke shaft by means of ducting, meeting the standards of DW.144.

The standby fan is to be activated on duty fan failure by means of current monitoring of the duty fan (pressure sensor not acceptable). The standby fan should be designed to run at maximum volume on a simple direct on line (DOL) starter bypassing the controls.

The fan ATS is to be provided as part of the mechanical contractor's package.

Provide override on/off/auto control panel to each fire service access level lobby at level GF in addition to similar level of override control within the security control room**.**

1.1.4. Fire Fighting Lobby Extract Damper: The extract vent serving each fire-fighting lobby is to comprise of a fire rated louvre providing a minimum of 1.0m² free area (maximum damper height is 2,138mm with minimum width of 700mm + 25mm minimum each side for framing and fixing). Each louvre will be provided with actuator damper operation provided and installed by the smoke extract fan system specialist.

All damper controlling components should achieve one hour fire resistance for integrity and stability when tested to EN.1366 Part 2 as a combined unit (damper / motor / connections). This includes the holding closed which should keep the door closed on the floors above the fire floor. The motor is to be 24v DC motor open, motor closed.

The front of the damper should have an IP10 louvre or similar which is fitted to the lobby side and be powder coated (colour to be advised by the Architect). The louvre is to be fixed by a method where no screws will be visible to the front.

1.1.5. Stair Door: The staircase door will swing into the lobby allowing for replacement air to flow into the corridor and will act as a pressure relief.

The door closers should satisfy the requirements of Approved Document M and limit the pressure difference to 30 Pascals when the system is running in means of escape mode. The closer should be approved and conforms to the EN.1154 and BS.476 Part 22 standards.

1.1.6. Staircase AOV: The staircase AOV will be provided at the head of each stair core. The vent will achieve 1.0m² free area, be automatic in operation and the controls will be 24v DC motor open, reverse polarity motor closed. A local key switch is to be provided adjacent to the vent which will provide the necessary override controls.

Each make-up air AOV duct will be provided with an additional in-line fire / smoke damper which will be automatic in operation and the controls will be 24v DC motor open, reverse polarity motor closed. A local key switch is to be provided within the stair lobby, both at level GF and level 04 which will provide the necessary override controls.

The smoke ventilation specialist contractor is to provide all necessary controls to interface with the duct mounted fire / smoke damper to facilitate its automatic and fire-brigade override control.

All supply make-up air ductwork must be fire-rated including associated thermal insulation.

1.1.7. Staircase Pressure Switch: As the staircase has an inward opening door , a pressure switch is to be provided between staircase and lobby to ensure that the system achieves 50Pa pressure differential.

1.1.8. Fan Control Panel: Each fire-fighting stair core fan control panel is to be located at level 05 adjacent to the associated stair core. The panel will power the shaft dampers, AOV and control the extract fans.

The duty fan speed should be controlled by means of an inverter speed controller. The standby fan will only run at maximum volume by means of direct on line (DOL) starter which bypasses the controls. The panel will be supplied with a maintained power supply. The fan panel is to send signals to the ground floor panel indicating system running, fan status and shaft damper status.

The panel is to be true open protocol so the Client is not tied into a contract with a specialist company for the life of the building. The system is to be constructed of relays which any company can maintain with components such as inverters, relays, etc. being off-the-shelf. PCBs and circuit boards are not allowed.

1.1.9. Electrical Changeover Panel: A 3 phase electrical changeover panel should be provided beside the fan control panel within the mechanical package. The Electrical Contractor will wire and make final connections to the electrical change over panel (with the Smoke Ventilation Contractor running the maintained cable between the panels & making final connections) and is responsible for all wiring after this point to achieve a working system.

1.1.10. Fire Alarm Panel: An addressable fire alarm panel by others is to be provided at ground level, which controls the building smoke detectors, smoke management system, interfaces with door entry and grounding the fire lifts. An 8-way MIOU will be positioned adjacent to the fan control panel on the top floor by others which will allow the fan panel status to be added to the fire alarm system which will be networked.

MIOUs will be provided at the base of the smoke shaft providing the necessary signalling to the smoke panels, allowing the correct panel / door to open.

A key switch should be provided by the Smoke Venting Contractor adjacent to the fire panel which allows the Mechanical Smoke Ventilation System to be manually turned to 'Auto/Off' or manually bypass the smoke detection systems, allowing the shaft dampers to be opened manually on the fire floor and bring the system into operation.

1.1.11. Break Glass: An orange re-settable break glass is to be positioned on the staircase landing below the AOV. The break glass is intended for testing the operation of the actuator locally as fire brigade override control.

1.1.12. Wiring: The system should be wired in fire rated cable with essential circuits required to maintain the system running and installed with enhanced fire rated cables.

Cables should be run on the containment provided by others.

1.1.13. Smoke Shaft Builderswork Requirements: The builderswork shaft, which shall be supplied and installed by other Trade Contractors, shall be vertical and plumb, directly adjacent to the lobbies. The construction shall have a smooth internal face and internal cross sectional of no less than 0.8m² with the face opening onto the lobby a minimum dimension of 750mm wide.

The builderswork shaft is to be of air tight construction as identified in BS.9991 and BS EN 12101-6, with a maximum leakage rate of 3.8m3/hr/m² wall area at 50Pa pressure differential.

The shaft is to achieve fire resistance from both sides to the same standard as the elements of structure. The structural opening dimensions will be as documented in this specification and will be framed by the Trade Contractor.

The entire smoke extract installation and any associated CFD analysis will form part of the CDP and be carried out by the specialist.

1.1.14. Fire Brigade Override Control: Applicable for 4no. fire-fighting lobbies:

Provide override on/off/auto control panel to each fire service access level lobby at level GF only.

Provide override on/off/auto control panel serving the lobby smoke extract fans to be located within the security control room.

The controls specialist must submit a drawing of the Security Control fire-fighting lobby smoke control override panel for fire-brigade approval. The panel must not be fabricated prior to receipt of approval. The controls specialist will be responsible for all abortive costs should an unapproved panel layout / design be manufactured.

The contractor shall provide AOV motorised fire / smoke damper break-glasses in fire fighting lobbies at LGF as well as as the upper most lobby of each core.

1.2. Main Hall Smoke Extract System: The main hall is served with a dedicated smoke extract system comprising 7no identical systems each rated at c.15% total design capacity and each as a duty / standby fan arrangement . Each fan system serves distribution ductwork at high level within the Hall. The fans are located, exposed within the level 05 plant trench and will run at a set single speed providing 22m³/s per fan system (150m³/s total).

1.2.1. Make-Up Supply Air:

On activation of the main smoke extract system serving the bowl, make-up air is provided through the following openings, as described in the fire consultant's report:

- Loading Bay inlet 1
- Loading Bay inlet 2
- Loading Bay inlet 3
- Loading Bay inlet 4
- Atrium inlet 1
- Atrium inlet 2
- Atrium inlet 3
- Atrium inlet 4
- Atrium inlet 5

A fire brigade override panel (on/off/auto) is to be located adjacent to the main fire alarm panel in the security control room to allow the fire brigade to take control of the supply fan.

1.3. Basement South Smoke Extract System:

This system serves the following areas:

- Talent areas
- Dressing rooms
- The Record Room
- Production offices
- Crew catering
- Commissary kitchen
- Adjacent ancillary spaces

The areas above are all served by fire rated ductwork (300°C/1hr) distribution as detailed on the drawings to facilitate smoke extract in the event of fire system activation in addition to normal day-to-day ventilation (via damper arrangement to AHU). The smoke extract fans serving these basement areas will be commissioned to run at 10ACH of the largest single fire compartment should fire alarm activation occur. All controlling components should achieve one hour fire resistance for integrity and stability when tested to EN.1366 Part 2 as a combined unit.

All rooms / branches served by the extract system must be provided with motorised fire / smoke dampers for both balancing as well as isolation of the general air handling plant under fire conditions in order to divert the extract air path to the smoke extract fans as detailed on the system schematics.

The duty / standby extract fan arrangement is located at level GF with discharge ductwork routed to high level of the discharge turret at podium level .

A fire brigade override panel (on/off/auto) is to be located adjacent to the main fire alarm panel in the security control room to allow the fire brigade to take control of the supply fan.

1.3.1. Make-Up Supply Air: Make-up supply air is derived from the supply ductwork system serving the area via smoke extract dampers.

In order to provide robust integrity for the supply air make-up under fire conditions, supply ductwork for this system **must** be fire-rated (including thermal insulation) regardless of whether the supply ductwork sits in an adjacent fire compartment.

A fire brigade override panel (on/off/auto) is to be located adjacent to the main fire alarm panel in the security control room to allow the fire brigade to take control of the supply fan.

1.4. Atrium Smoke Extract System:

This serves the following areas:

- triple height atrium area

The areas above are all served by served by fire rated ductwork (300°C/1hr) distribution as detailed on the drawings to facilitate smoke extract in the event of fire system activation in addition to normal day-to-day ventilation (via damper arrangement to AHU). The smoke extract fans serving the atrium will be commissioned to run at 10ACH of the fire compartment should fire alarm activation occur. All controlling components should achieve one hour fire resistance for integrity and stability when tested to EN.1366 Part 2 as a combined unit.

The smoke extract system must be provided with motorised fire / smoke dampers for both balancing as well as isolation of the general air handling plant under fire conditions in order to divert the extract air path to the smoke extract fans as detailed on the system schematics.

The duty / standby extract fan arrangements are located at level 05 plant trench.

A fire brigade override panel (on/off/auto) is to be located adjacent to the main fire alarm panel in the security control room to allow the fire brigade to take control of the supply fan.

1.4.1. Make-Up Supply Air:

On activation of the main smoke extract system serving the atrium, make-up air is provided through the main escape doors:

- Ground floor entrance
- Main entrance
- Level 01 north

- Level 01 south

A fire brigade override panel (on/off/auto) is to be located adjacent to the main fire alarm panel in the security control room to allow the fire brigade to take control of the supply fan.

1.5. Level 3 Concourse Smoke Extract System (north, south & west):

3no. separate smoke extract systems serve the following areas:

1. North double height concourse area
2. South double height concourse area
3. West double height concourse area

The areas above are all served by dedicated fire rated ductwork (300°C/1hr) distribution as detailed on the drawings to facilitate smoke extract in the event of fire system activation. The smoke extract fans serving the concourse area will be commissioned to run at 10ACH of the fire compartment should fire alarm activation occur. All controlling components should achieve one hour fire resistance for integrity and stability when tested to EN.1366 Part 2 as a combined unit.

The duty / standby extract fan arrangements are located at level 03, discharging through the facade.

A fire brigade override panel (on/off/auto) is to be located adjacent to the main fire alarm panel in the security control room to allow the fire brigade to take control of the supply fan

1.5.1. Make-Up Supply Air: On activation of the main smoke extract system serving the bowl, make-up air is provided through AOVs within each concourse area through the facade of the building as per the fire consultant's report.

A fire brigade override panel (on/off/auto) is to be located adjacent to the main fire alarm panel in the security control room to allow the fire brigade to take control of the supply fan.

2. System performance: Ss_65_40_80/230 Design of smoke control systems; Ss_65_40_80/250 Activation of the systems; Ss_65_40_80/260 Integration with fire alarm systems; Ss_65_40_80/270 Interaction with fire suppression systems; Ss_65_40_80/280 Firefighting power supply and cable selection; Ss_65_40_80/285 Fan operation
3. External air intake terminals: Pr_30_59_48_04 Aluminium louvre panel units
4. Duct: Pr_65_65_25_30 Fire resisting ductwork and fittings; Pr_65_65_25_77 Smoke extract ductwork
5. Fans
   5.1. Extract: Pr_65_67_29_64 Powered smoke and heat exhaust ventilators
6. Internal supply air terminal devices: Pr_70_65_04_03 Air grilles
7. Internal extract air terminal devices: Pr_70_65_04_03 Air grilles; Pr_65_65_24_80 Smoke dampers
8. External exhaust terminals: Pr_30_59_48_04 Aluminium louvre panel units

9. Accessories: Pr_80_77_27_73 Roof equipment supports
10. Controls
    10.1. Control panel: Pr_75_50_18_80 Smoke and heat exhaust control panels
    10.2. Strategy: Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems; Ss_75_70_52_80 [M] Smoke and heat detection extract control systems
11. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
12. Execution: Ss_65_40_80/620 Installing smoke control systems; Ss_65_40_80/640 Installing smoke and heat exhaust control panels
13. System completion: Ss_65_40_80/815 Commissioning and acceptance for smoke control systems; Ss_65_40_80/840 Demonstrations; Ss_65_40_80/850 Documentation for smoke control systems; Ss_65_40_80/860 Spares and consumables; Ss_65_40_80/870 Maintenance

Ss_75_70_52_80 [M] Smoke and heat detection extract control systems ADDED

Shared by: Ss_65_40_94_10 [M] Loading bay extract systems

1. Description:

   Refer to clause Ss_75_70_52_94 (ventilation control systems) for details / specification.
2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Operation: On receipt of fire alarm signal enable extract fan and open exhaust air damper.
4. Firemans' override switch
   4.1. Operation: Operate relative fan and open relative damper for switch position.
   4.2. Switch position: Supply and extract.
5. Equipment: Pr_75_50_18_21 Damper actuators; Pr_75_50_18_51 Mechanical services control panels
6. Equipment interconnectivity: Wired.
7. Cables: As specified by the controls specialist
8. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
9. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals
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

Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems ADDED

Shared by: Ss_65_40_94_10 [M] Loading bay extract systems

1. Description:

   Refer to clause Ss_75_70_52_94 (ventilation control systems) for details / specification.
2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Objectives: On receipt of fire alarm signal control all plant to shutdown

4. Operation: On receipt of fire alarm signal control all plant to shutdown.
5. Firemans' override switch
   5.1. Operation: Operate relative fan and open relative damper for switch position.
   5.2. Switch position: Supply and extract.
6. Variable speed fans: Operate to a constant speed signal under smoke extract (where applicable)
7. Equipment: Pr_75_50_18_21 Damper actuators; Pr_75_50_18_51 Mechanical services control panels
8. Equipment interconnectivity: Wired.
9. Cables: As Specialist's recommendations.
10. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
11. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals
12. Rewireable installations: Required.
13. Concealed installations: Required.
14. Control equipment power supply: Mains supply.
15. 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_65_40_80/230 Design of smoke control systems ADDED

1. Standards: Complete the design of the smoke control system in accordance with BS 7346-8 and BS 9999.
2. Calculation method: In accordance with BS 7346-4. In accordance with BS 7346-5.
3. Purpose: Protects escape routes. Protects firefighting shafts. Facilitates firefighting operations by creating a smoke-free layer.
4. Requirement: In accordance with BS 7346-8, clause 4.

Ss_65_40_80/250 Activation of the systems ADDED

1. Operation
   1.1. Means of escape: Automatically operated on activation of fire detection and alarm system in accordance with BS 5839-1.
   1.2. Property protection: Automatically operated on activation of sprinkler system in accordance with BS EN 12259-1 and BS EN 12845.
   1.3. Firefighting provision: Automatically operated on activation of fire detection and alarm system in accordance with BS 5839-1. Automatically operated on activation of sprinkler system in accordance with BS EN 12259-1 and BS EN 12845.

Ss_65_40_80/260 Integration with fire alarm systems ADDED

1. Objectives: Automatically operated on activation of the fire detection and alarm system.
2. Standard: In accordance with BS 5839-1.
3. Operation: Ensure that the fire detection and alarm system zones are aligned with the smoke and heat exhaust ventilation system (SHEV) zones to allow the SHEV to respond appropriately.

Ss_65_40_80/270 Interaction with fire suppression systems ADDED

1. Standard: In accordance with BS 7346-4, Appendix K.

Ss_65_40_80/280 Firefighting power supply and cable selection ADDED

1. Standard: In accordance with BS 8519.
2. Power supply: Standby generator.

Ss_65_40_80/285 Fan operation ADDED

1. Fan control: Emergency extract only.

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Products

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_30_59_48_04 Aluminium louvre panel units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_65_24_80 Smoke dampers ADDED

1. Standard: To BS EN 12101-8.
2. Classification
    2.1. Standard: To BS EN 13501-4.
    2.2. Multi-compartment
        2.2.1. Integrity class: EI 60. EI 120. Refer to fire compartmentation drawings
        2.2.2. High operational temperature: HOT 400/30.
        2.2.3. Smoke leakage: S.
        2.2.4. Inside or outside: (i → o). (o → i). (i ↔ o).
3. Aerodynamic performance: To BS EN 1751 and BS EN ISO 5135.
4. Activation: AA - Automatic.
5. Actuators: Tested to BS EN 1366-10.

