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P
Building fabric sundries
Fire stopping systems
P12 Fire stopping systems

To be read with Preliminaries/General conditions

GENERAL

110 FIRE STOPPING SYSTEM TO INDIVIDUAL SERVICE PENETRATIONS.
   • Penetration seal/ Gap filler: Contractor's choice.

130 FIRE STOPPING SYSTEM TO INDIVIDUAL SERVICES PENETRATIONS Generally
   • Fire resistance: As drawing A(22)001 and A(22)002.
   • Penetration seal: Contractor's choice.
     - Size: Not applicable.
   • Capping sealant: Contractor's choice.
     - Colour: Contractor's choice.

140 FIRE STOPPING SYSTEM TO MULTIPLE SERVICES PENETRATIONS Generally
   • Fire resistance: As drawing A(22)001 and A(22)002.
   • Bulkhead barrier:
     - Material: Contractor's choice.
     - Thickness: Not applicable.
     - Number of layers: Contractor's choice.
     - Framing: Not required.
     - Finish: Contractor's choice.
   • Capping sealant: Contractor's choice.
     - Colour: Contractor's choice.

SYSTEM PERFORMANCE

210 DESIGN
   • Design: Complete the design of the fire stopping system.
   • Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

EXECUTION

620 WORKMANSHIP GENERALLY
   • Gaps: Seal gaps between building elements and services, to provide fire resistance and resist the passage of smoke.
   • Adjacent surfaces: Prevent overrun of sealant or mortar on to finished surfaces.

660 INSTALLING INTUMESCENT FOAM
   • New joints: Remove builder's debris, mortar droppings, grease, and other contaminants.
   • Old joints: Clean and remove existing sealant from each joint.
   • Priming: Lightly moisten substrate with water.
   • Application: Fill joint to approximately half its depth, and allow foam to expand to face of joint.
   • Trimming: Trim excess foam to give a neat, flush appearance.
670 APPLYING INTUMESCENT MORTAR
• Sequence: Install mortar after services are permanently installed.
• Loose dust and combustible materials: Remove from the opening.
• Shuttering: Install suitable shuttering panels to the faces of the opening.
• Temperature: Do not apply mortar when it could be damaged by frost.
• Powder:water ratio: 2:1 for trowel grade by volume.
• Mortar cure: Do not disturb mortar before final set has taken place.
• Shuttering: Remove after mortar has cured.

690 APPLYING INTUMESCENT PUTTY
• Sequence: Install putty after services are permanently installed.
• Loose dust and combustible materials: Remove from the opening.

730 FIXING INTUMESCENT PIPE COLLARS
• Collar fixing: Contractor's choice.
• Gap around collar: Seal with gap filler and sealant or Seal with intumescent foam.
• Length of wraps: Not applicable.

740 INSERTING SEALANT BACKING MATERIAL
• Preparation: Removed debris from service penetration.
• Installation: Build-in joint filler as the work proceeds.

745 APPLYING SEALANTS GENERALLY
• Application: As section Z22.

750 APPLYING CAPPING SEALANT
• Preparation: De-grease using cleaner recommended by sealant manufacturer.
• Priming: Primer recommended by sealant manufacturer.
• Depth of sealant: 10 mm.
• Temperature: Do not apply water based sealants when they could be damaged by frost.

COMPLETION

910 CLEANING
• Masking tapes: Remove.
• Cleaning: Clean off splashes and droppings. Wipe down finishes.

920 INSPECTION
• Notice for inspection (minimum): 3 working days.
P31
Holes, chases, covers and supports for services
P31 Holes, chases, covers and supports for services

To be read with Preliminaries/General conditions

EXECUTION

610 COORDINATION  Locations and dimensions of holes and chases for services: Submit details Generally to be coordinated with all other trades on site.

620 HOLES AND CHASES IN SITU CONCRETE
- Cast in: Holes larger than 10 mm diameter and chases.
- Cutting and drilling:
  - Permitted for holes not larger than 10 mm diameter.
  - Not permitted for holes larger than 10 mm diameter except as indicated on drawings.

630 HOLES AND CHASES IN PRECAST CONCRETE
- Cutting and drilling: Not permitted except as indicated on drawings.

640 HOLES IN STRUCTURAL STEELWORK
- Cutting and drilling: Not permitted except as indicated on drawings.

650 HOLES, RECESSES AND CHASES IN MASONRY
- Locations: To maintain integrity of strength, stability and sound resistance of construction.
- Sizes: Minimum needed to accommodate services.
  - Holes (maximum): 300 x 300 mm.
- Walls of hollow or cellular blocks: Do not chase.
- Walls of other materials:
  - Vertical chases: No deeper than one third of single leaf thickness, excluding finishes.
  - Horizontal or raking chases: No longer than 1 m. No deeper than one sixth of the single leaf thickness, excluding finishes.
- Chases and recesses: Do not set back to back. Offset by a clear distance at least equal to the wall thickness.
- Cutting: Do not cut until mortar is fully set. Cut carefully and neatly. Avoid spalling, cracking and other damage to surrounding structure.