See Pr_65_65_25_30 Fire resisting ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_65_25_77 Smoke extract ductwork ADDED

Shared by: Ss_65_40_94_10 [M] Loading bay extract systems

1. Description:

    The contractor is to comply with the following requirements:

1. The Contractor shall employ a ductwork cleaning specialist prior to the installation of the system to advise and implement a ductwork cleaning regime on all air systems, in accordance with BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems', all other relevant BSRIA, CIBSE and HSE standards / guidance documents.
2. Provide flexible connections at building expansion joints.
3. All visible ductwork shall be cleaned externally (including ductwork with Hammerclad finish) prior to hand-over.
4. Leakage testing required for all ductwork systems as follows:
    a. Class A - Low Pressure: 10% of each system to be randomly selected for testing
    b. Class B - Medium Pressure: 100% of each system shall be tested
5. Leakage testing shall be carried out as the work proceeds and prior to the application of thermal insulation (where applied). All riser and plant area ductwork is to be subjected to a 100% test.
6. Provide fire-rated ductwork, where required and detailed (FR) to meet BSEN1366 parts 1,8 and 9 by Flameshield constructed using J6 rated flanging technology and also in compliance with BSEN.1587 and BSEN.12107
7. Provide ductwork systems and access doors in accordance with BESA specification DW144 2013 using J6 rated flanging throughout
8. Provide ductwork systems and access doors in accordance with BESA specification DW172 (kitchen ventilation systems) using J6 rated flanging throughout.
9. The M&E Contractor must refer to the Fire Engineering Consultant’s Fire Strategy Report and be fully compliant with its content.
10. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.
11. Fire rated ductwork and rated insulation to achieve EN.1366 Parts 1 & 8 and EN.13501-3 Standards, alongside BS.476 Part 24 and ISO.6944 (1985) All fire rated ductwork is to be subjected to a 100% test.
12. The ductwork will be subjected to a range of witnessed factory leakage tests for a range of sizes and types of ductwork installation and materials, allow for a minimum of 6 separate tests. Contractor to include for travel costs for up to 2no people to attend the testing.
13. All circular ductwork will required to have suitable flanges factory fitted and not fitted at site.
14. All circular joints are to be further made and suitably sealed using suitable high velocity jointing tape.
15. All ventilation components are to be selected to suit a specialist stadium and leisure venue environment.
16. Each aspect of the ventilation installation is to be benchmarked before installation begins.
17. A sample of each fire rated component is to be provided for approval.
18. The successful ductwork contractor will be required to work closely and manage all interfaces with the facade contractor to ensure a successful installation to the engineers satisfaction.
19. The ductwork contractor will provide a full design calculation check to ratify the air performance in the engineers design.
20. The successful ductwork contractor will liaise and interface with the structural engineer to provide all down weights and loadings for the ductwork installation and ventilation equipment.
21. A suitable mock-up of completed fire rated ductwork and insulation will be required to be constructed at the ductwork contractors factory for approval. Contractor to include for travel costs for up to 2no people to attend the testing.

22. The ductwork contractor is to include the manufacture of all fire rated attenuator casings and for installing the specified attenuator pods at their own factory.
23. The minimum acceptable levels for sheet metal gauges specified within DW144 will not be used for all ductwork.
24. The ductwork contractor will provide a comprehensive technical submission with their tender complete with all certification of conformity, and a full set of marked up drawings showing detailed scope of inclusions.
25. The ductwork contractor will include for sufficient vacuum tests to prove the cleanliness of all ductwork systems.
26. The ductwork contractor will provide such additional information and detail with his tender submission demonstrating his specific understanding of the completion of a development of this nature together specific project examples.

2. Manufacturer: Ductwork is to be supplied, manufactured, installed and tested by ES Group Ltd (01323 845492) or better and approved.
3. Standard
   3.1. Ductwork: To BS EN 12101-7.
   3.2. Testing: To BS EN 1366-1. To BS EN 1366-8. To BS EN 1366-9.
   3.3. Classification: To BS EN 13501-4.

   Class B. (+75Pa) medium pressure. All ducts to be pressure tested.
4. Internal Cleanliness of Ventilation System: With reference to BESA Guide TR.19 'Guide to Good Practice: Internal Cleanliness of Ventilation Systems, the following levels are to be achieved for each applicable system:
   4.1. Clean Plantrooms:

   Ventilation systems serving the following (or similar) plantrooms:

   - Low voltage switchrooms
   - Medium voltage switchrooms
   - High voltage switchrooms
   - UPS rooms
   - SCR rooms
   - Data centres
   - Potable domestic water plantrooms

   Cleanliness Quality Class: HIGH

   Acceptable dust accumulation level (supply): <0.3 g/m²

   Acceptable dust accumulation level (extract): <0.9 g/m²

   4.2. Front of House / Public / Occupied Areas: Cleanliness Quality Class: HIGH

   Acceptable dust accumulation level (make-up): <0.3 g/m²
   Acceptable dust accumulation level (extract): <0.9 g/m²

   4.3. Standard Plantrooms:

   Ventilation systems serving the following (or similar) plantrooms:

- Non-potable domestic water plantrooms
- Fire plantrooms
- Ventilation plantrooms

Cleanliness Quality Class: MEDIUM

Acceptable dust accumulation level (make-up): <0.6 g/m²

Acceptable dust accumulation level (extract): <1.8 g/m²

4.4. General Storage Areas: Cleanliness Quality Class: LOW

Acceptable dust accumulation level (make-up): <0.9 g/m²
Acceptable dust accumulation level (extract): <1.8 g/m²

4.5. Location of Access Panels for inspection/Servicing and Internal Cleanliness: Refer to clause Pr_65_65_23_20 for further details

5. Microbiological Contamination: Comply with the microbiological aspects of ventilation hygiene as detailed within CIBSE TM26.

Surface sampling microbial limits are as follows:

Category Low:
Colony Forming Units (CFU per 10cm²): equating to less than 10.

Category Medium:
Colony Forming Units (CFU per 10cm²): equating to 10 to 19.

Category High :
Colony Forming Units (CFU per 10cm²): equating to 20 and above.

Should the microbial counts from a particular general area (such as the AHU) indicate localised microbial contamination, ie more than 50% of samples in the “high” category, then the cleaning of that area is to be undertaken.

Cleaning of the entire system will be a requirement where, on average, more than 25% of the samples are in the “high” category.

6. Duct type: C.
7. Accessories
   7.1. Material: Compatible with ductwork.
   7.2. Finish: Match ductwork.
8. Execution: Pr_65_65_25/610 Air ductwork generally; Pr_65_65_25/730 Fire rated ductwork sleeves and collars; Pr_65_65_25/680 Ductwork support, special; Pr_65_65_25/700 Test holes in ductwork; Pr_65_65_25/720 Weatherproofing ductwork penetrations; Pr_65_65_25/645 Installing fire and smoke extract ductwork

Pr_65_67_29_64 Powered smoke and heat exhaust ventilators ADDED

1. Standard: To BS EN 12101-3.
2. Fire performance
   2.1. Standard: To BS EN 13501-4.
   2.2. Classification: F_{300} 60.
3. Duty
   3.1. Air volume: Refer to equipment schedules
   3.2. Electrical supply
      3.2.1. Nominal voltage: Single phase 230 V a.c.
4. Electrical safety: To BS EN 60335-1 and BS EN 60335-2-80.
5. Mounting: Refer to GA plans
6. Seals: Required.
7. Controls: Electromagnetic latch.
8. Accessories: Flexible electrical connection.
9. Execution: Pr_65_67_29/610 Installing fans generally; Pr_65_67_29/630 Installing smoke and heat control ventilators

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04_03 Air grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_04 Air plenum boxes in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18_21 Damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_18_80 Smoke and heat exhaust control panels ADDED

1. Enclosure
   1.1. Ingress protection (minimum): BS EN 60529
   1.2. Finish: Polyester powder coated.
2. Nominal frequency: 50 Hz.
3. Outputs: 24 V d.c.
4. Batteries

4.1. Type: Nickel-cadmium sealed to BS EN 60622.
4.2. Voltage: 12 V.
4.3. Battery autonomy (stored energy time at rated power): 72 hrs
4.4. Battery service life (minimum): Three years
5. Mounting: Wall. Suitable for DIN rail.

See Pr_80_77_27_73 Roof equipment supports in Ss_60_40_37_48 [M] Low temperature hot water heating systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/650 Installing ductwork identification in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/610 Air ductwork generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/645 Installing fire and smoke extract ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/670 Ductwork support for vapour seal continuity in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/680 Ductwork support, special in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/700 Test holes in ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/720 Weatherproofing ductwork penetrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/730 Fire rated ductwork sleeves and collars in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29/610 Installing fans generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_67_29/630 Installing smoke and heat control ventilators ADDED

1. Fixing: Use fixing points provided. Do not strain the ventilator structure when bolts are tightened.
2. Alignment: Install ventilator to allow optimum air flow path.

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04/610 Installing air terminal devices in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/650 Installing grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/680 Location of grille or diffuser blanking plates in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/690 Support of air terminal units in ceiling grids in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18/616 Installing damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_65_40_80/620 Installing smoke control systems ADDED

1. Standard: In accordance with BS 7346-8.

Ss_65_40_80/640 Installing smoke and heat exhaust control panels ADDED

1. Position: Plant room and as required by Fire Authority
2. Connection to sensors: Required.

System completion

Ss_65_40_80/815 Commissioning and acceptance for smoke control systems ADDED

1. Standards
   1.1. Commissioning: Carry out in accordance with BS 7346-8.
   1.2. Acceptance testing: Carry out in accordance with BS 7346-8.
2. Certificate: Submit acceptance certificate in accordance with BS 7346-8.

Ss_65_40_80/840 Demonstrations ADDED

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

Ss_65_40_80/850 Documentation for smoke control systems ADDED

1. Operating and maintenance instructions
   1.1. Scope: Submit information for operating and maintaining the system in accordance with BS 7346-8, including 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: Two.
2. Logbook: Submit in accordance with BS 7346-8.
3. Record drawings
   3.1. 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.
   3.2. Format: A1 paper print. Electronic.
   3.3. Number of copies: Two.
4. Submittal date: At handover.
5. Certification
   5.1. Design: Submit in accordance with BS 7346-8.
   5.2. Installation: Submit in accordance with BS 7346-8.
   5.3. Commissioning: Submit in accordance with BS 7346-8.

Ss_65_40_80/860 Spares and consumables ADDED

1. Filters
   1.1. Filter media: Supply one complete replacement for every filter.
   1.2. Retaining clips and rubber gaskets: Two sets for each type of filter.
2. Detectors: Supply two of each type.

Ss_65_40_80/870 Maintenance ADDED

1. Servicing and maintenance: Undertake for 12 months after completion.

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_40_94_10
[M] Loading bay extract systems ADDED

Systems

Ss_65_40_94_10 [M] Loading bay extract systems ADDED

1. Description:

The installation comprises / includes the following:

1. 3no. in-duct mounted duty / standby extract fan sets unit complete with manufacturers speed controller and generator backup up secondary power supply.
2. Jet / impulse fan units complete with manufacturer's speed controller and generator backup up secondary power supply
3. All ductwork, fire-rated ductwork, fittings, flexible connections, attenuators, brackets, supports etc to make a complete and working installation.

Refer to clauses Ss_75_70_52_94 for details of the smoke extract / pollution control system.

The fan units, ductwork and associated fittings are to be fire rated to provide a melting point of not less than 800°C for 1 hour. The speed controller is to be suitable for the fans to operate at a pre-determined low (6ACH) and high (10ACH) speed setting operated under BMS / fireman's control.

Each cyclone induction jet fan unit is to operate as dual speed;

1. Normal background / pollution control (carbon monoxide)
2. High speed subject to vehicle exhaust pollution levels and fire ventilation extract rates.

Each fan unit to be provided with vibration control mounts to avoid vibration transfer to the building structure.

Provide extract ductwork distribution to serve the Loading Bay as detailed on the drawings. Locate ductwork at high level to maximise available headroom. Co-ordinate ductwork with all other services and ensure a minimum headroom of 4.75m is provided in all areas of vehicle movement. Provide fire rating to all ductwork and systems where they form a part of, or could affect, the operation or integrity of the smoke extract system.

Provide dual speed fans per ventilation system (3no. duty / standby) arrangement to achieve the normal and fire ventilation extract rates, housed in suitable enclosures with vibration control mounts to avoid vibration transfer to the building structure. Provide fully fire rated fan flexible couplings to the ductwork. The fans exhaust at level 01 podium level via ductwork within the podium ventilation turret; seal and fit these with fire rated non-return or motorised dampers to eliminate recirculation through the fans.

Provide exhaust weather exposure rated louvres with bird guards to suit the discharge arrangements with interlocked motorised shut off dampers to seal the discharge louvre when the fans are de-energised.

Provide louvres as vandal resistant for an external environment.

Provide each fan with independent power supplies from the electrical essential supply system to provide automatic system operation in the event of the loss of the mains power supply for a minimum of 90 minutes. Separately wire each fan's power and controls with cabling and electrical equipment which is suitably fire rated.

Each fan ATS to be provided within the mechanical contractor's package.

The fan units are located within the ventilation turret at Level 01. Fire rated thermal insulation is not required to this system.

Makeup air path is via openings within the main roller shutter door which is specified and provided by others.

The contractor must include for calculating the external pressure drop for each fan set based on their installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement motor / fan unit at their own expense.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this system including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

Ensure that electrical equipment installed within the air stream of the extract ventilation system or where it may be exposed to potential petrol vapours is suitable for use in a Zone 1 hazardous area, in accordance with BS EN 60079-14

The contractor shall provide a truck exhaust air ventilation system. The system shall consist of an extract fan with interconnecting ductwork to adjustable drop down hoses, to connect to truck exhaust pipes. System will capture exhaust fumes when truck is idling. One hose system shall be provided per truck parking bay. System will exhaust air into main loading bay extract system bellmouths.

2. System performance: Ss_65_40_94/210 Design of car park ventilation; Ss_65_40_94/220 Performance criteria; Ss_65_40_94/240 Fan selection; Ss_65_40_94/250 Activation and

operation of systems; Ss_65_40_94/260 Integration with fire alarm systems; Ss_65_40_94/270 Interaction with fire protection and building systems

3. Air ductwork and accessories
   3.1. Ductwork: Pr_65_65_25_30 Fire resisting ductwork and fittings; Pr_65_65_25_77 Smoke extract ductwork
   3.2. Accessories: Pr_65_65_24_29 Fire and smoke dampers
4. Fans: Pr_65_67_29_44 Jet fans
5. Internal extract air terminal devices: Pr_70_65_04_03 Air grilles
6. External exhaust terminals: Pr_30_59_48_04 Aluminium louvre panel units
7. Accessories: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps
8. Controls
   8.1. Central control and building management: Ss_75_70_52_28 [M] Extract ventilation control systems; Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems; Ss_75_70_52_80 [M] Smoke and heat detection extract control systems
   8.2. Local control: Pr_75_50_18_51 Mechanical services control panels
9. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
10. Execution: Ss_65_40_94/620 Installing smoke control fans
11. System completion: Ss_65_40_94/810 Commissioning car park ventilation systems; Ss_65_40_94/820 Inspection and test records; Ss_65_40_94/830 Demonstrations; Ss_65_40_94/840 Documentation; Ss_65_40_94/850 Spares and consumables; Ss_65_40_94/860 Maintenance

See Ss_75_70_52_28 [M] Extract ventilation control systems in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Ss_75_70_52_80 [M] Smoke and heat detection extract control systems in Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems

See Ss_75_70_52_81 [M] Smoke and heat detection shut down control systems in Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems

System performance

Ss_65_40_94/210 Design of car park ventilation ADDED

1. Design: Complete the design of the Loading Bay ventilation system.
2. Standard: In accordance with BS 7346-7.
3. Application: Vehicle exhaust pollution and smoke control.
4. Smoke and heat control system:

   Systems to achieve smoke clearance by horizontal cross-flow:

   - Mechanical cross ventilation using conventional mechanical ventilation
   - Mechanical cross ventilation using impulse fans
   - Impulse ventilation system
5. Vehicle pollution control systems: Mechanical ventilation to limit concentration of carbon monoxide.
6. Requirement: Submit design documentation in accordance with BS 7346-7.

Ss_65_40_94/220 Performance criteria ADDED

1. Smoke control: To assist fire-fighters to clear smoke from the Loading Bay during and after a fire.

2. Ventilation openings: Refer to GA plans

Ss_65_40_94/240 Fan selection ADDED

1. Flow rate: Refer to equipment schedules
2. Operation: Continuous.

Ss_65_40_94/250 Activation and operation of systems ADDED

1. Ventilation mode:
    - At CO levels of 0–20 ppm run extract fans
    - At CO levels of 20–30 ppm run extract fans and jet fans at low speed
    - At CO levels of 30 ppm and above run extract fans and jet fans at high speed
2. Fire mode
    2.1. Activation:
        - Building fire detection system
        - Smoke detection
        - Fire service switch
    2.2. Operation: Run extract fans.
3. Fan control: Two speed starter / High speed emergency extract.

Ss_65_40_94/260 Integration with fire alarm systems ADDED

1. Standard: To BS 5839-1.

Ss_65_40_94/270 Interaction with fire protection and building systems ADDED

1. Impulse fans and sprinklers: See BS 7346-7, clause 16.2 for further information.
2. Other ventilation systems: See BS 7346-7, clause 16.3 for further information.
3. Lighting, signage and public address systems: See BS 7346-7, clause 16.4 for further information.
4. Other smoke ventilation systems: See BS 7346-7, clause 16.5 for further information.
5. External escape routes: See BS 7346-7, clause 16.6 for further information.
6. Security systems: See BS 7346-7, clause 16.7 for further information.