670 NOTCHES AND HOLES IN STRUCTURAL TIMBER
- General: Avoid if possible.
- Sizes: Minimum needed to accommodate services.
- Position: Do not locate near knots or other defects.
- Notches and holes in same joist: Minimum 100 mm apart horizontally.
- Notches in joists: Locate at top. Form by sawing down to a drilled hole.
  - Depth (maximum): 0.125 x joist depth.
  - Distance from supports: Between 0.07 and 0.25 x span.
- Holes in joists: Locate on neutral axis.
  - Diameter (maximum): 0.25 x joist depth.
  - Centres (minimum): 3 x diameter of largest hole.
  - Distance from supports: Between 0.25 and 0.4 of span.
- Notches in roof rafters, struts and truss members: Not permitted.
- Holes in struts and columns: Locate on neutral axis.
  - Diameter (maximum): 0.25 x minimum width of member.
  - Centres (minimum): 3 x diameter of largest hole.
  - Distance from ends: Between 0.25 and 0.4 of span.
690 INSTALLING PIPE SLEEVES
   • Sleeves: Fit to pipes passing through building fabric.
   • Material: Match pipeline.
   • Size: One or two sizes larger than pipe to allow clearance.
   • Finish: Install sleeves flush with building finish. In areas where floors are washed down, install protruding 100 mm above floor finish.
   • Masking plates: Fit at visible penetrations, including through false ceilings of occupied rooms.

710 SEALING Generally
   • Service: Hot and cold water pipes.
   • Location: Pipe sleeves through walls and floors.
   • Sealing material: Silicone sealant.
   • Method: Gun.
   • Performance requirement: Moisture vapour and airtight.
Services painting systems
P32 Services painting systems

To be read with Preliminaries/General conditions

130 METAL SURFACE COATING To all unprotected metal surfaces
- Surface: Steel.
- Initial coats: Contractor's choice.
  - Number of coats: 1
  - Colour: To be selected from manufacturers' standard range .
- Finishing coats: Contractor's choice.
  - Number of coats: 1
  - Colour: To be selected from manufacturers' standard range .
  - Finish: Not applicable.

SYSTEM PERFORMANCE

210 DESIGN
- General: Complete the design of the coating systems in accordance with BS 6150.
- Proposals: Submit schedules, drawings and manufacturer's literature.

220 DESIGN LIFE OF METAL SURFACE COATINGS
- Design life (assuming reasonable wear and tear, and regular maintenance): 7 years
- Environment category in accordance with BS 6150: Determine on site.
  - Chemical and liquid resistance: Not applicable.

EXECUTION

610 PREPARATION GENERALLY
- Standard: In accordance with BS 6150.
- Substrates: Sufficiently dry and sound in depth to suit coating.
- Efflorescence: Remove.
- Dirt, grease and oil: Remove.
  - Give notice if surfaces and/ or substrates have been contaminated.
- Joints, cracks, holes and other depressions:
  - Fill with stoppers and/ or fillers. Work well in and finish off flush with surface.
  - Provide smooth finish.
- Water based stoppers and fillers:
  - Apply before priming unless recommended otherwise by manufacturer.
  - If applied after priming: Patch prime.
- Oil based stoppers and fillers: Apply after priming.
- Surface irregularities: Finish smooth.
- Dust, particles and residues from abrasion: Remove.
- 'Wet paint' signs and barriers: Locate where necessary.

635 SERVICE EQUIPMENT, FIXTURES AND FITTINGS
- Preparation:
  - Items to be removed: Grilles, coverplates and other surface mounted fixtures. and Plant labels and/ or signage.
  - Surfaces to be cleaned: None.
  - Surfaces not to be coated: Radiator valves and stop valves.
PREPARING PREVIOUSLY COATED SURFACES
- Standard: In accordance with BS 6150, clause 11.5 and tables 19 and 20.
- Removing coatings: Do not damage substrate and adjacent surfaces or adversely affect subsequent coatings.
- Existing coatings on ironmongery:
  - Remove old coating marks. Clean and polish.
  - Do not remove hinges.
  - Refix ironmongery on completion.
- Loose, flaking or otherwise defective areas: Carefully remove to leave a firm surface.
- Alkali affected coatings: Completely remove.
- Problematic substrates: Give notice of the following:
  - Coatings suspected of containing lead.
  - Substrates suspected of containing asbestos.
  - Significant rot, corrosion or other degraded substrates.
- Retained coatings: Remove dirt, grease and contaminants.
- Gloss coated surfaces: Form a key for subsequent coat.
- Partly removed coatings:
  - Additional preparatory coats: Apply to restore original film thicknesses.
  - Junctions: Make surfaces flush.
- Completely stripped surfaces: Prepare as for uncoated surfaces.

PREPARING PREVIOUSLY COATED STEEL
- Existing defective coatings including primers: Remove to leave a firm edge and clean bright metal.
- Sound coatings: Form a key for subsequent coat.
- Corrosion and loose scale: Remove to leave bare metal.
- Residual rust: Remove.
- Remaining areas: Degrease.
- Bare areas: Re-prime as soon as possible.