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/272 Constant volume extract fan control strategy in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_30_59_48_04 Aluminium louvre panel units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24_29 Fire and smoke dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_25_30 Fire resisting ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_77 Smoke extract ductwork in Ss_65_40_80_80 [M] Smoke and heat exhaust ventilation systems

Pr_65_67_29_44 Jet fans ADDED

1. Description:
    1. The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer or better and approved alternative. Acceptance of alternative manufacturers will only be determined during the technical submittal approval stage.
2. Standard: To BS EN ISO 13350.
3. Duty
    3.1. Air volume: Refer to equipment schedules
    3.2. Fan speed: Refer to equipment schedules
    3.3. Sound power level spectrum: Refer to equipment schedules
4. Execution: Pr_65_67_29/610 Installing fans generally; Pr_65_67_29/620 Installing jet fans

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04_03 Air grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_04 Air plenum boxes in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18_21 Damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/650 Installing ductwork identification in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24/725 Installing fire and smoke control dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24/750 Access to dampers for resetting and maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/610 Air ductwork generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/645 Installing fire and smoke extract ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/670 Ductwork support for vapour seal continuity in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/680 Ductwork support, special in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/700 Test holes in ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/720 Weatherproofing ductwork penetrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/730 Fire rated ductwork sleeves and collars in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29/610 Installing fans generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Pr_65_67_29/620 Installing jet fans ADDED

1. Standard: In accordance with BS 7346-7 when installed in car parks.
2. Position: Where jet fans are installed in an area protected by sprinklers, ensure the fans do not interfere with the sprinkler heads. Install jet fans over roadways in car parks.

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04/610 Installing air terminal devices in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/650 Installing grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/680 Location of grille or diffuser blanking plates in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/690 Support of air terminal units in ceiling grids in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18/616 Installing damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

Ss_65_40_94/620 Installing smoke control fans ADDED

1. Standard: In accordance with BS 7346-7.
2. Protection: Where fans are installed in the building but outside the fire compartment, enclose in a protection equivalent to the fire compartment.
3. Jet fans: Where jet fans are installed in an area protected by sprinklers, mount away from the sprinkler heads. Install jet fans over the road ways.

System completion

Ss_65_40_94/810 Commissioning car park ventilation systems ADDED

1. Standard: In accordance with BS 7346-7, clause 17.

Ss_65_40_94/820 Inspection and test records ADDED

1. Reports: Submit details of inspections and tests in accordance with BS 7346-7, Table 2.
2. Record sheets
   2.1. Submission: On completion.
   2.2. Number of copies: Three.

Ss_65_40_94/830 Demonstrations ADDED

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

Ss_65_40_94/840 Documentation ADDED

1. Operating and maintenance instructions
   1.1. Scope: Submit details in accordance with BS 7346-7, clause 18.
   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: 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.
   2.2. Format: A1 paper print. Electronic.
   2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_65_40_94/850 Spares and consumables ADDED

1. Filters
   1.1. Filter media: Supply one complete replacement for every filter.
   1.2. Retaining clips and rubber gaskets: Two sets for each type of filter.
   1.3. Cleaning solution: Supply coating solution for one complete cleaning of metal plate filters.
2. Air terminal device keys: Supply a set for adjusting each type of grille and diffuser damper.

Ss_65_40_94/860 Maintenance ADDED

1. Servicing and maintenance: Undertake for 12 months after completion.

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_80_05_10
[M] Centralized all-air conditioning systems ADDED

Systems

Ss_65_80_05_10 [M] Centralized all-air conditioning systems ADDED

1. Description:

The mechanical supply ventilation installation generally comprises / includes for the following:

1. Main hall supply / extract ventilation systems (16no. AHUs)
2. Black-out finish on all ductwork routed at high level above the floor and seating.
3. Condensate disposal pipework and condensate lift pumps as required.
4. Ductwork (including fire-rated where identified on the drawings), flexible connections to each fan unit, shut-off dampers, dampers, including fire, fire/smoke dampers, attenuators, grilles, ambient terminals, supports, bracketry and all other fittings required to make a complete and working installation.

1.1. General - applicable to all detailed systems: Fire dampers (inc fire/smoke actuator operated) to be provided through all compartment walls, with VCDs located on each branch all as detailed on the drawings.

All extract fan units must be selected to comply with specific fan power threshold to meet Part L compliance.

Each AHU will be provided complete with manufacturers integral control system for fan speed adjustment, dP switches, thermal wheel control or mixing box, shut-off dampers, fault logging and full BMS interface. Prior to fabrication of the unit the AHU manufacturer must liaise directly with the automatic controls specialist to ensure seamless compatibility of systems.

The contractor must include to replace both AHU panel/bag filters with new modules at Practical Completion.

Insulated flexible ductwork to terminal grilles from each duct branch must not exceed 750mm in length.

Flexible ductwork connections to be made to the intake and exhaust spigot connections of each AHU.

The contractor must include for calculating the external pressure drop for each fan set based on his installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement motor/fan unit at his expense.

Prior to ordering equipment the Mechanical Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and

controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

Each fan controller unit will be provided with hard-wired fire alarm interface to shut-down in the event of fire alarm activation.

1.2. Main Hall Ventilation System: A total of 16 AHUs with integral refrigerant based heat pump units are provided within the level 05 services trench to serve the Hall. Each unit comprises high efficiency heat recovery utilising both a thermal wheel and a run-around coil bringing in fresh air from the service trench and exhausting vitiated air over the Hall roof as detailed on the drawings and system schematics.

All ductwork within the Hall distributing across level 05 is to be provided as a matt black finish as detailed under clause Pr_80_77_76_76.

2no Western AHUs are provided with an additional motorised damper system and duct branches such that the units can provide conditioned air to the atrium in addition to the Hall. Refer to GA drawings and system schematics for further details.

The ductwork distribution within the Hall is comprised of galvanised ductwork with the upper seating tier on all sides served from a fabric ductwork system.

1.3. Main Hall Fabric Ductwork:

Where detailed within the design drawings the fabric ductwork is to conform to the following:

Install a circular fabric duct system manufactured of a cotton-based fire-retardant material.

Provide a low-impulse fabric duct system with directional jet nozzles (angled towards floor level) installed and designed by the manufacturer (or manufacturer's approved supplier / installer) to achieve the following criteria:

- Throw = Approximately 6 m (to ensure a good air flow distribution) at full flowrate
- Noise Level = NR55
- Nozzles = Approximately 20 mm diameter and colour-matched to the duct colour
- Colour = RAL colour to be confirmed by the architect

Supply the system with a removable cap for each nozzle, to allow the client to adjust the flow of air by capping off nozzles serving areas not required. Arrange for these caps to be provided by the fabric duct manufacturer.

Attach the fabric duct to an extruded aluminium ladder frame and ensure that it is easily detachable in sections to allow washing (ensure the duct is fully machine washable).

Ensure that the aluminium frame is manufactured by the same company as the fabric duct and is installed with a protective aluminium horizontal top sheet to prevent cigarette butts from burning the fabric. Angle the top sheet with a central ridge to prevent the build-up of debris.

Hang the frame from drop rods secured to the soffit and install it to the fabric duct manufacturer's requirements. Paint the drop rods and frame to colour-match the ductwork.

2. System performance: Ss_65_80_05/210 Design of air conditioning systems; Ss_65_80_05/240 Ductwork design; Ss_65_80_05/250 Fan performance; Ss_65_80_05/255 Variable duty fan performance; Ss_65_80_05/260 Attenuator performance
3. Type of system: Single duct, constant volume. Single duct, variable volume.
4. External air intake terminals: Pr_30_59_48_04 Aluminium louvre panel units
5. Air filters: Pr_60_65_03_86 Supply air handling units; Pr_65_57_02_66 Panel air filters; Pr_65_57_02_07 Bag air filters
6. Heat recovery: Pr_60_65_03_86 Supply air handling units; Pr_60_60_36_88 Thermal wheels
7. Air handling units: Pr_60_65_03_86 Supply air handling units; Pr_60_65_03_87 Supply and return air handling units
8. Silencers and acoustic treatment: Pr_65_67_78_12 Circular attenuators; Pr_65_67_78_72 Rectangular attenuators
9. Air ductwork and accessories
    9.1. Ductwork: Pr_65_65_25_14 Circular sheet metal ductwork and fittings and fabric ductwork as detailed under clause Ss_65_80_05_10/1.4.

    9.2. Accessories: Pr_65_65_23_20 Duct access panels; Pr_30_59_57_07 Bird guards; Pr_65_65_24_29 Fire and smoke dampers; Pr_65_65_25_32 Flexible ductwork; Pr_65_65_24_78 Shut off dampers
10. Thermal insulation on supply air ductwork: Pr_80_77_76_52 Mineral wool duct metal mesh faced mattress insulation; Pr_80_77_76_62 Phenolic foam insulation
11. Vibration isolation mountings: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_84 Spring isolators; Pr_80_77_94_42 Isolation hangers
12. Reheaters: Pr_60_65_03_86 Supply air handling units
13. Cooling coils: Pr_60_65_03_86 Supply air handling units
14. Room supply air terminal devices: Pr_70_65_04_02 Air diffusers; Pr_70_65_04_86 Swirl air diffusers; Pr_70_65_04_03 Air grilles
15. Accessories: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps
16. Condensate pipelines: Pr_65_52_63_17 Copper pipelines; Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines
17. Controls: Ss_75_70_52_93 [M] Variable volume air conditioning control systems
18. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
19. Testing: Pr_65_65_25/785 Air leakage testing of medium pressure ductwork; Pr_65_65_25/790 Air leakage testing of plant items
20. Execution: Ss_65_80_05/620 Installing ductwork on air handling units; Ss_65_80_05/640 Ductwork systems cleaning
21. System completion: Ss_65_80_05/810 Commissioning of air distribution systems; Ss_65_80_05/820 Performance testing; Ss_65_80_05/830 Inspection and test records;

Ss_65_80_05/840 Demonstrations; Ss_65_80_05/850 Documentation; Ss_65_80_05/860 Spares and consumables; Ss_65_80_05/870 Maintenance

Ss_75_70_52_93 [M] Variable volume air conditioning control systems ADDED

1. Description:

   Refer to clause Ss_75_70_52_94 (ventilation control systems) for details / specification
2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Start and stop control: Ss_75_70_52/204 Fan overrun; Ss_75_70_52/205 Hand off auto switch; Ss_75_70_52/206 Low inside air temperature interlock for building fabric and contents protection; Ss_75_70_52/207 Low temperature interlock signals for plant protection; Ss_75_70_52/209 Optimum start and stop cooling; Ss_75_70_52/210 Optimum start and stop heating; Pr_75_51_17_89 Time switches (integral to BMS outstations)
4. Damper control strategies: Ss_75_70_52/246 Full outside air damper control strategy; Ss_75_70_52/247 Mixing damper control strategy
5. Heat recovery devices control strategies: Ss_75_70_52/255 Thermal wheel, fixed speed with bypass damper, control strategy
6. Supply fan control strategies: Ss_75_70_52/267 VAV branch duct, supply fan speed control strategy; Ss_75_70_52/268 VAV main duct, supply fan speed control strategy; Ss_75_70_52/269 VAV system, supply fan speed control strategy
7. Extract fan control strategies: Ss_75_70_52/274 Variable volume extract fan control strategy
8. Filter control strategies: Ss_75_70_52/284 Air filter with pressure sensor control strategy
9. Supply air temperature control strategies: Ss_75_70_52/289 Zone air temperature control
10. Equipment: Pr_75_50_18_21 Damper actuators; Pr_75_50_18_51 Mechanical services control panels
11. Sensors: Pr_75_50_76_03 Air temperature sensors; Pr_75_50_76_68 Pressure sensors
12. Equipment interconnectivity: Wired.
13. Cables: As Specialist's recommendations.
14. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
15. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals
16. Rewireable installations: Required.
17. Concealed installations: Required.
18. Control equipment power supply: Mains supply.
19. 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_65_80_05/210 Design of air conditioning systems ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Design: The contractor shall complete the design of the air conditioning systems.
2. Standard: Performance to BS EN 16798-3.
3. Method: In accordance with BS EN ISO 52016-1. In accordance with CIBSE Applications Manual AM 11.

4. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_65_80_05/240 Ductwork design ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Air velocity
   1.1. Standard: As CIBSE Guide B2.
2. Ductwork cleaning
   2.1. Standard: In accordance with BESA TR/19.

Ss_65_80_05/250 Fan performance ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Standard: In accordance with BS 6583. In accordance with BS EN 16798-3.
2. Flow rate: Refer to equipment schedules
3. Operation: Continuous.
4. Specific fan power: Refer to equipment schedules. The installed units shall comply with the requirements of Part L of the building regulations.

Ss_65_80_05/255 Variable duty fan performance ADDED

1. Means of varying fan duty: Variable speed centrifugal. Variable speed axial.

Ss_65_80_05/260 Attenuator performance ADDED

1. Performance requirements
   1.1. Standards: To BS EN ISO 7235 and BS EN ISO 11691.
   1.2. Insertion loss: To achieve the noise criteria as stipulated by the acoustic consultant.

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/204 Fan overrun in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/206 Low inside air temperature interlock for building fabric and contents protection in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/207 Low temperature interlock signals for plant protection in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Ss_75_70_52/209 Optimum start and stop cooling in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Ss_75_70_52/210 Optimum start and stop heating in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/246 Full outside air damper control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/247 Mixing damper control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/255 Thermal wheel, fixed speed with bypass damper, control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Ss_75_70_52/267 VAV branch duct, supply fan speed control strategy ADDED

1. Equipment to be controlled: VAV supply fan, hand/off/auto switch hardwired to motor and to extract fan fail.
2. Additional start and stop control: Associated extract fan failure.
3. Fan control
   - 3.1. Normal operation: Enable fan and start on receipt of damper open signal. Modulate the supply fan speed control signal under PI control to obtain minimum static pressure set points. Use the measured sensor value with the largest negative differential from its set point to operate the controller.
   - 3.2. High limit static pressure: Disable fan and generate a warning signal if supply air pressure rises above high limit setting.
   - 3.3. Fan operation: Proved when supply air pressure switch or air velocity switch is made. If condition is not met within the failure time, generate a fan failure alarm and disable the fan.
   - 3.4. Failure time: 30 s
4. Shut down: Disable fan.

Ss_75_70_52/268 VAV main duct, supply fan speed control strategy ADDED

1. Equipment to be controlled: VAV supply fan, hand/off/auto switch hardwired to motor and to extract fan fail.
2. Additional start and stop control: Associated extract fan failure.
3. Fan control
   - 3.1. Normal operation: Enable fan and start on receipt of damper open signal. Modulate the supply fan speed control signal under PI control to obtain static pressure set point at a position downstream of the fan.
   - 3.2. High limit static pressure: Disable fan and generate a warning signal if supply air pressure rises above high limit setting.
   - 3.3. Fan operation: Proved when supply air pressure switch or air velocity switch is made. If condition is not met within failure time, generate a fan failure alarm and disable the fan.
   - 3.4. Failure time: 30 s
4. Shut down: Disable fan.

Ss_75_70_52/269 VAV system, supply fan speed control strategy ADDED

1. Equipment to be controlled: VAV supply fan, hand/off/auto switch hardwired to motor and to extract fan fail.
2. Additional start and stop control: Associated extract fan failure.
3. Fan control
   - 3.1. Normal operation: Enable fan and start on receipt of damper open signal. Modulate the supply fan speed control signal under PI control to obtain static pressure set point, calculated from the measured air flow rates at a position downstream of the supply fan.
   - 3.2. High limit static pressure: Disable fan and generate a warning signal if supply air pressure rises above high limit setting.
   - 3.3. Fan operation: Proved when supply air pressure switch or air velocity switch is made. If condition is not met within failure time, generate a fan failure alarm and disable the fan.
   - 3.4. Failure time: 30 s

4. Shut down: Disable fan.

Ss_75_70_52/274 Variable volume extract fan control strategy ADDED

1. Equipment to be controlled: Variable volume extract fan interlocked to associated supply fan. Hand/off/auto switch hardwired to motor.
2. Start and stop control: Associated supply fan failure.
3. Fan control
   3.1. Normal operation: Enable fan and start on receipt of damper open signal. Modulate the signal to return an air volume flow rated at a set ratio of the measured supply air flow rate.
   3.2. Fan operation: Proved when supply air pressure switch or air velocity switch is made. If condition is not met within failure time, generate a fan failure alarm and disable the fan.
   3.3. Failure time: 30 s
4. Shut down: Disable fan.

See Ss_75_70_52/284 Air filter with pressure sensor control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Ss_75_70_52/289 Zone air temperature control ADDED

1. Set point adjustment
   1.1. Operation: Provide temperature setback during periods when zone is unoccupied
2. Sensor: Occupancy detector.
3. Time delay
   3.1. Time from detection that occupancy has ended to set point adjusting: 10 minutes
   3.2. Time from detection that occupancy has resumed to set point adjusting: 10 minutes

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_30_59_48_04 Aluminium louvre panel units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_30_59_57_07 Bird guards in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36_62 Plate recuperators in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_60_36_74 Run-around coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36_88 Thermal wheels in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_03_86 Supply air handling units in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

Pr_60_65_03_87 Supply and return air handling units ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Description:
    1. All AHUs to be provided with manufacturers matching variable speed controller
    2. The electrical contractor shall provide a separate electrical feed to all motor fan compartments - to allow maintenance to be carried out without the fan running. The AHU manufacturer shall provide a suitable terminal block for this item.
    3. Contractor must ensure / confirm spatial fit prior to proposing any alternative manufacturer.
    4. Scheduled design external static pressures are provisional only and are subject to confirmation by contractor prior to placing the order.
    5. AHU Flexible joints shall be provided at all fan inlet and outlet connections; should be equal in cross-section to the points of connection; and should not be longer than 200mm or shorter than 100mm.
    6. Motorised dampers to be rigid with square connections fitted with end and edge seals of a flexible material and with minimal play in linkages. Leakage on shut-off to be less than 2%
    7. Supply and handover to client one complete set of SPARE filters (supplied by the AHU manufacturer) for each and every AHU filter
    8. Post-commissioning and prior to practical completion the Mechanical Contractor shall carry out a clean of all AHU filters and demonstrate their condition
    9. All equipment to be issued with a full and detailed manual for installation, operating / maintenance and fault finding.
    10. The electrical input for all fans shall be confirmed in the Mechanical Contractor's technical submission.
2. Manufacturer: The design has been based on the manufacturers as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
3. Factory Testing & Witnessing: One of each type of air handling unit (supply only, supply air with mixing box, supply and return air with run-around coil, supply and return air with plate heat exchanger & supply and return air with thermal wheel) shall be offered for factory inspection, load / acoustic testing and witnessing to the client and the Consultant for approval prior to delivery to site of any part of the order. The contractor is to include for all costs (including travel arrangements) associated with the factory inspection / witnessing for 5no. client team representatives.
4. Standard: To BS EN 13053.
5. Duty
    5.1. Air volume
        5.1.1. Supply: Refer to equipment schedules
        5.1.2. Extract: Refer to equipment schedules
    5.2. External resistance: Refer to equipment schedules
    5.3. Sound power level: Refer to equipment schedules
6. Casing construction
    6.1. Standard: To BS EN 1886.
    6.2. Casing class: D1.
    6.3. Leakage class of casing: L1.
    6.4. Filter bypass leakage: To BS EN 1886, section 7.
    6.5. Thermal performance of casing

6.5.1. Thermal transmittance: T2.

6.5.2. Thermal bridging: TB2.

6.6. Acoustic insulation of casing: To BS EN 1886, section 9.

6.7. Mechanical safety: To BS EN 1886, section 11.

6.8. Material: Galvanized sheet steel.

6.9. Finish: Painted.

7. Components

7.1. Dampers

7.1.1. Purpose: To BS EN 13053, Category B - Sections for flow control.

7.2. Filters: Pr_65_57_02_66 Panel air filters; Pr_65_57_02_07 Bag air filters

7.3. Cooling coils: Pr_60_65_37_72 Refrigerant cooling coils

7.4. Heat recovery

7.4.1. Heat recovery equipment: Pr_60_60_36_62 Plate recuperators; Pr_60_60_36_88 Thermal wheels; Pr_60_60_36_74 Run-around coils

7.5. Supply fan

7.5.1. Fan type: Pr_65_67_29_12 Centrifugal fans; Pr_65_67_29_62 Plug fans

7.6. Extract fan

7.6.1. Fan type: Pr_65_67_29_12 Centrifugal fans

7.7. Attenuators: Pr_65_67_78_72 Rectangular attenuatorsIntegral to AHU as detailed in the equipment schedules

8. Accessories: Access panels. Anti-vibration mountings. Flexible connectors.

9. Execution: Pr_60_65_03/610 Installing air handling units; Pr_60_65_03/615 Access; Pr_60_65_03/620 Coil installation generally; Pr_60_65_03/625 Installing cooling coils; Pr_60_65_03/630 Installing hot water coils; Pr_60_65_03/645 Installing fans; Pr_60_65_03/650 Services connections; Pr_60_65_03/655 Isolation of air handling units; Pr_60_65_03/660 Support for air handling units; Pr_60_65_03/665 Pre-commissioning of coils; Pr_60_65_03/680 Air leakage testing; Pr_60_65_03/685 Testing

See Pr_60_65_37_72 Refrigerant cooling coils in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_65_52_34_22 Differential pressure gauges in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_52_34_50 Manometers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_52_62_09 Brazing compounds in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_27 Elastomeric ring seals in Ss_55_70_38_65 [P] Pumped cold water supply systems

See Pr_65_52_62_29 Flange jointing rings for copper flanges in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_81 Solders in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_17 Copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_18 Copper pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. General requirements: Pr_65_52_62_27 Elastomeric ring seals
2. Standards
   2.1. Pipe: To BS EN ISO 1452-2.
   2.2. Fittings: To BS EN ISO 1452-3.
3. Execution: Pr_65_52_63/645 Installing plastics pipelines

See Pr_65_57_02_07 Bag air filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_57_02_66 Panel air filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_23_20 Duct access panels in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24_29 Fire and smoke dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24_78 Shut off dampers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_14 Circular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_32 Flexible ductwork in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_67_29_12 Centrifugal fans in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29_62 Plug fans in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_65_67_78_12 Circular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_78_72 Rectangular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04_02 Air diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_70_65_04_03 Air grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_04 Air plenum boxes in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_32 Floor-mounted air plenum boxes in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_70_65_04_86 Swirl air diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_75_50_18_21 Damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_80_77_76_47 Loadbearing pipeline support insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

Pr_80_77_76_52 Mineral wool duct metal mesh faced mattress insulation

ADDED

1. Standard: To BS 3958-3. To BS EN 14303.
2. Thermal conductivity: 0.032 W/m·K at 0°C.
3. Reaction to fire classification: Class '0'
4. Insulation thickness (minimum): To BS 5422.
5. Vapour barrier
   5.1. Vapour permeability: To BS 5422, clause 5.6.
6. Protection: Pr_80_77_76_95 Valve and flange insulation casing; Pr_80_77_76_76 Self-adhesive insulation casingVentureClad
7. Items to be insulated: Cover plates. Removable access covers.
8. Execution: Pr_80_77_76/770 Insulation carried through ductwork supports; Pr_80_77_76/780 Installing vapour barriers

See Pr_80_77_76_62 Phenolic foam insulation in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76_76 Self-adhesive insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_94 Valve and flange insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_95 Valve and flange insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/650 Installing ductwork identification in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36/610 Installing drain traps in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36/630 Supports in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/610 Installing air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/615 Access in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/620 Coil installation generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/625 Installing cooling coils in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_03/630 Installing hot water coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/645 Installing fans in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/650 Services connections in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/655 Isolation of air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/660 Support for air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/665 Pre-commissioning of coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/680 Air leakage testing in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_03/685 Testing in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_37/610 Installing heating and cooling coils generally in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_37/630 Installing eliminator plates in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_65_52_34/660 Installing pressure gauges in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_52_63/610 Pipelines installation generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/615 Installing pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/620 Installing anchors generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/625 Installing slide guides in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/631 Installing copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/645 Installing plastics pipelines in Ss_55_70_38_65 [P] Pumped cold water supply systems

See Pr_65_52_63/690 Spacing of pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/710 General inspection and testing in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_57_02/640 Installing filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24/725 Installing fire and smoke control dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24/750 Access to dampers for resetting and maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/610 Air ductwork generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/640 Installing sheet metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/670 Ductwork support for vapour seal continuity in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/680 Ductwork support, special in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/690 Drainage of ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/700 Test holes in ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/720 Weatherproofing ductwork penetrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/785 Air leakage testing of medium pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/790 Air leakage testing of plant items in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/795 Air leakage testing of low pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29/610 Installing fans generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_65_04/610 Installing air terminal devices in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/620 Installing circular and rectangular diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_70_65_04/640 Installing floor mounted swirl diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_70_65_04/650 Installing grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/680 Location of grille or diffuser blanking plates in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/690 Support of air terminal units in ceiling grids in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18/616 Installing damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/640 Installing phenolic foam insulation on pipelines in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/645 Installing phenolic foam insulation on ductwork in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/690 Installing phenolic foam insulation on vessels in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/715 Installing self adhesive cladding and jacketing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/720 Installing sheet aluminium protection in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/740 Installing at valves and flanges in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/750 Installing at loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/755 Installing at non-loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/760 Insulation not carried through pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/770 Insulation carried through ductwork supports in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

Ss_65_80_05/620 Installing ductwork on air handling units ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Air discharge: Connect ductwork to allow air to straighten as it leaves the air handling unit.

Ss_65_80_05/640 Ductwork systems cleaning ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning 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. Faults identified that may impact future hygiene. Additional works carried out. COSHH data on chemicals used where applicable. Recommendations for future testing and cleaning.
      2.2.2. Format: Electronic. Paper copy.
      2.2.3. Submit: On completion.
      2.2.4. Number of copies: One

System completion

Ss_65_80_05/810 Commissioning of air distribution systems ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning 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): One week.

Ss_65_80_05/820 Performance testing ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. General: Demonstrate the performance of the installations.
2. Environmental tests: Carry out environmental testing. If necessary, use artificial loads to simulate operating conditions.
3. Recorders
   3.1. Type: Supply and maintain portable seven day space temperature and relative humidity recorders, complete with charts.
   3.2. Number : Two.
   3.3. Duration of loan: One week.
4. Reports: Submit on completion.

Ss_65_80_05/830 Inspection and test records ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Construction phase reports: System design is commissionable. Post-installation. System cleanliness. 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_80_05/840 Demonstrations ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Running of plant
   1.1. Operation: Run, maintain and supervise the installations under normal working conditions.
   1.2. Duration: One week.

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

Ss_65_80_05/850 Documentation ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning 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: Electronic. 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 ductwork. Location and identification of regulating dampers and fire dampers.
   2.2. Format: A1 paper print. Electronic.
   2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_65_80_05/860 Spares and consumables ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Filters
   1.1. Filter media: Supply one replacement for every type of filter. Supply two sets of filters, the first for use before commissioning and the second for final commissioning.
   1.2. Retaining clips and rubber gaskets: Two sets for each type of filter.
   1.3. Cleaning solution: Supply coating solution for one complete cleaning of metal plate filters.
2. Detectors: Supply two of each type.
3. Air terminal device keys: Supply a set for adjusting each type of grille and diffuser damper.

Ss_65_80_05/870 Maintenance ADDED

Shared by: Ss_65_80_05_30 [M] Fan coil unit air conditioning systems

1. Servicing and maintenance: Undertake for 12 months after completion.

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_65_80_05_30
[M] Fan coil unit air conditioning systems ADDED

Systems

Ss_65_80_05_30 [M] Fan coil unit air conditioning systems ADDED

1. Description:

The fan coil unit ventilation installation generally comprises / includes for the following:

1. Fan coil units distributed throughout the building as generally indicated on the design drawings, schedules and schematics.
2. MVHR units delivering filtered and tempered outside air to occupied areas.
3. Condensate disposal pipework and condensate lift pumps as required.
4. Black-out finish on all ductwork, services distribution, plant and ancillaries visible to the public within the building.
5. Ductwork (including fire -rated where identified on the drawings), flexible connections to each fan unit, shut-off dampers, dampers, including fire, fire/smoke dampers, attenuators, grilles, ambient terminals, supports, bracketry and all other fittings required to make a complete and working installation

1.1. Fan Coil Unit System:

1.1.1. Concourse System: The FCUs distributed through the building will be served by outside air / extract MVHRs providing tempered air through heat recovery only. Outside air connection is provided via connectivity to the building facade. Fire / smoke dampers must be provided as indicated on the GA plans, schematics and in accordance with the fire engineer's requirements.

Refer to clause Pr_80_77_76_76 for details of matt black finish for ductwork in exposed concourse areas.

1.2. MVHRs serving FCUs: Refer to clause Ss_65_40_33_51 for details.

1.3. Fan Coil Units - general requirements: VRF ducted fan coil units are to be provided as detailed on the GA plans, system schematics and schedules.

Each fan coil unit is to be provided with an acoustically lined discharge plenum with size / quantity of spigots as detailed on the drawings.

Provide condensate disposal to FCUs at 1:100 fall, including for lift pumps where required. The first meter from each FCU is to be thermally insulated copper pipework, thereafter, pipework can revert to uninsulated ABS.

The contractor is to include for replacing each fan coil unit return air filter with new modules at Practical Completion.

1.3.1. Factory testing & Witnessing: Two of each type / size of fan coil unit shall be offered for factory inspection for thermal and acoustic testing and witnessing to the client and the Consultant for approval prior to delivery to site of any part of the order. The contractor is to include for all costs (including travel arrangements) associated with the factory inspection / witnessing for 5no. client team representatives.

Refer to clause Pr_60_65_03_86 and Pr_60_65_03_87 for details of associated air handling plant factory testing and witnessing.

1.4. General - applicable to all above detailed systems: Flexible ductwork connections to be made to the intake and exhaust spigot connections of each MVHRs.

Insulated flexible ductwork to terminal grilles from each fan coil unit must not exceed 750mm in length.

Fire dampers (inc fire/smoke actuator operated) to be provided through all compartment walls, with VCDs located on each branch all as required.

All extract fan units must be selected to comply with specific fan power threshold to meet Part L compliance.

Each fan unit will be provided with common fault volt free contacts to enable a healthy/fault indication of the fan unit on the BMS. Refer to Ss_75_70_52_94 and schematic for further details. The MVHRs are provided with manufacturers open protocol control system with BMS interface. prior to fabrication of the unit, the MVHR manufacturer must liaise directly with the automatic controls specialist to ensure seamless compatibility of systems.

The contractor must include for calculating the external pressure drop for each fan set based on their installation drawings prior to ordering. Where the calculated figure differs from the design duty, the contractor must advise the engineer at the earliest opportunity in order to review the fan selection accordingly. If an undersized fan has been installed, prior to the submission of contractors calculations for engineers approval, the contractor will be held responsible for replacement motor/fan unit at their own expense.

Prior to ordering equipment the Contractor shall issue a full technical system proposal submission for this schedule including all component details, any wiring and controls diagrams and layout drawings showing the locations of all components - for approval by the Consultant.

Each fan controller unit will be provided with hard-wired fire alarm interface to shut-down in the event of fire alarm activation.

2. System performance: Ss_65_80_05/210 Design of air conditioning systems; Ss_65_80_05/240 Ductwork design; Ss_65_80_05/250 Fan performance
3. Air filters: Pr_60_65_03_86 Supply air handling units; Pr_65_57_02_66 Panel air filters; Pr_65_57_02_07 Bag air filters
4. Heat recovery: Pr_60_60_36_62 Plate recuperators; Pr_60_60_36_88 Thermal wheels
5. Air handling units: Pr_60_65_03_87 Supply and return air handling units
6. Silencers and acoustic treatment: Pr_65_67_78_12 Circular attenuators; Pr_65_67_78_72 Rectangular attenuators
7. Air ductwork and accessories
   7.1. Ductwork: Pr_65_65_25_14 Circular sheet metal ductwork and fittings; Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings
   7.2. Accessories: Pr_65_65_23_20 Duct access panels; Pr_30_59_57_07 Bird guards; Pr_65_65_24_29 Fire and smoke dampers; Pr_65_65_25_32 Flexible ductwork; Pr_65_65_24_78 Shut off dampers
8. Thermal insulation on supply air ductwork: Pr_80_77_76_53 Mineral wool duct slab insulation; Pr_80_77_76_62 Phenolic foam insulation

9. Vibration isolation mountings: Pr_80_77_94_15 Compression isolators; Pr_80_77_94_84 Spring isolators; Pr_80_77_94_42 Isolation hangers
10. Room supply air terminals: Pr_70_65_03_29 Fan coil units; Pr_70_65_04_02 Air diffusers; Pr_70_65_04_48 Linear air diffusers; Pr_70_65_04_03 Air grilles; Pr_70_65_04_86 Swirl air diffusers
11. Accessories: Pr_80_77_27_15 Channel supports; Pr_20_29_14_08 Beam clips; Pr_20_29_14_07 Beam clamps
12. Condensate pipelines: Pr_65_52_63_17 Copper pipelines; Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines
13. Controls: Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems
14. Identification of ductwork and equipment: Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers; Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels
15. Testing: Pr_65_65_25/785 Air leakage testing of medium pressure ductwork; Pr_65_65_25/790 Air leakage testing of plant items
16. Execution: Ss_65_80_05/620 Installing ductwork on air handling units; Ss_65_80_05/640 Ductwork systems cleaning
17. System completion: Ss_65_80_05/810 Commissioning of air distribution systems; Ss_65_80_05/820 Performance testing; Ss_65_80_05/830 Inspection and test records; Ss_65_80_05/840 Demonstrations; Ss_65_80_05/850 Documentation; Ss_65_80_05/860 Spares and consumables; Ss_65_80_05/870 Maintenance

Ss_75_70_52_29 [M] Fan coil unit air conditioning control systems ADDED

1. Description:

   Refer to clause Ss_75_70_52_94 (ventilation control systems) for details / specification.