PREPARING UNCOATED STEEL - MANUAL CLEANING
- Oil and grease: Remove.
- Corrosion, loose scale, welding slag and spatter: Remove.
- Residual rust: Treat using a proprietary removal solution.
- Primer: Apply as soon as possible.

PREPARING UNCOATED ALUMINIUM OR COPPER OR LEAD
- Surface corrosion: Remove and provide suitable surface for coating.

PREPARING AND DEALING WITH ORGANIC GROWTHS
- Loose growths and infected coatings: Scrape off and dispose of.
- Treatment biocide: Apply appropriate solution to growth areas and surrounding surfaces.
- Dead growth: Scrape off and dispose of.
- Residual effect biocide: Apply appropriate solution to inhibit re-establishment of growths.

PREPARING AND APPLYING SEALANTS
- General: Apply acrylic sealant to junctions of walls and ceilings with architraves, skirtings, movement joints and other trims.
- Preparation and application: As section Z22.
760 APPLYING COATINGS GENERALLY
  • Conditions: Maintain suitable temperature, humidity and air quality during application and drying.
  • Surfaces: Clean and dry at time of application.
  • Thinning and intermixing of coatings: Not permitted unless recommended by manufacturer.
  • Overpainting: Do not paint over intumescent strips or silicone mastics.
  • Priming coats:
    - Thickness: To suit surface porosity.
    - Application: As soon as possible on same day as preparation is completed.
  • Finish:
    - Even, smooth and of uniform colour.
    - Free from brush marks, sags, runs and other defects.
    - Cut in neatly.

770 COATING CONCEALED METAL SURFACES
  • General: Apply additional coatings to surfaces that will be concealed when fixed in place.

COMPLETION

910 REMOVED ITEMS
  • General: Refix when finishing coat is dry.

920 DOCUMENTATION
  • Maintenance instructions: Submit.
  • Record drawings: Submit.
S

Piped supply systems
Hot and cold water supply systems
S10 Hot and cold water supply systems

To be read with Preliminaries/ General conditions

GENERAL

120 COLD WATER SUPPLY SYSTEM Generally
- Type: Storage.
- Water meters: as fitted.
- Storage tank or cistern: Not required.
- Water treatment: Not required.
- Pipelines:
  - Below ground: As section Y10.
  - Above ground: As section Y10.
- Pipeline ancillaries: As section Y11.
- Thermal insulation:
  - Pipelines: As section Y30.
  - Tanks: Not required.
- Vibration isolation: Submit design and cost proposals.
- Sanitary appliances: as Architects drawings.
- Drinking water outlets: At kitchen sink.
- Flush control devices: Not required.
- Water coolers: Required.
- Controls: As section Y40.
- Accessories: n/a.
- Completion:
  - Cleaning and chemical treatment: Flushing and chemical treatment, as section Y12.
  - Plant and equipment identification: As section Y32.
  - Commissioning: Commissioning of cold water supply systems, as section Y50.
130 PUMPED COLD WATER SUPPLY SYSTEM To office
- Type: existing.
- Water meters: Not required.
- Pressure booster sets: as existing.
- Pumps: as existing.
- Storage tank or cistern: as existing.
  Water treatment: Not required.
- Pipelines:
  - Below ground: As section Y10.
  - Above ground: As section Y10.
- Pipeline ancillaries: As section Y11.
- Thermal insulation:
  - Pipelines: As section Y30.
  - Tanks: as existing.
- Vibration isolation: as existing.
- Sanitary appliances: as existing.
- Drinking water outlets: At kitchen sink.
- Flush control devices: as existing.
- Water coolers: Required.
- Controls: As section Y40.
- Accessories: n/a.
- Completion:
  - Cleaning and chemical treatment: Flushing and chemical treatment, as section Y12.
  - Plant and equipment identification: As section Y32.
  - Commissioning: Commissioning of cold water supply systems, as section Y50.

150 DIRECT HOT WATER STORAGE SUPPLY SYSTEM Office plantroom
- Storage unit: Unvented hot water storage.
  - Electric immersion heater: as existing.
  - System: as existing.
- Capacity: as existing.
- Pumps: as existing.
- Pipelines: As section Y10.
- Pipeline ancillaries: As section Y11.
- Thermal insulation:
  - Pipelines: As section Y30.
  - Cylinders: as existing.
- Vibration isolation: Not required.
- Sanitary appliances: as existing.
- Controls: As section Y40.
- Accessories: n/a.
- Completion:
  - Cleaning and chemical treatment: Flushing and chemical treatment, as section Y12.
  - Plant and equipment identification: As section Y32.
  - Commissioning: Commissioning of hot water supply systems, as section Y50.

SYSTEM PERFORMANCE

220 COLD WATER SUPPLY
- Incoming mains water supply:
  - Site factors: as existing.
- Type of system: as existing.
- Design parameters: as existing.
- Daily consumption: as existing.
- Storage capacity: as existing.
240 CENTRALIZED HOT WATER STORAGE SYSTEM
- System design: Design the system to meet the following requirements:
  - Storage capacity: as existing.
  - Primary heat source: Capable of raising temperature of water from 10°C to 60°C within one hour.
  - Temperature range of stored hot water: 60–65°C.
  - Type of building: Office.
  - Number of people: 200.
  - Water supply: as existing.