   Refer to clause Ss_75_50_52_97 (Refrigerant (DX/VRF) fan coil unit control systems) for details / specification.
2. System performance: Ss_75_70_52/201 Design; Ss_75_70_52/212 Time control
3. Start and stop control: Ss_75_70_52/205 Hand off auto switch; Ss_75_70_52/204 Fan overrun; Ss_75_70_52/206 Low inside air temperature interlock for building fabric and contents protection; Ss_75_70_52/207 Low temperature interlock signals for plant protection; Ss_75_70_52/209 Optimum start and stop cooling; Ss_75_70_52/210 Optimum start and stop heating; Pr_75_51_17_89 Time switches (integral to BMS outstations)
4. Damper control strategies: Ss_75_70_52/246 Full outside air damper control strategy; Ss_75_70_52/247 Mixing damper control strategy
5. Heat recovery devices control strategies: Ss_75_70_52/253 Fixed plate heat exchanger control strategy; Ss_75_70_52/255 Thermal wheel, fixed speed with bypass damper, control strategy
6. Supply fan control strategies: Ss_75_70_52/265 Constant volume supply fan control strategy
7. Extract fan control strategies: Ss_75_70_52/272 Constant volume extract fan control strategy
8. Fan coil units control strategies: Ss_75_70_52/283 Fan coil unit, water side control strategy
9. Filter control strategies: Ss_75_70_52/284 Air filter with pressure sensor control strategy
10. Supply air temperature control strategies: Ss_75_70_52/285 Constant air volume system, zone temperature control of primary supply air temperature control strategy
11. Equipment: Pr_75_50_18_21 Damper actuators; Pr_75_50_18_51 Mechanical services control panels; Pr_65_54_95_53 Motorized valves
12. Sensors: Pr_75_50_76_03 Air temperature sensors; Pr_75_50_76_30 Flow in duct sensors; Pr_75_50_76_68 Pressure sensors
13. Equipment interconnectivity: Wired.

14. Cables: As Specialist's recommendations.
15. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit; Pr_65_70_11_18 Cable trunking
16. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals
17. Rewireable installations: Required.
18. Concealed installations: Required.
19. Control equipment power supply: Mains supply.
20. 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

See Ss_65_80_05/210 Design of air conditioning systems in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/240 Ductwork design in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/250 Fan performance in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_75_70_52/201 Design in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/204 Fan overrun in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/205 Hand off auto switch in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/206 Low inside air temperature interlock for building fabric and contents protection in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/207 Low temperature interlock signals for plant protection in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Ss_75_70_52/209 Optimum start and stop cooling in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Ss_75_70_52/210 Optimum start and stop heating in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Ss_75_70_52/212 Time control in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/246 Full outside air damper control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/247 Mixing damper control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/253 Fixed plate heat exchanger control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/255 Thermal wheel, fixed speed with bypass damper, control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/265 Constant volume supply fan control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/272 Constant volume extract fan control strategy in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

Ss_75_70_52/283 Fan coil unit, water side control strategy ADDED

1. Equipment to be controlled: Fan coil unit or group of fan coil units with fans, heating coils and cooling coils.
2. Fan motor speed: Constant.
3. Shut down: Disable unit with fan switched off and valves closed.
4. Low outside temperature or low return water temperature condition: Open valves.
5. Fan overrun
   - 5.1. Operation: Close cooling valve.
   - 5.2. Heater: Disable heater battery.
   - 5.3. Fan: Run fan.
6. Optimum start heating, boost or low zone temperature condition
   - 6.1. Operation: Close cooling valve.
   - 6.2. Heater: Operate heater battery.
   - 6.3. Fan: Run.
7. Optimum start cooling
   - 7.1. Operation: Fully open cooling valve and disable heating.
   - 7.2. Fan: Run.
8. Normal operation
   - 8.1. Operation: Modulate the heating and cooling valve positions under PI control to provide the zone heating and cooling temperature set points
   - 8.2. Heating set point: Refer to equipment schedules
   - 8.3. Cooling set point: Refer to equipment schedules
   - 8.4. Fan: Run.

See Ss_75_70_52/284 Air filter with pressure sensor control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Ss_75_70_52/285 Constant air volume system, zone temperature control of primary supply air temperature control strategy in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Products

See Pr_20_29_14_07 Beam clamps in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_20_29_14_08 Beam clips in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_30_59_57_07 Bird guards in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_40_10_57_26 Engraved mechanical plant and equipment identification labels in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57_79 Self-adhesive plastics ductwork labels and transfers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36_62 Plate recuperators in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_60_36_74 Run-around coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36_88 Thermal wheels in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_03_86 Supply air handling units in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_03_87 Supply and return air handling units in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Pr_60_65_37_72 Refrigerant cooling coils in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_65_52_34_22 Differential pressure gauges in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_52_34_50 Manometers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_52_62_09 Brazing compounds in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_27 Elastomeric ring seals in Ss_55_70_38_65 [P] Pumped cold water supply systems

See Pr_65_52_62_29 Flange jointing rings for copper flanges in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_62_81 Solders in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_17 Copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_18 Copper pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63_89 Unplasticized polyvinyl chloride (PVC-U) pipelines in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Pr_65_54_95_53 Motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_57_02_07 Bag air filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_57_02_66 Panel air filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_23_20 Duct access panels in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24_29 Fire and smoke dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24_78 Shut off dampers in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_14 Circular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25_32 Flexible ductwork in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_25_72 Rectangular sheet metal ductwork and fittings in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29_12 Centrifugal fans in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29_62 Plug fans in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_65_67_78_12 Circular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_78_72 Rectangular attenuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_65_03_29 Fan coil units ADDED

1. Manufacturer: The design has been based on the manufacturer as noted within the equipment schedules. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.

   All FCUs shall be supplied by a Eurovent certified manufacturer.

   All FCUs shall have integral fully welded stainless steel extended drip trays.
2. Factory testing & Witnessing (FCUs): Two of each type/size of fan coil unit shall be offered for factory inspection, load and acoustic/thermal testing and witnessing to the client and the Consultant for approval prior to delivery to site of any part of the order . The contractor is to include for all costs (including travel arrangements) associated with the factory inspection/witnessing for 5no. client team representatives.
3. Finish: All fan coil units must be provided with a factory applied black painted finish where they are located above the 'open' ceilings of each level. Contractor must refer to architects ceiling plans to identify the extent of open ceilings and therefore, the extent of fan coil units to be finished in black.
4. Standards

   4.1. Performance: To BS 4856-1, BS 4856-2, BS 4856-3 and BS 4856-4.

4.2. Electrical safety: To BS EN 60335-1 and BS EN 60335-2-40.

5. Duty
   5.1. Air volume: Refer to equipment schedules
   5.2. Heating output: Refer to equipment schedules
   5.3. Cooling output: Refer to equipment schedules
   5.4. Noise levels: Refer to equipment schedules
6. Water temperature
   6.1. Heating flow: Refer to equipment schedules
   6.2. Heating return: Refer to equipment schedules
   6.3. Chilled water flow: Refer to equipment schedules
   6.4. Chilled water return: Refer to equipment schedules
7. Primary air supply
   7.1. Volume: Refer to equipment schedules
   7.2. Dry bulb: Refer to equipment schedules
   7.3. Wet bulb: Refer to equipment schedules
8. Fan speed: Refer to equipment schedules
9. Noise levels: Refer to equipment schedules
10. Electrical supply type: Refer to equipment schedules
11. Mounting: Refer to equipment schedules
12. Ductwork connections: Refer to GA plans and schematics
13. Access: Provide access to filter, fan and motor, valves and controls.
14. Drip tray
    14.1. Position: Under coil, and under control valve where fitted.
    14.2. Material: Corrosion resistant.
    14.3. Finish: Insulate external faces to prevent condensation.
15. Controls: Refer to controls description
16. Execution: Pr_70_65_03/610 Installing drain lines

See Pr_70_65_04_02 Air diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_70_65_04_03 Air grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_04 Air plenum boxes in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04_32 Floor-mounted air plenum boxes in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

Pr_70_65_04_48 Linear air diffusers ADDED

1. Standards
   1.1. Mixed flow applications: To BS EN 12238.
   1.2. Sound power levels: To BS EN ISO 5135.
2. Application: Supply. Extract.
3. Duty
   3.1. Air volume: Refer to equipment schedules
   3.2. Size: Refer to equipment schedules
   3.3. Sound power level: Refer to equipment schedules

4. Diffuser: Circular linear. Rectangular linear. Slot. Refer to equipment schedules
5. Arrangement: Adjustable.
6. Position: Refer to GA plans
7. Material: Aluminium.
8. Finish: RAL colour as specified by architect
9. Accessories: Pr_70_65_04/680 Location of grille or diffuser blanking plates; Pr_70_65_04_04 Air plenum boxes
10. Execution: Pr_70_65_04/660 Installing linear and slot diffusers

See Pr_70_65_04_86 Swirl air diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_75_50_18_21 Damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18_51 Mechanical services control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76_03 Air temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

Pr_75_50_76_30 Flow in duct sensors ADDED

1. Standards: To BS EN 60730-1 and BS EN 60730-2-15.
2. Sensor type: Pitot tube. Hot wire anemometer.
3. Equipment interconnectivity
   3.1. Wired: Required.
4. Application: Air flow operating.
5. Execution: Pr_75_50_76/660 Installing flow sensors

See Pr_75_50_76_68 Pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_51_17_89 Time switches (integral to BMS outstations) in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_27_15 Channel supports in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_80_77_76_47 Loadbearing pipeline support insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_53 Mineral wool duct slab insulation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_62 Phenolic foam insulation in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76_76 Self-adhesive insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76_94 Valve and flange insulation in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76_95 Valve and flange insulation casing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_15 Compression isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_42 Isolation hangers in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_94_84 Spring isolators in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Execution

See Pr_40_10_57/611 Installing mechanical plant and equipment identification in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_40_10_57/650 Installing ductwork identification in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36/610 Installing drain traps in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_60_36/630 Supports in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/610 Installing air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/615 Access in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/620 Coil installation generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/625 Installing cooling coils in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_03/630 Installing hot water coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/645 Installing fans in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/650 Services connections in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/655 Isolation of air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/660 Support for air handling units in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/665 Pre-commissioning of coils in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_60_65_03/680 Air leakage testing in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_03/685 Testing in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_37/610 Installing heating and cooling coils generally in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_60_65_37/630 Installing eliminator plates in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_65_52_34/660 Installing pressure gauges in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_52_63/610 Pipelines installation generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/615 Installing pipeline fittings in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/620 Installing anchors generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/625 Installing slide guides in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/631 Installing copper pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/635 Brazed joints in copper and copper alloy pipes in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/645 Installing plastics pipelines in Ss_55_70_38_65 [P] Pumped cold water supply systems

See Pr_65_52_63/690 Spacing of pipelines in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_52_63/710 General inspection and testing in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_54_95/641 Installing motorized valves in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_57_02/640 Installing filters in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_24/725 Installing fire and smoke control dampers in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_65_65_24/750 Access to dampers for resetting and maintenance in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/610 Air ductwork generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/640 Installing sheet metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/670 Ductwork support for vapour seal continuity in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/680 Ductwork support, special in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/690 Drainage of ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/700 Test holes in ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/720 Weatherproofing ductwork penetrations in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/740 Installing control equipment and instruments in metal ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/785 Air leakage testing of medium pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/790 Air leakage testing of plant items in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_65_25/795 Air leakage testing of low pressure ductwork in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_67_29/610 Installing fans generally in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_65_03/610 Installing drain lines ADDED

1. Drain connections: Connect drainline flush with bottom of drip tray.
2. Drain line material: Plastics. Copper.

See Pr_70_65_04/610 Installing air terminal devices in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/620 Installing circular and rectangular diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_70_65_04/640 Installing floor mounted swirl diffusers in Ss_65_40_33_51 [M] Mechanical supply and extract ventilation systems

See Pr_70_65_04/650 Installing grilles in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

Pr_70_65_04/660 Installing linear and slot diffusers ADDED

1. General requirements: Pr_70_65_04/610 Installing air terminal devices
2. Method: Bracket from plenum box. Hidden screw fixing. Wire support.

See Pr_70_65_04/680 Location of grille or diffuser blanking plates in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_70_65_04/690 Support of air terminal units in ceiling grids in Ss_65_40_33_50 [M] Mechanical extract ventilation systems

See Pr_75_50_18/616 Installing damper actuators in Ss_65_40_33_45 [M] Kitchen & concession extract ventilation systems

See Pr_75_50_18/631 Installing control panels in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/651 Installing sensors generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/660 Installing flow sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/670 Installing pressure sensors in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_76/675 Installing temperature sensors in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_75_51_17/620 Installing time switches in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/610 Installing insulation and protection products generally in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Pr_80_77_76/640 Installing phenolic foam insulation on pipelines in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/645 Installing phenolic foam insulation on ductwork in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/660 Installing foil faced mineral wool insulation on ductwork in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/690 Installing phenolic foam insulation on vessels in Ss_60_40_37_48 [M] Low temperature hot water heating systems

See Pr_80_77_76/715 Installing self adhesive cladding and jacketing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/720 Installing sheet aluminium protection in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/740 Installing at valves and flanges in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/750 Installing at loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/755 Installing at non-loadbearing pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/760 Insulation not carried through pipelines supports in Ss_60_40_17_94 [M] Variable refrigerant flow systems (VRF/DX)

See Pr_80_77_76/770 Insulation carried through ductwork supports in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_77_76/780 Installing vapour barriers in Ss_50_30_02_40 [P] Internal gravity rainwater drainage systems

See Ss_65_80_05/620 Installing ductwork on air handling units in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/640 Ductwork systems cleaning in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

System completion

See Ss_65_80_05/810 Commissioning of air distribution systems in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/820 Performance testing in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/830 Inspection and test records in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/840 Demonstrations in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/850 Documentation in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/860 Spares and consumables in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_65_80_05/870 Maintenance in Ss_65_80_05_10 [M] Centralized all-air conditioning systems

See Ss_75_70_52/810 Inspection and testing in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/820 Start up and commissioning in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/830 Commissioning of automatic control systems in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/840 Spares in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/850 Keys in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/860 Documentation in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Ss_75_70_52/870 Servicing and maintenance in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ω End of System

Ss_75_50_28_30
[M] Fixed gas detection and alarm systems ADDED

Systems

Ss_75_50_28_30 [M] Fixed gas detection and alarm systems ADDED

1. Description: Fixed gas detection and alarm systems are to be provided to the Level 05 boiler plantroom

   Provision of the fixed gas detection systems associated with the level 05 boiler plant room does form part of the mechanical contractors scope of works.

   The mechanical contractor must include for all interfaces necessary between the fixed gas systems and the site-wide BMS installation for both alarms and ventilation interlock.

2. Boiler Plant Gas Pressure Proving & Gas Detection : A gas pressure proving & gas detection system is to be provided comprising a control panel and a gas pressure sensor. The system will be capable of receiving connections from remote emergency shut-off buttons, gas detectors, fire panel and heat detectors with BMS integration (BACnet).

   The control unit shall be rated to IP65 with an ABS enclosure and be CE Approved.

   The fascia of the panel should be touch operated and a shrouded emergency shut off button shall be fitted. The panel shall have a full colour TFT display to visually display the current status of the panel and detectors, as well as any error conditions should they occur.

   Methane and carbon monoxide sensors are to be located above each boiler. In the event of gas detection, the gas solenoid fire valve shall close and the boilers will shut off. The mechanical control panel will indicate a "GAS DETECTED" status indication in addition to "GAS SOLENOID VALVE CLOSED" indication and an alarm signal is relayed to the BMS.

   Configure the system so that on detection of gas within the boiler plant room above the Lower Explosive Limit (LEL) the emergency gas shut-off valve automatically closes, the remote indicator lamp in the security room operates and an alarm signal is relayed to the BMS.

   In all shut down scenarios above, the gas solenoid valve shall remain closed until the reset buttons on the fascia of the control panel is depressed and the alarm cleared.

3. General: Local gas solenoid valves to each area identified above will be provided and installed by the specialist catering fit-out contractor. The specialist fit-out contractor's scope of works is to include the interface between each solenoid valve and the respective fixed gas detection and alarm installation.

   The gas pressure proving & gas detection system is to be manufactured by S&S Northern Ltd (Merlin range) or better and approved equivalent.

   Refer to clause Ss_75_70_52_36 clause 1.10 (heating system controls) for further details

associated with the isolation of the main incoming gas supply serving the venue.

4. System performance: Ss_75_50_28/211 Design of gas detection and alarm systems; Ss_75_50_28/221 Sensitivity; Ss_75_50_28/231 Integration with other alarm systems; Ss_75_50_28/241 Interfaces to equipment; Ss_75_50_28/251 Interface isolation for testing purposes
5. Type of protection: Plant and equipment. Personnel.
6. Control panel: Pr_75_50_18_33 Gas detection control panels
7. Connection cable to sensors
   7.1. Cable type: As specified by controls specialist
   7.2. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays
   7.3. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals
8. Rewireable installation: Required.
9. Concealed installation: Required.
10. Detectors: Pr_75_50_76_33 Gas detectors
11. Alarm indication: Pr_70_75_94_28 Electronic sounders BMS alarm
12. System accessories: Automatic shut-off valves. SMS Text messaging unit.
13. Execution: Ss_75_50_28/631 Installation generally; Ss_75_50_28/640 Installing gas leak detectors sensors; Ss_75_50_28/675 Installing fixed gas detector control panels; Ss_75_50_28/690 Labelling
14. System completion: Ss_75_50_28/812 Testing and commissioning gas detection and alarm systems; Ss_75_50_28/822 Documentation; Ss_75_50_28/841 Maintenance

System performance

Ss_75_50_28/211 Design of gas detection and alarm systems ADDED

1. Design: The Contractor shall complete the design of the gas detection and alarm system.
2. Standard: To BS EN 45544-4. To BS EN 60079-29-2 & IGEM UP/2 edition 3.
3. Areas to be protected: Boiler Room
4. Hazardous area classification: Zone 2 to BS EN 60079-10-1. Zone 22 to BS EN 60079-10-2.
5. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_75_50_28/221 Sensitivity ADDED

1. Lower alarm: 10% of the lower explosion limit (max).
2. Higher alarm: 25% of the lower explosion limit (max).

Ss_75_50_28/231 Integration with other alarm systems ADDED

1. Objectives: To isolate gas supply in the event of leak detection
2. Systems to be integrated: Gas solenoid valve. Central controls and building management systems.