250 PIPELINE SIZES
- Sizing: Calculate sizes to meet simultaneous demand for the building in accordance with BS 6700 Appendix D or BS EN 806-3. Submit proposals.
- Performance:
  - Water velocity (maximum): 1.3 m/s for hot water and 2.0 m/s for cold water.
  - Filling time (maximum) for cold water storage cistern: Submit proposals.
DRAW OFF REQUIREMENTS

- **Baths (G¾):**
  - Type of supply: n/a.
  - Discharge rate (design): 0.3 L/s.

- **Baths (G1):**
  - Type of supply: n/a.
  - Discharge rate (design): 0.6 L/s.
  - Hot water discharge temperature (maximum): 48°C.

- **Bidets:**
  - Type of supply: n/a.
  - Discharge rate (design): 0.2 L/s.

- **Dish-washing machines:**
  - Type of supply: n/a.
  - Discharge rate (design): 0.15 L/s.

- **Handbasins (pillar or mixer taps):**
  - Type of supply: Hot and cold.
  - Discharge rate (design): 0.1 L/s.

- **Handbasin (spray or spray mixer taps):**
  - Type of supply: Hot and cold.
  - Discharge rate (minimum): 0.05 L/s.

- **Kitchen sinks (G¾):**
  - Type of supply: Hot and cold from mains.
  - Discharge rate (design): 0.2 L/s.

- **Kitchen sinks (G¾):**
  - Type of supply: Hot and cold from mains.
  - Discharge rate (design): 0.3 L/s.

- **Kitchen sinks (G1):**
  - Type of supply: Hot and cold from mains.
  - Discharge rate (design): 0.6 L/s.

- **Shower heads:**
  - Type of supply: Hot and cold.
  - Discharge rate (minimum): 0.2 L/s.

- **Urinal cisterns (each position served):**
  - Type of supply: Cold from cistern.
  - Discharge rate (design): 0.004 L/s.

- **Urinal flushing valve:**
  - Type of supply: Cold from cistern.
  - Discharge rate (design): 0.3 L/s.

- **Washbasins (pillar or mixer taps):**
  - Type of supply: Hot and cold.
  - Discharge rate (design): 0.15 L/s.

- **Washing machines:**
  - Type of supply: n/a.
  - Discharge rate (design): 0.2 L/s.

- **WC cisterns (to fill in 2 minutes):**
  - Type of supply: Boosted cold.
  - Discharge rate (design): 0.13 L/s.

- **WC flushing troughs:**
  - Type of supply: Boosted cold.
  - Discharge rate (design): 0.15 L/s.

- **WC pressure flushing valves:**
  - Type of supply: Boosted cold.
  - Discharge rate (design): 1.5 L/s.
PRODUCTS

310 DEZINCIFICATION
• Fittings, pipelines and equipment located below ground or in concealed or inaccessible locations: Resistant to dezincification, e.g. gunmetal.

490 WATER COOLERS
• Manufacturer: clients choice.
  - Product reference: Submit proposals.
• Type: -.
• Flow rate: -.
• Temperature of delivered water: -.
• Water inlet: 15mm.
• Power supply: -.

EXECUTION

610 STRIPPING OUT HOT AND COLD WATER SYSTEMS
• Extent of stripping out: as detailed on drawings

620 INSTALLATION OF HOT AND COLD WATER SYSTEMS GENERALLY
• Standard: To BS 6700 and BS EN 806-4.
• Performance: Free from leaks and the audible effects of expansion, vibration and water hammer.
• Fixing of equipment, components and accessories: Fix securely, parallel or perpendicular to the structure of the building.
• Preparation: Immediately before installing tanks and cisterns on a floor or platform, clear the surface completely of debris and projections.
• 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.

690 HYDRAULIC PRESSURE TESTING OF HOT AND COLD WATER SUPPLY SYSTEMS
• Standard: To BS 6700 and BS EN 806-4.
• Notice (minimum): 48 h.
• Pressure: 2 times working pressure.
• Duration of test: 1 h.

SYSTEM COMPLETION

810 DOCUMENTATION
• Manufacturers’ operating and maintenance instructions: Submit for equipment and controls.
• System operating and maintenance instructions: Submit for the system as a whole giving optimum settings for controls.
• Record drawings: Submit drawings showing the location of circuits and operating controls.
• Wholesome water consumption notice: Submit within five days.

830 OPERATING TOOLS
• Tools: Supply tools for operation, maintenance and cleaning purposes.
• Keys: Supply keys for valves and vents.

840 MAINTENANCE
• Servicing and maintenance: Undertake for 12 months after Practical Completion.
Heating, cooling and refrigeration
T10
Heating systems
T10 Heating systems

To be read with Preliminaries/ General conditions.

GENERAL

110 LOW TEMPERATURE HOT WATER HEATING SYSTEM Generally
• Type: Constant flow circuits and Variable flow circuits.
• Heat source: Existing gas boilers.
  - Flues and chimneys: Use existing.
• Pressurization units: Existing.
• Feed and expansion tanks: Not required.
• Pumps: Existing.
• Pipelines: Steel.
• Pipelines ancillaries: As section Y11.
• Thermal insulation: As section Y30.
• Vibration isolation: Submit design and cost proposals.
• Heat emitters: Fan coil units, as section U41 and Radiators, as section T30.
• Controls: As section Y40.
• Accessories: n/a.
• Completion:
  - Cleaning and chemical treatment: Flushing and chemical treatment, as section Y12.
  - Plant and equipment identification: Mechanical plant and equipment identification, as section Y32.
  - Commissioning:
    - Commissioning of heating systems, as section Y50;
    - Commissioning boiler plant, as section Y50; and
    - Performance testing, as section Y50.

SYSTEM PERFORMANCE

220 BASIC DESIGN TEMPERATURES
• Design temperatures: As room data sheets.
• External air temperature: -5°C.

250 SYSTEM OPERATING PARAMETERS
• Design flow temperature: Maximum 82°C.
• Temperature difference across primary heating circuit: 11°C.
• Temperature difference across primary hot water circuit: Maximum 11°C.
• Water velocity: Maximum 1.5 m/s.

EXECUTION

610 STRIPPING OUT
• Extent of stripping out: as detailed in drawings.

620 INSTALLING WATER BASED HEATING SYSTEMS
• Standard: To BS EN 14336.
COMPLETION

905 HYDRAULIC PRESSURE TESTING OF LOW TEMPERATURE HOT WATER HEATING SYSTEMS
   • Testing: In accordance with HVCA TR/6.
   • Notice (minimum): 48 h
   • Pressure: 2 times working pressure.
   • Duration of test: 1 h.

910 DOCUMENTATION
   • Operation and maintenance instructions: Submit.
   • Record drawings: Submit.

920 OPERATING TOOLS
   • Tools: Supply tools for operation, maintenance and cleaning purposes.
   • Keys: Supply keys for valves and vents.

930 MAINTENANCE
   • Servicing and maintenance: Undertake.
     - Duration: Until 12 months after Practical Completion.
T30
Heat emitters
T30 Heat emitters

To be read with Preliminaries/ General conditions.

PRODUCTS

320 FAN CONVECTORS Generally
• Standards: To BS EN 442-1, -2 and -3.
• Requirements: As Fan convector schedule.

350 RADIATORS Generally
• Standards: To BS EN 442-1, -2 and -3.
• Requirements: As Radiator schedule.
• Third party certification to RADMAC scheme: Not required.

EXECUTION

610 INSTALLATION GENERALLY
• Fixing: Securely and parallel or perpendicular to the structure of the building.
• Stud walls: Fix to studs and/ or noggins.
• Isolating valve: Provide on flow pipelines.
• Regulating valve: Provide on return pipelines.

620 INSTALLING UNIT HEATERS AND AIR CURTAINS
• Suspension: Fix high level supports.
T50
Chilled water systems
T50 Chilled water systems

To be read with Preliminaries/ General conditions.

GENERAL

110 CHILLED WATER SYSTEM Generally
   • System: Two pipe.
   - Pipeline circuits: Constant flow.
   • Cooling source: Air cooled liquid chiller, as section T60.
   • Pressurization units: Not required.
   • Pumps: Close coupled end suction pumps, as section Y20.
   • Pipelines: As section Y10.
   • Pipelines ancillaries: As section Y11.
   • Thermal insulation: As section Y30.
   • Vibration isolation: Submit design and cost proposals.
   • Emitters: Air handling units, as section U81 and Fan coil units, as section U41.
   • Controls: As section Y40.
   • Accessories: Submit design and cost proposals.
   • Completion:
     - Cleaning and chemical treatment: Flushing and chemical treatment as section Y12.
     - Plant and equipment identification: As section Y32.
     - Commissioning: Commissioning of chilled water systems, as section Y50.

SYSTEM PERFORMANCE

220 BASIC DESIGN TEMPERATURES
   • Design temperatures: As room data sheets.

250 SYSTEM OPERATING PARAMETERS
   • Design flow temperature: 6 ºC.
   • Temperature difference across water circuit: Maximum 6ºC.
   • Water velocity: Maximum 1.5 m/s.

EXECUTION

610 STRIPPING OUT
   • Extent of stripping out: as drawings.

COMPLETION

905 HYDRAULIC PRESSURE TESTING OF CHILLED WATER SYSTEMS
   • Testing: In accordance with HVCA TR/6.
   • Notice (minimum): 48 h.
   • Pressure: 2 times working pressure.
   • Duration of test: 1 h.

910 DOCUMENTATION
   • Operation and maintenance instructions: Submit.
   • Record drawings: Submit.
920 OPERATING TOOLS
   • Tools: Supply tools for operation, maintenance and cleaning purposes.
     - Quantity: 1 set.

930 MAINTENANCE
   • Servicing and maintenance: Undertake.
     - Duration: Until 12 months after Practical Completion.
T60
Central refrigeration plant
T60 Central refrigeration plant

To be read with Preliminaries/ General conditions.