Ss_75_50_28/241 Interfaces to equipment ADDED

1. Interfaces to equipment not forming part of the gas detection and alarm system: Design system to interact with the equipment in the event of a fire or fault signal.
2. Equipment and mode of operation: Gas solenoid valve operation under alarm signal: Close. HVAC control panel operation under alarm signal: Close down ventilation systems

Ss_75_50_28/251 Interface isolation for testing purposes ADDED

1. Isolation of systems and equipment: Design system so that the actuation, integration and interfacing can be isolated during gas detection and alarm system testing.
2. Means of isolation: Separate key switch for each connection.

Products

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_75_94_28 Electronic sounders in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_18_33 Gas detection control panels ADDED

1. Manufacturer: The design has been based on S&S Northern Ltd. Tender return must be based on the specified manufacturer. Better and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
2. Standards: To BS EN 45544-3. To BS EN 45544-1. To BS EN 45544-2.
3. Controls
   - 3.1. Display
     - 3.1.1. Type: Integral full colour TFT display indicating all functions and status in text.
     - 3.1.2. Display the following information: Power 'On' LED. Alarm status indicator LED. Fault LED. Low gas alarm. High gas alarm.
     - 3.1.3. Event log: Recording of 50 events including alarm, fault or user change to system. Each event to be dated and timed.
4. Battery backup capacity: Yes
5. Mounting: Wall

Pr_75_50_76_33 Gas detectors ADDED

1. Manufacturer: The design has been based on S&S Northern Ltd. Tender return must be based on the specified manufacturer. Equal and approved alternative manufacturers can be proposed in the tender return, however, acceptance will only be determined during the technical submittal approval stage.
2. Standards: To BS EN 45544-1. To BS EN 45544-2. To BS EN 45544-3.
3. Gas: Natural gas, Carbon Monoxide
4. Display type: Integral full colour TFT display.

Execution

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_75_94/610 Installing electronic sounders in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_50_28/631 Installation generally ADDED

1. Standard: To BS EN 45544-4. To BS EN 60079-29-2.
2. Equipment to be connected: Programmable control units.
3. Power supplies: Derive from a dedicated low voltage final circuit.

Ss_75_50_28/640 Installing gas leak detectors sensors ADDED

1. Position: Adjacent to likely sources of hazard, at the perimeter of plant and away from mechanical or water damage.
2. Mounting heights
   2.1. Sensors for gases lighter than air: Above area of potential leak.
   2.2. Sensors for gases heavier than air: At floor level, in inspection pits or in ducts into which heavy gas may flow.
3. Cable connections: Minimize cable length between control panel and sensor.
4. Access: Install equipment in accessible locations to allow for regular calibration, maintenance and electrical safety inspection.

Ss_75_50_28/675 Installing fixed gas detector control panels ADDED

1. Position: In plantroom
2. Connection to BMS:: Required
3. Connection to automatic isolation valve: Required.
4. Access: Install equipment in accessible locations to allow for regular calibration, maintenance and electrical safety inspection.

Ss_75_50_28/690 Labelling ADDED

1. Sensor identification: Label with a unique reference.
2. Alarm devices: Label with function.

System completion

Ss_75_50_28/812 Testing and commissioning gas detection and alarm systems ADDED

1. Standard: To BS EN 45544-4. To BS EN 60079-29-2.
2. Notice before commencing tests (minimum): 7 d.
3. Sensor list: Before commissioning submit proposed sensor and zone names.
4. Schedule of tests and method statement: Submit.
5. Sensor calibration: As manufacturers' instructions.
6. Sensor testing: Verify the operation of each device.

7. Alarm signalling: Verify operation
8. Connections with other systems and equipment: Verify and demonstrate operation of the systems and equipment under pre-alarm and alarm conditions.
9. Audible signal sound level: Measure.
10. Battery back up testing
    10.1. Mains power supply: Isolate.
    10.2. Quiescent mode: Measure current supplied by standby source when gas detection and alarm system is operating in the quiescent mode.
11. Results: Submit.
12. Certificates of calibration for meters and instruments: Submit.

Ss_75_50_28/822 Documentation ADDED

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.
    1.4. Number of copies: Two.
2. Record drawings
    2.1. Content: Locations of all equipment. Location and routes of all cables. Schematic diagram of wiring and pipework connections.
    2.2. Format: A1 paper print drawing. Electronic drawing.
    2.3. Number of copies: Two.
3. Submittal date: At handover.
4. Modifications to existing gas detection and alarm systems
    4.1. Modification certificate: Submit.

Ss_75_50_28/841 Maintenance ADDED

1. Duration: Undertake for 12 months after Practical completion.

Ω End of System

Ss_75_50_28_96
[P], [M] Water leak detection and alarm systems ADDED

Systems

Ss_75_50_28_96 [P], [M] Water leak detection and alarm systems ADDED

1. Description:
   1.1. Major Water Leak Detection:

The incoming mains cold water service will be provided with a leak detection system capable of monitoring high / low flow rates and will raise an alarm on the BMS system (volt free contacts) in the event of these figures being exceeded for a set period of time. The leak detection system will meet the requirements of BREEAM 2018 WAT03.

Ensure that the installed system is capable of identifying major leaks both within the building and between the building and the site boundary.

Ensure the detection system is:

1. A permanent automated water leak detection system that alerts the building occupants to the leak or an inbuilt automated diagnostic procedure for detecting leaks is installed
2. Activated when a continuous flow of water passes through the water meter / data logger at a flow rate above a pre-set minimum for a pre-set period of time
3. Able to identify different leakage rates eg continuous, high / low level leaks, over set time periods
4. Programmable to suit the owner's / occupier's requirements
5. Where applicable, designed to avoid false alarms caused by normal operation of large water consuming plant such as boilers

The system need not cut off the water supply when the alarm is activated.

Note:

The equipment installed must have the flexibility to distinguish between different flow rates to enable the system to be programmed to suit the owner's / occupier's requirements.

Pre-set flow rates and time periods will vary depending on the building type and usage.

It is anticipated that this credit will usually be achieved by installing a system which detects higher than normal flow rates at meters and / or sub-meters. It does not

require a system that would directly detect water leakage along part or the whole length of the water supply system.

Where there is a water authority meter at the site boundary, it may be necessary to install a separate flow meter to detect leaks, however if the water authority agrees to some form of leak detection being installed on their meter, this would also be acceptable.

In addition to detecting leaks for internal pipework, this credit requires any length of pipe between the building and any water authority meter at the site boundary to have leak detection.

1.2. Minor Water Leak Detection: Provide solenoid valves on the cold water supply to each toilet area in the building to control the water supply to all urinals and WCs, to meet the requirements of BREEAM 2018, WAT03 second credit. Control each solenoid valve by the following means, to ensure water is supplied only when needed, and therefore prevent minor water leaks:

A presence detector and controller (ie an automatic device detecting occupancy or movement in an area) to switch water on and turn it off when the presence is removed.

In single WCs provide the water shut-off operated by the same switch that operates the lighting (whether proximity detection or a manual switch).

1.3. Water Leak Detection (in comms rooms): Each telecomms room, MOCR, MER, SCR and AV room provided with either an 'In-Row', CRAC or CCU cooling unit must be provided with a comprehensive leak detection system serving the entire extent of pipework within each room.

Each room will be provided with its own 'stand-alone' system and associated control panel which will all be interfaced with the on-site BMS installation for remote alarms (using volt free contacts) in the security / control room.

For the full extent of rooms to be served, the contractor must refer to the schematics and GAs plus specialist AV / ICT consultant drawings to identify all applicable rooms.

1.3.1. General Requirements: Each complete liquid leak detection system shall be based on a digital monitoring unit, addressable sense cables, jumper cables and all required auxiliary equipment. This system shall detect and locate multiple leaks simultaneously as well as cable break faults.

The liquid leak detection system shall identify any abnormal presence of liquid on any point of its connected sense cables, to the nearest meter for water & acid and nearest cable for hydrocarbon. The status of the sense cable shall be indicated by an LED embedded in the cable connector. Green blinking light indicates a normal status; red blinking light indicates a leak on the cable. In the event of leak, an audible alarm is triggered and the dry contact is activated. The panel's touch screen display shows the time and date of the alarm, the type of fault and the location of the leak to the nearest meter for water & acid and nearest cable for hydrocarbon. Dynamic zone maps highlighting faults on the panel's screen will be provided for ease of location. A power failure relay shall be activated when the power shuts down.

1.3.2. Cable Break Faults: Besides leak, the system shall be able to detect any damaged sense cables (cable break). In the event of a cable break, an audible alarm is triggered and the dry contact is activated. The dynamic zone maps showing a cable break and highlighting the exact location on the panel's screen are available as an optional feature.

1.3.3. Digital Monitoring: The digital monitoring unit shall be a microprocessor based complete leak locating system. It shall receive data processed and transmitted by each sense cable as well as raising the alarm. It shall be supplied from the same supplier as the sense cables.

1.3.3.1. Power: The digital monitoring unit shall be supplied by 100 VAC to 240 VAC, 50/60Hz, single phase. The total power consumption shall not exceed 25 VA.

1.3.3.2. Touch screen display: A (7”) touch screen display shall be assembled on the front of the digital monitoring unit. In the event of simultaneous leaks or multiple faults, the display shall show all alarms. English language shall be the language by default.

1.3.3.3. Interface: RS-232, RS-422/485 serial ports with Modbus/Jbus communication protocol shall be available on the digital monitoring unit. An Ethernet port shall be available on the monitoring unit, for providing network functionalities as well as Modbus over TCP/IP.

1.3.3.4. Enclosure: The digital monitoring unit shall be enclosed in dust-tight enclosure.

1.3.3.5. Security: A password management feature shall provide a maximum security of the system with different security levels.

1.3.3.6. Nonvolatile memory: The unit shall be equipped with nonvolatile memory (Secure Digital card). The user settings, as well as the interactive schematic drawings are accessible for the user on this SD card.

1.3.4. Performance:

The sense cable shall perform the following functions continuously:

- Detection of the presence of water based liquid at any point along its length
- Location of the leak to the nearest meter
- Detection of a cut or break at any point along its length
- Digital communication of the nature and location of the fault to the digital unit

1.3.5. Floor Plan: Schematic drawings shall represent the layout of the leak detection system installed. It shall indicate the location of sense cables, jumper cables and all auxiliary equipment. It shall be provided by the contractor installing the water leak detection system. An interactive version of the floor plan shall be available on the screen of the digital monitoring unit. In the event of leak or cable break, the location of the fault shall be represented by a highlighted indicator with detailed information.

1.3.6. Manufacturer: The system shall be installed by well trained staff, with the procedure recommended by the manufacturer.

The digital leak detection system shall be manufactured by:

TTK UK. or approved equivalent (contact: Barry Warner (bwarner@ttkuk.com; 07919 134800)

2. System performance: Ss_75_50_28/212 Design of water detection systems; Ss_75_50_28/222 Zoning and identification for water presence and alarm system
3. System manufacturer: Refer to equipment schedules
4. Programmable control unit: Pr_75_50_18_47 Liquid leak detection control panels
5. Pulsed output water meter: Pr_80_51_51_97 Water meters

6. Cable type: Pr_65_70_48_58 Ordinary duty heat resistant PVC insulated and sheathed flexible cables; Pr_65_70_48_75 Single core non-sheathed (LHSF) insulated cables, to be confirmed by controls specialist
7. Containment: Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_71 Rigid conduit
8. Concealed installation: Required.
9. Rewireable installation: Required.
10. Meter cabinets: Required.
11. Isolating valve: Pr_65_54_95_18 Copper alloy service stop valves; Pr_65_54_95_19 Copper alloy stop valves
12. Alarm indication: Pr_70_75_94_46 LED warning beacons; Pr_70_75_94_28 Electronic sounders
13. System accessories: Automatic shut-off valves. SMS Text messaging unit.
14. Execution: Ss_75_50_28/641 Installing power supplies; Ss_75_50_28/665 Installing pulsed output water meters; Ss_75_50_28/676 Installing programmable control units; Ss_75_50_28/681 Installing sounders; Ss_75_50_28/687 Installing visual alarm signal devices; Ss_75_50_28/691 Labelling
15. System completion: Ss_75_50_28/813 Testing and commissioning; Ss_75_50_28/823 Documentation; Ss_75_50_28/832 Spares and consumables; Ss_75_50_28/842 Maintenance

System performance

Ss_75_50_28/212 Design of water detection systems ADDED

1. Design: Develop the Stage 4A scheme to contractor information for the water leak detection and alarm system.
2. Areas to be protected: All mains water supply between the building and the site boundary.
3. Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
4. Zone diagram: Submit for water presence detection and alarm system.

Ss_75_50_28/222 Zoning and identification for water presence and alarm system ADDED

1. Zoning: Divide the installation into separately controlled and identifiable zones.
2. Sensor identification: Individual address.

Products

See Pr_65_54_95_18 Copper alloy service stop valves in Ss_55_70_95_50 [P] Mains water distribution network systems

See Pr_65_54_95_19 Copper alloy stop valves in Ss_55_70_95_50 [P] Mains water distribution network systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_71 Rigid conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_65_70_48_58 Ordinary duty heat resistant PVC insulated and sheathed flexible cables ADDED

1. Description:
2. Manufacturer:
3. Standards: To BS EN 50525-1 and BS EN 50525-2-11.

4. Third party certification:
5. Cable type:
6. Size:
7. Sheath colour:
8. Reaction to fire class
    8.1. Fire behaviour:
    8.2. Additional classification for smoke production:
    8.3. Additional classification for flaming droplets and/ or particles:
    8.4. Additional classification for acidity:
9. Execution:

Pr_65_70_48_75 Single core non-sheathed (LHSF) insulated cables ADDED

1. Standards: To BS EN 50525-1 and BS EN 50525-3-41.
2. Third party certification:
3. Cable type:
4. Size:
5. Reaction to fire class
    5.1. Fire behaviour:
    5.2. Additional classification for smoke production:
    5.3. Additional classification for flaming droplets and/ or particles:
    5.4. Additional classification for acidity:
6. Execution:

See Pr_70_75_94_28 Electronic sounders in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_70_75_94_46 LED warning beacons ADDED

1. Description:
2. Manufacturer:
3. Ingress protection (minimum):
4. Format:
5. Lens colour:
6. Execution:

Pr_75_50_18_47 Liquid leak detection control panels ADDED

1. Features: Fully programmable to detect different leakage rates over set time periods. Integral timer with facility for out of hours shut off and / or shut off following detection of excessive consumption.
2. Response to leak detection
    2.1. Alarms: Audible. BMS connection. Remote. Visual.
    2.2. Automatic shut off: Required.

See Pr_80_51_51_97 Water meters in Ss_55_70_38_65 [P] Pumped cold water supply systems

Execution

See Pr_65_54_95/610 Installation of valves generally in Ss_55_20_34_57 [M] Natural gas supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/720 Installing rigid metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/725 Installing rigid non metallic conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_70_75_94/610 Installing electronic sounders in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_80_51_51/670 Installing water meters in Ss_55_70_38_65 [P] Pumped cold water supply systems

Ss_75_50_28/641 Installing power supplies ADDED

1. Equipment to be connected: Programmable control units.
2. Power supplies: Derive from dedicated low voltage final circuit.

Ss_75_50_28/665 Installing pulsed output water meters ADDED

1. Standard: To BS EN ISO 4064-5.
2. Position: On consumer's side of supply authority's meter within an in-ground meter cabinet. On consumer's side of building stop-cock.
3. Connection to programmable control units: Required.

Ss_75_50_28/676 Installing programmable control units ADDED

1. Position: Wall mounted, adjacent to main stop-cock.
2. Connection to BMMS: Required.
3. Connection to automatic isolation valve: Required.
4. Access: Install equipment in accessible locations to allow for regular calibration, maintenance and electrical safety inspection.

Ss_75_50_28/681 Installing sounders ADDED

1. Position: Install one sounder in facilities office.
2. Circuit wiring: Power supply to sounders to be fed from the same dedicated circuit feeding programmable control unit.

Ss_75_50_28/687 Installing visual alarm signal devices ADDED

1. Position: Install one visual alarm signal device inside facilities office.
2. Circuit wiring: Power supply to visual alarm signal devices to be fed from the same dedicated circuit feeding programmable control unit.