PRODUCTS

330 AIR COOLED LIQUID CHILLERS
- Standards: To BS EN 14511-1, -2, -3 and -4.
- Type: submit proposals.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Output: as scheduled.
- Refrigerant: submit proposals.
- Chilled water entering temperature: 12°C.
- Chilled water leaving temperature: 6°C.
- Design ambient temperature: 25°C.
- Evaporator fouling factor: 0.0880 m²·K/kW.
- Energy efficiency ratio (EER): submit proposals.
- Sound pressure level: Submit proposals.
- Electrical supply type: Three phase.
- Number of refrigerant circuits: 2.
- Compressor start: Soft start.
- Refrigerant circuit accessories: submit proposals.
- Evaporators: submit proposals.
- Evaporator accessories: Electric heaters to prevent freezing down to -28°C ambient temperature, complete with thermostat.
- Condenser coils: Internally enhanced, seamless copper tubes mechanically expanded into aluminium alloy fins with full height collars. Integral subcooler circuit.
- Condenser fans: submit proposals.
- Condenser fan discharge: Vertical.
- Warning indication: submit proposals.
- Accessories: submit proposals.

430 REFRIGERANT PIPEWORK AND FITTINGS
- Standard: To BS EN 378-2.
- Pipelines: Manufacturer's standard.

EXECUTION

610 INSTALLATION GENERALLY
- Fixing of equipment and components: Fix on purpose made bases or supports.
- Pressure testing of joints: Immediately before installation of lagging and casing.
  - Results: Submit.

620 INSTALLING CHILLERS
- Location: Provide adequate space around chillers: For air circulation across the condenser heat transfer surface and For maintenance and servicing.
- Access: Provide for inspection and servicing of chiller and ancillary equipment.

640 INSTALLING REFRIGERANT PIPEWORK
- Standards: To BS EN 378-3 and -4.
- Refrigerant lines: Short and straight.
Ventilation and air conditioning systems
Ventilation systems
U10 Ventilation systems

To be read with Preliminaries/ General conditions

GENERAL

110 NATURAL VENTILATION SYSTEM Windows
- External air intake terminals: n/a.
- Room extract air terminal devices: windows.
- Air ductwork and ancillaries: n/a.
  - Accessories: na/.
- Room supply air terminal devices: n/a.
- External exhaust air terminals: n/a.
- Controls: n/a.
- Completion:
  - Identification of ductwork and equipment: Not required.
  - Testing and commissioning: n/a.

130 MECHANICAL SUPPLY VENTILATION SYSTEM Generally to Office spaces
- Location of plant: In adjacent depot mounted on new platform.
- Route of distribution: as detailed in drawings.
- Type of system: Multizone, constant volume.
- External air intake terminals: External louvres, as section U88.
- Air filters: In air handling units, as section U81.
  - Accessories: Submit design and cost proposals.
- Heat recovery: Thermal wheel, as section U85.
- Air handling units: As section U81.
  - Fabrication: Construction, as section U81.
- Supply fans: In air handling unit.
- Acoustic treatment: Acoustic lining, as section U87.
- Air ductwork and ancillaries:
  - Pre-insulated ductwork and fittings, as section U80;
  - Sheet metal ductwork and fittings, circular, as section U80; and
  - Sheet metal ductwork and fittings, rectangular, as section U80.
  - Accessories:
    - Dampers, fire and smoke, metal ductwork, as section U80;
    - Flexible ductwork, as section U80;
    - Guards, bird, as section U80; and
    - Guards, insect, as section U80.
- Thermal insulation on supply air ductwork: Ductwork carrying warm air, as section Y30.
- Vibration isolation mountings: Spring isolators, as section Y31.
- Reheat batteries: In air handling unit, as section U81.
- Room supply air terminal devices: Grilles, as section U88.
- Controls: As section Y40.
- Completion:
  - Identification of ductwork and equipment: As section Y32.
  - Testing and commissioning: Ductwork pressure testing, as section U80 and Air distribution system commissioning, as section Y50.
MECHANICAL EXTRACT VENTILATION SYSTEM Generally from Office spaces

- Room extract air terminal devices: Grilles, as section U88.
- Air ductwork and ancillaries:
  - Pre-insulated ductwork and fittings, as section U80;
  - Sheet metal ductwork and fittings, circular, as section U80; and
  - Sheet metal ductwork and fittings, rectangular, as section U80.
  - Accessories:
    - Dampers, fire and smoke, metal ductwork, as section U80;
    - Dampers, non return, as section U80;
    - Guards, bird, as section U80; and
    - Guards, insect, as section U80.
- Thermal insulation on extract air ductwork: Not required.
- Vibration isolation mountings: Spring isolators, as section Y31.
- Heat recovery: Thermal wheel, as section U85.
- Acoustic treatment: Acoustic lining, as section U87.
- Extract fans: Submit design and cost proposals.
- External exhaust air terminals: External louvres, as section U88.
- Controls: As section Y40.
- Completion:
  - Identification of ductwork and equipment: As section Y32.
  - Testing and commissioning: Ductwork pressure testing, as section U80 and Air distribution system commissioning, as section Y50.

TOILET EXTRACT VENTILATION SYSTEM Existing system

- Room extract air terminal devices: Existing.
- Air ductwork and ancillaries: Sheet metal ductwork and fittings, circular, as section U80 and Sheet metal ductwork and fittings, rectangular, as section U80.
- Accessories: Submit design and cost proposals.
- Thermal insulation on extract air ductwork: Not required.
- Vibration isolation mountings: Not required.
- Acoustic treatment: Submit design and cost proposals.
- Extract fans: Existing.
- External exhaust air terminals: Existing.
- Controls: As section Y40.
- Completion:
  - Identification of ductwork and equipment: As section Y32.
  - Testing and commissioning: Ductwork pressure testing, as section U80 and Air distribution system commissioning, as section Y50.

EXECUTION

INSTALLING DUCTWORK ON AIR HANDLING UNITS

- Air discharge: Connect ductwork to allow air to straighten as it leaves the air handling unit.

COMPLETION

DOCUMENTATION

- Operation and maintenance instructions: Submit.
- Record drawings: Submit.
U41
Fan coil units
U41 Fan coil units

To be read with Preliminaries/ General conditions.

PRODUCTS

310 FAN COIL UNITS Offices
- Performance: To BS 4856.
- Manufacturer: Dunham Bush.
  - Product reference: as schedules.
- Water temperature:
  - Heating flow: 82 °C.
  - Heating return: 71 °C.
  - Chilled water flow: 6 °C.
  - Chilled water return: 12 °C.
- Primary air supply:
  - Volume: as ventilation drawings.
  - Dry bulb: As Fan coil schedule.
  - Wet bulb: As Fan coil schedule.
- Fan speed: Low.
- Noise levels: Submit proposals.
- Electrical supply type: Single phase.
- Casings: Manufacturer's standard.
- Mounting: Horizontal.
- Finish: Manufacturer's standard.
- Ductwork connections: supply only.
- Access: Provide access to filter, fan and motor, valves and controls.
- Drip tray:
  - Position: Under coil, and under control valve where fitted.
  - Material: Corrosion resistant.
  - Condensation: Insulate external faces to prevent.
- Controls: temperature / timeschedule.
- Accessories: n/a.

EXECUTION

610 FAN COIL UNIT DRAIN LINE
- Drain connections: Connect drainline flush with bottom of drip tray.
- Drain line material: contractors choice.
U80
Air ductwork and ancillaries
U80 Air ductwork and ancillaries

To be read with Preliminaries/ General conditions

PRODUCTS

305 DAMPERS, FIRE AND SMOKE, METAL DUCTWORK Generally
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Standard:
  - Fire dampers: To BS EN 15650.
  - Test: To BS EN 1366-2.
- Type: Folding curtain blades out of air stream.
- Classification: E240.
- Material: Steel.
- Accessories: External visual indication of fire damper blade position.
- Fusible links:
  - Fusing temperature: 72°C.
  - Spare fusible links: 1.

310 DAMPERS, NON-RETURN Generally
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Standard: To BS EN 1751.
- Leakage through closed blades: Class 0.
- Casing leakage: A.
- Pressure: Negative.
- Material: Submit proposals.

330 DAMPERS, SHUT OFF Generally
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Standard: To BS EN 1751.
- Leakage through closed blades: Class 1.
- Casing leakage: A.
- Pressure: Negative.
- Setting: 100%.
- Material: Submit proposals.
- Control method: manual.

340 FLEXIBLE DUCTWORK Generally
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Standard: To HVCA DW/144.
- Material: Contractors choice.

350 GUARDS, BIRD
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Material: Black PVC coated 12 mm square mesh steel wire. Wire gauge at least 1 mm.
GUARDS, INSECT
- Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
- Material: Black PVC coated 3.15 mm square mesh steel wire. Wire gauge at least 1 mm.

ACCESS DOORS generally.
- Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
- Material: Galvanized sheet steel.

FABRICATION

PRE-INSULATED DUCTWORK AND FITTINGS Where detailed on drawings
- Manufacturer: isover.
  - Product reference: as detailed in drawings.
- Standard: To BS EN 13403.
- Insulation material: Manufacturer's standard.
- Internal and external material: Manufacturer's standard.
- Finish: Manufacturer's standard.
- Hangers and supports: As section Y31.
- Accessories:
  - Materials: Compatible with ductwork.
  - Finish: To match ductwork.
- Access openings:
  - Function:
    - Inspection;
    - Cleaning; and
    - Maintenance.
  - Sizes: To BS EN 12097.