Ss_75_50_28/691 Labelling ADDED

1. Sensor identification: Label with a unique reference.
2. Alarm devices: Label with function.

System completion

Ss_75_50_28/813 Testing and commissioning ADDED

1. Notice before commencing tests (minimum): 7 d.
2. Sensor list: Before commissioning submit proposed sensor and zone names.
3. Schedule of tests and method statement: Submit.
4. Sensor calibration: As manufacturers' instructions.
5. Sensor testing: Verify operation of each device.
6. Alarm signalling: Verify operation
7. Connections with other systems and equipment: Verify and demonstrate operation of the systems and equipment under leak and alarm conditions.
8. Audible signal sound level: Measure.
9. Battery back up testing
    - 9.1. Mains power supply: Isolate.
    - 9.2. Quiescent mode: Measure current supplied by standby source when water detection and alarm system is operating in the quiescent mode.
10. Results: Submit.
11. Certificates of calibration for meters and instruments: Submit.

Ss_75_50_28/823 Documentation ADDED

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.
    - 1.4. Number of copies: Two.
2. Record drawings
    - 2.1. Content: Locations of all equipment. Location and routes of all cables. Schematic diagram of wiring and pipework connections.
    - 2.2. Format: A1 paper print drawing. Electronic drawing.
    - 2.3. Number of copies: Two.
3. Submittal date: At handover.

Ss_75_50_28/832 Spares and consumables ADDED

1. Supply the following spares: One of each type of sensor.

Ss_75_50_28/842 Maintenance ADDED

1. Duration: Until 12 months after Practical Completion.

Ω End of System

Ss_75_70_54_10
[M] Building monitoring and management systems ADDED

Systems

Ss_75_70_54_10 [M] Building monitoring and management systems ADDED

1. Description:

Appoint a controls specialist to carry out the design, supply, installation, testing and commissioning of the complete automatic control system to provide control and monitoring of all the mechanical engineering systems and plant installed within the new building, along with monitoring of the status of certain items of electrical and other plant and equipment.

The controls specialist shall provide the building with a central BMS which will provide the following building control functions:

1. Reduce energy consumption wherever possible
2. Upon Practical Completion, ensure environmental conditions are achieved
3. Upon Practical Completion, ensure airflow regimes are maintained
4. Upon Practical Completion, log utility meter data
5. Upon Practical Completion, log electric meters, gas sub meters, energy meters and water meter data and produce detailed energy reports and highlight unusual demand trends
6. Upon Practical Completion, monitor systems for run and fault condition
7. Upon Practical Completion, provide multi-level alarms for fault conditions
8. Upon Practical Completion, provide safety shutdowns
9. Upon Practical Completion, provide historical operating data to assist with energy management tasks and fault finding.
10. Upon Practical Completion, provide interlocks with the fire safety systems as required
11. Upon Practical Completion, outstations to be IP addressable
12. Upon Practical Completion, provide multi-level user access depending on skill level

BMS controls to be based on Johnson Control Systems or better and approved equivalent (contact: Paul Mills 07779 808433)

1.1. Performance Objectives: To provide, install, test and commission a complete automatic control system to meet the functional and performance criteria as outlined within this section.

To provide all software and associated programming to ensure the system operates in accordance with this specification.

To ensure the software is secure and that only authorised personnel are able to access and make adjustments to the controls system.

To provide a system that alerts the operator to critical alarms, out-of-range values and maintenance alarms.

To ensure that the system software is easy to use and that information is displayed in a clear and logical manner.

To provide a long-term archiving system for the collection and subsequent retrieval of nominated data of any object such as real inputs eg sensors, real outputs eg actuator position demand and calculated system values eg energy consumption as collected or calculated by any controller, field devices or supervisor system.

1.2. Controls Specialist Specific Scope of Work:

1. Design of the automatic control system on the design from the client
2. Supply and installation of field equipment
3. Supply and installation of control panels
4. PC based BMS with dynamic graphics and fully integrated for web-based access
5. System software engineering including dynamic plant graphics
6. Software Licences (with 2 simultaneous users to access)
7. Testing and commissioning
8. Project Management of the installation
9. Provision of comprehensive record information and operating and maintenance information adequate for a 3rd party Facilities Management Company to use, maintain, modify and upgrade the system in the future
10. Training

1.3. The Control Specialist General Scope of Works :

1. System design including interpretation of the building operating strategy, liaison with 3rd party equipment suppliers where controls interface is required, calculating and scheduling of input / output points, production of field and panel wiring diagrams and panel layouts and design of the BMS operating software and graphics.
2. System supply / install of all DDC components, IP outstations, control panels, central operator interface and all other hardware and software to provide a fully functional system.
3. Supply / install of all pressure sensors, pressure switches, temperature sensors, thermostats, actuators, gas safety interlocks etc, local temperature controllers to provide a fully functional system.
4. All containment for field devices served from the control panels.
5. Provision of details for the electrical and controls wiring requirements for the electrical sub-contractor to provide

The controls specialists proposed BMS graphics, graphics description must be submitted for review and approval to the Consultant.

1.4. Design Parameters:

Comply fully with the edition (including amendments, replacements and associated normative references) of each of the following, current at the time of tender:

- The Low Voltage Electrical Equipment (Safety) Regulations
- The Electromagnetic Compatibility Regulations
- British Standards (inc. BS.EN as detailed within this specification)
- ISO 11801 Information technology. Generic cabling for customer premises
- BSRIA AG 7/98 Library of system control strategies
- BSRIA AG 9/2001 Standard specification for BMS
- CIBSE Guide H Building control systems
- CIBSE Commissioning Code C Automatic controls

Base the system on the principal of direct digital communication (DDC), with a number of intelligent outstations linked together in a network. Ensure that these outstations contain the controls software and exchange information with a number of input/output (I/O) units. Generally, locate outstations and I/O units within control panels. Ensure that all sensors, controlling elements, valves, etc. are compatible with the operating characteristics of the control system outstations to provide full direct digital control of all plant.

Design, supply and install all wiring systems between control panels, control devices, sensors etc. Design, supply and install all wiring systems between local intelligent controllers (within the ceiling voids and risers, etc.) and their motorised valves and temperature detectors.

The equipment detailed within this section of the specification is the minimum required for successful system operation. Include any additional sensors, wiring, controls, relays, etc that are not specifically referred to in the specification, but that are required to give the specified mode of operation.

Where there is a requirement for interfacing of control, monitoring and status functions from the control system with equipment / plant supplied by other manufacturers under the work package, ensure that such equipment / plant is designed to transmit / receive the interface signals compatible with the proposed control system installation.

1.5. Hard Wired Interlocks:

Provide hardwired interlocks for the following system plant groups:

1. Boilers, dedicated high and low pressure switches primary pump flow proving, gas valve, gas detection, heat detectors and panic buttons.
2. Variable refrigerant flow systems
3. Fire alarm signal to cause shut down of ventilation plant and closing of gas solenoid valve via a direct interface.
4. Pressurisation units to boilers and pumps.
5. Frost coil stats to supply fans.
6. HWS high limit safety cutouts.
7. Interlocks to prevent booster sets running dry.
8. Hardwired fireman’s control of plant for on/off/extract only - interlocks only enabled during fire alarm condition to enable the fire officer to reinstate the extract plant to assist with smoke clearance, by means of a key-operated switch. Locate the fireman’s override panel in an appropriate position in the entrance area and house the key to operate the switch in a break-glass unit mounted adjacent to the panel.

1.6. BMS Operating and Supervisory Software:

1.6.1. General:

Provide operating and supervisory software as necessary to meet the requirements of this specification and the BMS. Verify that licences to use software applications are owned by the client.

Supply software with the following features:

1. Complete control and monitoring of BMS from colour graphics pages on the supervisor machine, or from a remote web browser.
2. Full client-server operation.
3. SQL server database.
4. Comprehensive alarm handling with alarm re-transmission and logging.
5. Scheduled recording of logged data from controllers.
6. Management of multiple controller occupation times.
7. Multilevel security system.
8. International language support
9. Display of HTML pages from company Intranet, or Internet.
10. Display of live, logged, or recorded data in multi-trace graphs.
11. Simple engineering path using drag and drop operations.
12. Self-learning of all local networks.
13. System documentation, covering all operator functions and system fault conditions, supplied as a Help file and in PDF format for viewing or printing. The help facility is to be resident in software in the operator workstation and not rely on access to the internet.
14. Access to the configuration mode of control devices.
15. Display all devices on the system connected via LANs, internetworks, and ethernet network connections.
16. A connection to the BMS network.

Provide software that includes Dynamic Data Exchange (DDE) to allow exchange of data with other proprietary management software, such as planned maintenance packages, databases and spreadsheets. Incorporate in the software the capability to interface with Autocad 2018 (or more recent version).

Structure the software to allow modification of application programmes and data files with the supervisory system on-line and without interruption of the monitoring and control programmes.

Provide and / or generate control programmes for each mechanical system or sub-system as detailed on the schematic drawings. Enable the control system to modulate the loop control actions directly and compare any translated signals from sensors with closed loop algorithms. Provide the capability for control programmes to use three-term control techniques (PID) which will minimise control characteristics, such as tracking errors, offsets, transients etc. Provide the capability to produce variable single and multi-loop linear and non-linear control functions as necessary.

1.6.2. Third party software: Supply a licensed version of the latest edition of Microsoft office Professional Plus.

Verify that licences to use software applications are owned by the client.

1.6.3. System security: Take all necessary steps to prevent unauthorised access to the software.

Configure the system for a total of 10 users (to be agreed / confirmed with the client), grouped into 3 user groups (to be agreed / confirmed with the client).

Provide each user with a unique username and password.

Set up a security profile for each user, defining their ability to view data on the system and make adjustments.

Allow each user's access to be restricted to specific parts of the building and / or specific systems only.

Ensure that password protected operator access is set up for both operator workstations and field controllers which have an operator interface.

Ensure that the system creates a log of the date and time of each occasion when each user logs on to and logs off from the system. Ensure that all changes made by the operator are logged and identified by operator / time stamp.

Ensure the passwords permit at least eight alpha numeric characters.

Ensure that the BMS software is protected from unauthorised entry.

Ensure that the BMS complies with BS 7799

1.6.4. Graphics:

Prepare interactive graphical diagrams, to display real-time data on the supervisor screen.

Supply colour schematics for the supervisor displaying the following features:

1. Each and every connected point, status conditions (running / stopped etc), analogue values with engineering parameters (°C, %rh, l/s etc), output positions (% open, rpm. etc.).
2. Animations where appropriate to make the graphical user interface more intuitive.
3. All calculated parameters as dictated by the controls specification, (highest, lowest, total, rate etc.).
4. Selected optimiser switching times (start, stop).
5. Adjustable set points and overrides.
6. Current sequences in operation.
7. Energy / efficiency calculations.
8. Alarm conditions, shown highlighted.

9. Push buttons or icons to display text panels, pre-configured graphs and other displays.
10. Push buttons or icons to select pre-configured control actions.

Supply sketches / diagrams showing the layouts and menu forms, prior to data entry, for comment. Generally supply colour displays on the basis of one per plant item, with sequential and cross indexing / paths to allow movement between the displays in a logical manner. Make an exit to the head / index page available from each display. Check the correct performance of the displays as part of the plant commissioning procedures.

Do not incorporate any suppliers' advertisements into the displays other than on the front page. On the front page, show the supplier's name(s), contacts and telephone number(s). On each page, identify the name of the site and the location.

Prepare overview diagrams for each major system or group of systems (eg heating, cooling, ventilation, electrical utilities etc). Ensure these diagrams show overall distribution and function in a clear and concise manner.

Use only codes and designations employed within the system when annotating each diagram.

Ensure each graphical page starts to display within 2 seconds and is complete (with all analogue set points, actual values, alarm values and status displays) within 7 seconds. Update all variable data on the display every 10 seconds.

Provide the ability to change this update rate.

The speed of response, displays and action, quoted within this Specification are based on the following criteria:

1. That the test graphic is dynamically updating on the screen
2. A minimum of 20 analogue values
3. A minimum of 10 digital values

Provide a software library of plant schematics and symbols. Provide a facility to allow the operator to modify plant schematics and to generate new ones.

Create and integrate the following graphics pages, tailored to the requirements of the system:

1.6.4.1. Main graphic 1 - project logo: Access to log in, log out and to site plan.

1.6.4.2. Site plan: Provide one-click access to each floor level.

Plant level – one-click access to each item of plant / each engineering system.

Occupied floor levels – one-click access to page for each floor.

Loading bay – one-click access to each item of plant / each engineering system.

1.6.4.3. Floor plans: Each floor plan may be split into two or more sections if required for speed and legibility. Show location and reference of each terminal unit, current measured temperature, set point and heating / cooling percentage output. Provide access to adjust set points and run time schedule.

1.6.4.4. Plant / engineering system:

Fully animated schematic drawings of the plant, physical arrangement, input and output values. Provide access to set point adjustment and time programme adjustment. Provide a separate graphics page for each of the following system:

1. Primary heating schematic, including gas
2. Secondary heating schematics (including all modulating 2-port valves)
3. Cold water systems schematic
4. Hot water systems schematic
5. Each supply / extract ventilation system
6. Toilet ventilation systems
7. Floor plans showing fan coil unit locations and space temperature sensor readings, and ability to call up individual fan coil unit status
8. Car park ventilation systems
9. Smoke extract systems
10. Variable refrigerant flow systems

Generate all graphics and issue for comment to the engineer 3 months prior to installation on site.

Provide engineer 2 complete hard copy colour sets and engineer 2 electronic sets (USB format) to the Contract Administrator for comment at this time. Generate a typical schematic and general arrangement plan initially, prior to the full issue, and seek comment prior to proceeding with the balance. Allow for both the installer and the controls specialist to attend a series of meetings with the Contract Administrator and client representatives to develop the graphics to the client’s specific requirements.

Ensure that the graphics are of the highest quality and resolution and ensure that the controls specialist allows sufficient time (at least 4 weeks) to create them.

Incorporate digital photographic images of all plant rooms within the graphics suite to allow direct comparison between graphics representation and the real installation via split screen. Represent equipment, sensors etc, shown operating on schematics, on the photographic images via either a change of colour or highlight box. This will allow direct comparison between engineered scheme drawings and the user's view of the actual installation.

1.6.4.5. Text pages: Set up a text page for each item of plant configured to show the basic plant item description and hours-run total if required, along with maintenance details such as serial number, manufacture information, model number, and service items. This will assist with the maintenance requirements of the plant as the BMS supervisor can be set to display this page upon receipt of an hours run alarm

1.6.5. Alarms:

Group alarms by general location and type. Set up a display page(s) showing the condition of all critical alarms. Ensure that critical alarms and any other alarm specified automatically loads the relevant schematic or text page to ensure accurate identification of the event. Also group alarm information by workgroups, such that an alarm panel can be sent to the appropriate person(s) should they be logged into the system at the time of the alarm occurring.

Ensure that alarm data provides:

1. Condition identity
2. Condition value
3. Alarm source
4. Alarm time and date
5. Acknowledgement status

Ensure that the operator can acknowledge alarms, including muting of audible or flashing annunciators. Provide the facility to acknowledge alarms individually or on a group basis.

Ensure that alarms can be configured to ignore start-up and shut-down delays.

Provide a facility for the operator to adjust the triggering limits of alarms.

Ensure that alarms can be prioritised (including a high priority that will be annunciated regardless of other activity) and a low priority or information status that is only annunciated on demand.

Ensure that visual, audible and printed annunciation of alarms, or any combination of these, can be selected by the operator.

Arrange plant alarms in outstations so that they overwrite in the alarm buffer onto the oldest stored information. The intention is to prevent the buffers becoming full and the system 'locking-up'.

1.6.6. HTML documentation and on-line help: Provide all Operating and Maintenance documentation in both paper and HTML ‘soft’ copy format. Use Tooltips to further aid users to identify the function of each button / hotspot on the schematics.

1.6.7. Smart phone interface: Ensure that the supervisory system allows connection to the World Wide Web (internet) if desired, and supports the use of web enabled devices to allow a user to browse the BMS information served by the BMS supervisor.

1.6.8. Data monitoring and logging:

Log the hard and soft points of each field controller.

Provide the facility for the operator to set start / stop times and logging frequency at the operator workstation.

Ensure each log can be defined in terms of:

- Log identification
- Units
- Date / time stamp

Provide the software with the capacity to display logs of at least six different connected items of plant on the same graph of a trend log. Allow trend logs to be set up, using either real-time data or stored values, and for data to be stored on the hard-disc if necessary.

Ensure that for individual control zones, individual trend logs displaying the set-point temperature, return air temperature are available on the software if required.

At practical completion, initiate trend logs of each of the following points, to record values at hourly intervals:

1. All space temperatures
2. All space relative humidities
3. All space CO_2 levels
4. External air temperature
5. External air relative humidity

1. Low temperature hot water primary flow and return temperatures
2. All heat meters
3. All water meters
4. All ventilation system supply and return air temperatures

1.7. Penetration testing (Ethical hacking):

The Arena will have a single converged IP network that will be the transport for all IP devices and their associated applications.

Oak View Group (OVG) will be appointing a Penetration Tester to assess the confidentiality, integrity and availability of building services that use the converged IP network along with the IP network itself.

Such testing will include (but not be limited to):

- Physical Security
- External security (from internet)
- Internal security (within Arena)
- Server/workstation build

The penetration testers will be UK Government CREST and Tiger certified.

Building services includes (but is not limited to):

- Control systems
- Building management system
- Electronic Security (such as Video Surveillance, Access Control, Intrusion detection)
- HVAC
- Lighting Control
- Vertical transportation
- Energy Management
- Public Address
- Audio Systems
- Television Distribution
- Large format displays, LED ribbon boards, Video walls
- Car parking
- Electric Vehicle Charging
- Un-interruptible Power Supplies (central or distributed)
- Metering
- SCADA (where applicable, this may reside on its own IP network, but will be subject to same level of penetration testing)

The contractor shall ensure that all electronic field devices and systems are made secure in terms of cyber security.

Hardware, firmware, software and management access shall be hardened in order to mitigate against malicious activities which may affect / compromise confidentiality, integrity or availability of the system or service. Some examples of protection are:

- Disabling un-necessary services
- Disabling un-used interfaces
- Ensuring latest version of all firmware and software is installed, with security updates
- Software / firmware to be configured in run mode (as opposed to left in programme mode)

- Enabling logging
- Enabling Authentication, Authorisation and Accounting (AAA)
- Enabling Network Access Control (all IP devices pre-registered / profiled by network prior to connecting to the network)
- High level of encryption (ciphers, key lengths)
- Limiting administration access (location, device, accounts)
- Strong passwords

The contractor shall collaborate as required with all parties including (but not limited to) OVG's direct appointments 'Converged Network Systems (CNS)' and the 'Penetration Testing Assessor'.

Where the penetration tester finds vulnerabilities, the contractor will take remedial action to remove the vulnerabilities at their cost and re-submit systems for testing.

Acceptance by ME Engineers of a technical submittal for a system, device or piece of software from the contractor does include acceptance of vulnerabilities that may be discovered in penetration testing.

1.8. BREEAM Ene 08:

All IT-intensive operating areas (MER, SCRs, PAVA rooms etc.) are to be provided with plant and controls methodologies to conform with the requirements of BREEAM Ene 08, namely:

- Natural ventilation while the room temperature T<=20°C
- Mechanical ventilation is used while the room temperature T is in the range of 20°C<T<=22°C
- Active cooling is used when the room temperature T>22°C

Additionally IT equipment shall be provided a mechanism to automatically power-down when not in use.

2. System performance: Ss_75_70_54/210 Design; Ss_75_70_54/215 Meter data; Ss_75_70_54/217 Water supply systems monitoring and management; Ss_75_70_54/225 Gas supply systems monitoring and management; Ss_75_70_54/227 Liquid fuel supply systems monitoring and management; Ss_75_70_54/240 Heating systems monitoring and management; Ss_75_70_54/243 Cooling water systems monitoring and management; Ss_75_70_54/247 Ventilation systems monitoring and management; Ss_75_70_54/250 Air conditioning systems monitoring and management; Ss_75_70_54/273 Detection and alarm systems monitoring and management

   The controls specialist must refer to individual system clauses for full details of the controls strategy / description of operation to include within the scope of works.

3. Water supply systems linked to BMMS:
   - Cold water
   - Pumped water
   - Instantaneous hot water
   - Direct hot water storage
   - Indirect hot water storage
   - Rainwater reclamation systems
4. Gas supply systems linked to BMMS:

- Natural gas

5. Liquid fuel supply systems linked to BMMS:
    - Diesel
6. Fire fighting systems linked to BMMS:
    - Sprinkler system
    - Foam spreader system
    - Gas suppression system
7. Heating systems linked to BMMS:
    - Low temperature hot water
    - Variable refrigerant flow system
    - Air source heat pump system
8. Cooling systems linked to BMMS:
    - Variable refrigerant flow system
    - Air source heat pump
9. Ventilation systems linked to BMMS:
    - Mechanical supply
    - Mechanical extract
    - Toilet extract
    - Kitchen extract
    - Car park
    - Smoke and heat exhaust
    - Pressure differential system
10. Air conditioning systems linked to BMMS:
    - Centralized all-air
    - All-air
    - Fan coil
11. Detection and alarm systems linked to BMMS:
    - Fire detection and alarm system
    - Gas detection and alarm system
    - Water leak detection and alarm system
    - Refrigerant leak detection, pump down and alarm system
12. Communications network type: Wired local area network.
13. Equipment: Pr_80_77_28_49 Low voltage switchgear enclosures; Pr_75_50_18_29 Field controllers
14. Computer components: Pr_75_75_15_21 Desktop computers; Pr_75_75_15_15 Computer keyboards; Pr_75_75_15_16 Computer monitors; Pr_75_75_15_66 Printers
15. Equipment interconnectivity: Wired.
16. Cables: As specified by controls specialist
17. Containment: Pr_65_70_11_12 Cable baskets; Pr_65_70_11_17 Cable trays; Pr_65_70_11_30 Flexible conduit; Pr_65_70_11_18 Cable trunking
18. Containment accessories: Pr_65_70_11_20 Conduit fittings; Pr_25_80_81_42 Intumescent linear gap seals; Pr_25_80_81_44 Intumescent trunking pillows
19. Rewireable installations: Required.
20. Concealed installations: Required.
21. Control equipment power supply: Mains supply.
22. Execution: Ss_75_70_54/620 Installation of building monitoring and management systems; Ss_75_70_54/630 Installation of field controllers; Ss_75_70_54/640 Installation of cables; Ss_75_70_54/650 Installation of sensors

23. 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 ADDED

Shared by: Ss_75_70_54_95 [P] Water metering systems and Ss_75_70_54_30 [M] Fuel metering systems

1. Design: Develop the 4A design to contractor information.
2. Standards
   2.1. Communications network: To BS EN 50174-1.
   2.2. Communications protocol: To BS EN ISO 16484-5.
   2.3. Documentation of plant and application specific functions: To BS EN ISO 16484-3.
3. Requirements: Submit proposal including detailed design drawings, technical information, calculations and manufacturers' literature.

Ss_75_70_54/215 Meter data ADDED

Shared by: Ss_75_70_54_95 [P] Water metering systems and Ss_75_70_54_30 [M] Fuel metering systems

1. Software functions:
   - Acceptance of data from other sources
   - Automatic production of routine reports
   - Historical analysis of energy consumption
   - Immediate warning of exceptions, such as parameters exceeding preset limits
   - Instant access on demand to data from individual meters
   - Retrieval, checking and collation of metered data
   - Review of data in flexible format, allowing comparison between different time periods and meter locations

Ss_75_70_54/217 Water supply systems monitoring and management ADDED

1. Input:

   All alarm signals as defined in the respective controls section, including

   - Tank level alarms.
   - High limit & pressure alarms
   - Low limit & pressure alarms
   - Common plant alarms
2. Output: Output warning / notification on BMS

Ss_75_70_54/225 Gas supply systems monitoring and management ADDED

1. Input:

   All alarm signals as defined in the respective controls section, including

   - Gas booster failure alarm.
   - Gas solenoid shut off valve alarms
   - High limit & pressure alarms
   - Low limit & pressure alarms
   - Common plant alarms

2. Output: Output warning / notification on BMS

Ss_75_70_54/227 Liquid fuel supply systems monitoring and management ADDED

1. Input:

   All alarm signals as defined in the respective controls section, including

   - Pump failure alarm.
   - High limit & pressure alarms
   - Low limit & pressure alarms
   - Common plant alarms
2. Output: Output warning / notification on BMS

Ss_75_70_54/240 Heating systems monitoring and management ADDED

1. Input:

   All alarm signals as defined in the respective controls section, including

   - Pump failure alarm.
   - High limit & pressure alarms
   - Low limit & pressure alarms
   - Common plant alarms
2. Output: Output warning / notification on BMS

Ss_75_70_54/243 Cooling water systems monitoring and management ADDED

Ss_75_70_54/247 Ventilation systems monitoring and management ADDED

1. Input:

   All alarm signals as defined in the respective controls section, including

   - Fan failure alarm.
   - High limit & pressure alarms
   - Low limit & pressure alarms
   - Common plant alarms
2. Output: Output warning / notification on BMS

Ss_75_70_54/250 Air conditioning systems monitoring and management ADDED

1. Input:

   All alarm signals as defined in the respective controls section, including

   - Fan failure alarm.
   - High limit & pressure alarms
   - Low limit & pressure alarms
   - Common plant alarms
2. Output: Output warning / notification on BMS

Ss_75_70_54/273 Detection and alarm systems monitoring and management ADDED

1. Input:

   - Gas alarm.

2. Output: Output warning / notification to BMS and security office

Products

See Pr_25_80_81_42 Intumescent linear gap seals in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_25_80_81_44 Intumescent trunking pillows in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_12 Cable baskets in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_17 Cable trays in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_18 Cable trunking in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_20 Conduit fittings in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11_30 Flexible conduit in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Pr_75_50_18_29 Field controllers ADDED

1. Enclosure
   1.1. Ingress protection (minimum): To BS EN 60529, IP41. To BS EN 60529, IP54. To BS EN 60529, IP65.
   1.2. Mounting: Suitable for surface fixing. Suitable for DIN rail mounting. As required
2. Network communications options: BACnet MS/TP. LON FT/TP-10. RS-232.
3. Internal power backup
   3.1. Type: Rechargeable batteries.
   3.2. Battery functions: Real-time clock battery back-up for 2 years minimum. Database storage and real-time clock battery back-up for 3 months minimum.
4. User interfaces: Access password protected programmable LCD with back light.
5. Execution: Pr_75_50_18/605 Installing control components

Pr_75_75_15_15 Computer keyboards ADDED

1. Standard: To BS EN ISO 9241-400 and BS EN ISO 9241-410.
2. Format: USB.
3. Features: QWERTY with full upper / lower case ASCII key-set and numeric keys.

Pr_75_75_15_16 Computer monitors ADDED

1. Standard: To BS EN ISO 9241-303, BS EN ISO 9241-304,BS EN ISO 9241-305 and BS EN ISO 9241-307.
2. Format: LCD.
3. Size (nominal diagonal): 24 inch.
4. Resolution: 1280 x 1024.
5. Display screen: Anti-glare coated.
6. Display positions: Adjustable height, swivel, and tilt.
7. Additional features: None.

Pr_75_75_15_21 Desktop computers ADDED

1. Processor
2. RAM: 8 GB.
3. Hard disk
   3.1. Capacity: 1 TB.
   3.2. Speed: 7200 rpm.
4. Graphics card
   4.1. Memory: 2 GB.
   4.2. Resolution: 1920 x 1200 HDMI.
5. Sound card: On motherboard.
6. Optical drive: 16 x DVD+/-RW.
7. Network card: 10/ 100/ 1000 Ethernet LAN.
8. I/O ports: Two front-panel connectors for headphone-output and microphone-in. Three back-panel connectors for line-in, line-out, microphone-in. 6 USB (two front, four back).
9. Monitor: Pr_75_75_15_16 Computer monitors
10. Keyboard: Pr_75_75_15_15 Computer keyboards
11. Mouse: Wired.
12. Operating system: Windows 10

Pr_75_75_15_66 Printers ADDED

1. Format: Laser jet.
2. Print functions
   2.1. Print size: A4.
   2.2. Print speed
      2.2.1. Mono (minimum): 12 images per minute.
      2.2.2. Colour (minimum): 10 images per minute.
      2.2.3. Draft mode (minimum): 28 ppm colour.
   2.3. Duplex printing: Required.
   2.4. Automatic document feeder: Required.
   2.5. Paper tray capacity (minimum): 500 sheets.
3. Scan functions
   3.1. Optical scan resolution (minimum): 1200 x 2400 pi colour.
4. Connection type: Ethernet. USB 3.0.
5. Ink reservoirs: Individual black, cyan, magenta, and yellow.

Pr_80_77_28_49 Low voltage switchgear enclosures ADDED

1. Standard: To BS EN 62208.
2. Ingress protection (minimum):
3. Impact protection (minimum):
4. Dimensions
   4.1. Length:
   4.2. Width:
   4.3. Height:
5. Material:

6. Finish:
7. Access:
8. Handles:
9. Internal mounting plate:
10. Cable gland plate:
11. Mounting:
12. Arrangement:
13. Rated insulating voltage:
14. EMC shielding performance (minimum):
15. Service conditions:
16. Hardware:
17. Labelling: Describe controlgear purpose.

Execution

See Pr_65_70_11/630 Installing cable basket in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/640 Installing cable supports on roofs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/650 Multiple cable runs in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/661 Cable support zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/700 Installing conduit, trunking and ducting in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/710 Installing conduit generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/735 Installing conduit connections to equipment in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/740 Installing trunking generally in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_65_70_11/765 Conduit, trunking and ducting zones in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

See Pr_75_50_18/605 Installing control components in Ss_55_70_38_42 [P] Unvented Indirect hot water storage supply systems

Ss_75_70_54/620 Installation of building monitoring and management systems

ADDED

1. General: Install in accordance with BSRIA AG 9/2001.

Ss_75_70_54/630 Installation of field controllers

ADDED

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

Ss_75_70_54/640 Installation of cables ADDED

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 routes generally: Concealed routes
8. Cables from other systems
   8.1. Segregation: Segregate and cross at right angles.
   8.2. Distance from steam and low temperature hot water systems running parallel: 500 mm minimum.
9. Cable terminations: Support cable within 150 mm of termination.
10. Balanced twisted-pair cabling
    10.1. Maximum untwist at terminations: 12 mm.

Ss_75_70_54/650 Installation of sensors ADDED

1. General: Install in accordance with BCIA Sensor Installation.

System completion

Ss_75_70_54/810 Inspection and testing ADDED

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

Ss_75_70_54/820 Commissioning ADDED

1. General: Commission in accordance with BSRIA AG 9/2001 and BCIA Start up and commissioning guide.

Ss_75_70_54/830 Documentation ADDED

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: 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. Cable schedules

3.1. Location: Within each panel and O&M manual

3.2. Format: Electronic and paper

3.3. Size: A4

4. Submittal date: At handover.

Ω End of System

Ss_75_70_54_30
[M] Fuel metering systems ADDED

Systems

Ss_75_70_54_30 [M] Fuel metering systems ADDED

1. Description:

   Provide Energy meters in accordance with the requirements of The Building Regulations: 2014 Approved Document L2A Conservation of Fuel and Power and TM39: Building Energy Metering CIBSE, 2010.

   The gas meter shall be provided by the meter supplier complete with a pulsed output to enable gas usage to be logged by the BMS.

   Sub-meters to be provided as indicated on the system schematics complete with a pulsed output to enable gas usage to be logged by the BMS for each applicable system / usage type.

   All meters shall have Modbus outputs for interfacing with the BMS.
2. System performance: Ss_75_70_54/210 Design; Ss_75_70_54/215 Meter data
3. Fuel: Gas.
4. Number and location of meters: Refer to system schematics
5. Monitoring period: Half hourly.
6. Reporting:
   - Graphical
   - Monthly
   - Spreadsheet
   - Stored
   - Weekly

System performance

See Ss_75_70_54/210 Design in Ss_75_70_54_10 [M] Building monitoring and management systems

See Ss_75_70_54/215 Meter data in Ss_75_70_54_10 [M] Building monitoring and management systems

Ω End of System

Ss_75_70_54_95
[P] Water metering systems ADDED

Systems

Ss_75_70_54_95 [P] Water metering systems ADDED

1. Description:

Provide water meters to each of the following service locations:

- Incoming mains water supply at site boundary (United Utilities)
- Mains water connections to Potable Tanks.
- Incoming harvested rainwater service to PH plantroom
- BCWS service to venue.
- CAT5 service to venue.
- Cold Feed to hot water generation plant
- Hot and cold supplies to each Kitchen / F&B / Kitchen / Bar.
- To WC areas where necessary to achieve the relevant BREEAM 'Excellent' standard.

The incoming supply shall be metered at the site boundary, and at each of the potable tanks. The system will provide BMS linked leak detection/consumption monitoring which meets the criteria for the necessary credits for BREEAM 'Excellent' standard targeted. All meters will be interfaced with the BMS for data logging/alarm.

All kitchens, bars and concessions will be fitted out by others and will have hot and cold meters as part of valve set outside each space.

The M&E Contractor shall liaise with Building Control and obtain Building Control approval of the metering for the works. All additional items required by Building Control shall be provided. The submission of the energy metering strategy shall be issued to Building Control for approval prior to any replacement works commencing.

Energy use and sub-metering shall meet Building Regulation and CIBSE TM39 requirements as a minimum.

All meters shall be WRAS approved.

All meters shall have Modbus outputs for interfacing with the BMS.

All meters shall be suitable of suitable construction for their installed location and the environment to which they are exposed.

Meters shall be linked to a full measuring system where requires. The system shall be hardwired to a central local data collection.

Flow meters to have a correct MINIMUM distance of straight pipe before the meter, as required by meter manufacturer.

The M&E Contractor shall include for all power wiring, controls wiring, containment and ancillaries to proved a full and complete energy metering installation.

The M&E Contractor shall verify and confirm all flow rates to ensure correct selection of meter.

Staff Training:

The M&E Contractor shall include within the tender costs for training the Client's maintenance operative/representative(s) in all aspects of the energy metering installation, systems and their operation. The full and complete understanding of these systems by the Clients' maintenance operative shall be a pre-condition of practical completion.

2. System performance: Ss_75_70_54/210 Design; Ss_75_70_54/215 Meter data
3. Number and location of meters: Refer to system schematics
4. Monitoring period: Half hourly.
5. Reporting: Graphical. Monthly. Spreadsheet. Stored. Weekly.

System performance

See Ss_75_70_54/210 Design in Ss_75_70_54_10 [M] Building monitoring and management systems

See Ss_75_70_54/215 Meter data in Ss_75_70_54_10 [M] Building monitoring and management systems

Ω End of System



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