SHEET METAL DUCTWORK AND FITTINGS, CIRCULAR Generally
- Standards: To HVCA DW/144, BS EN 1506 and BS EN 12237.
- Classification to DW/144: Class A.
- Air leakage testing: Required.
- Special installations: Not applicable.
- Material: Mild steel.
- Construction: Spirally wound.
- Regulating dampers:
  - Standard: As HVCA DW/144.
  - Balancing type: Double skin multi-blade damper.
  - Material: To match ductwork.
- Flexible joint connections: Fit on fan inlets and outlets and at building expansion joints.
- Hangers and supports:
  - Standard: To HVCA DW/144.
  - Strength requirements: To BS EN 12236.
- Access openings:
  - Function:
    - Inspection;
    - Cleaning; and
    - Maintenance.
  - Sizes: To HVCA DW/144, Appendix D.
SHEET METAL DUCTWORK AND FITTINGS, RECTANGULAR

- Standards: To HVCA DW/144 and BS EN 1505.
- Classification to DW/144: Class A.
- Air leakage testing: Required.
- Special installations: Not applicable.
- Material: Mild steel.
- Regulating dampers:
  - Standard: To HVCA DW/144.
  - Balancing type: Double skin multi-blade damper.
  - Material: To match ductwork.
- Flexible joint connections: Fit on fan inlets and outlets and at building expansion joints.
- Hangers and supports:
  - Standard: To HVCA DW/144.
  - Strength requirements: To BS EN 12236.
- Access openings:
  - Function: Inspection, Cleaning, and Maintenance.
  - Sizes: To HVCA DW/144, Appendix D.

EXECUTION

AIR DUCTWORK GENERALLY
- Cut edges on ductwork, flanges and supports: Smooth and burr free.

INSTALLATION OF SHEET METAL DUCTWORK
- Standard: To HVCA DW/144.
- Installing flexible joint connections: Install fully stretched to minimize pressure drop.

INSTALLING DUCTWORK SUPPORTS
- Standard: In accordance with DW/144.

SUPPORT OF AIR TERMINAL UNITS IN CEILING GRIDS
- Standard: To HVCA DW/144.
- Special supports: contractors choice.
- Position: Agree final position of air terminals before installation.

COMPONENT SUPPORT ON PRE-INSULATED DUCTWORK
- Standard: To BS EN 12236.
- Support spacing (maximum):
  - Ducts with dimensions less than 1 m: 4 m.
  - Ducts with dimensions over 1 m: 2 m.
- Accessories: Provide independent support.

DUCTWORK SUPPORT FOR VAPOUR SEAL CONTINUITY
- Method of support: Ensure vapour seal is maintained throughout.

DRAINAGE OF DUCTWORK
- Ductwork: Install to drain entrained moisture
- Joints: Lap to minimize moisture leakage.

TEST HOLES IN DUCTWORK
- Location: In accordance with CIBSE Commissioning Code Series A and HVCA DW/144.
725 INSTALLING FIRE AND SMOKE CONTROL DAMPERS
   • Standard: In accordance with ASFP Fire dampers, Grey book and In accordance with HVCA DW/145.

730 FIRE RATED DUCTWORK SLEEVES
   • Location: generally.
   • Material: To match ductwork.

740 INSTALLING CONTROL EQUIPMENT AND INSTRUMENTS IN METAL DUCTWORK
   • General: Fit sensors, damper motors and other control equipment.
   • Connections: Connect control equipment and instruments.

750 ACCESS TO DAMPERS FOR RESETTING AND MAINTENANCE
   • Location: 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.
   • Fire links: Provide access so that they can be replaced.

790 AIR LEAKAGE TESTING OF PLANT ITEMS
   • Standard: To HVCA DW/144.
   • Procedure: Include in-line plant with certificate of conformity for pressure class and air leakage classification for system under test.
   • Report:
     - Format: Electronic.
     - Submit: At handover.
     - Number of copies: 2.
U81
Air handling units
U81 Air handling units

To be read with Preliminaries/ General conditions

PRODUCTS

310 AIR HANDLING UNITS Office AHU
- Manufacturer: Submit proposals.
- Product reference: Submit proposals.
- Standard: To BS EN 13053.
- Duty: on drawings.
- Environment: Internal.
- Construction: Double skin.
- Arrangement: Draw through.
- Method of support: on platform.
- Anti-vibration mountings: As section Y31.
- Components:
  - Air control dampers;
  - Dampers, as section U80;
  - Primary filters;
  - Filters, as section U83;
  - Preheaters;
  - Cooling coils;
  - Heating coils, as section U84;
  - Cooling coils, as section U84;
  - Heat recovery, as section U85;
  - Fans;
  - Fans, as section U82;
  - Attenuator; and
  - Attenuators, as section U87.
- Flexible connections: As section U80.
- Positions for maintenance access: manufacturers standard.
- Direction of airflow: Horizontal.

320 AIR CONTROL DAMPERS generally
- Function: Mixing.
- Air volume: As AHU schedule.
- Damper position: horizontal.
- Type: Manufacturer's standard.
- Material: Manufacturer's standard.
- Ancillaries Position indicator.

330 PRIMARY FILTERS In AHU
- Standards: To BS EN 779 and Eurovent 4/9.
- Class of filter: standard.
- Filter type: Bag.
- Flammability: Non-flammable.
- Access: Manufacturer's standard.

360 PREHEATERS AHU
- Medium: Low temperature hot water.
- Materials: Manufacturer's standard.
370 COOLING COILS AHU
- Medium: Chilled water.
- Materials: Manufacturer's standard.
- Airflow: Evenly distributed over face area of coil.
- Air velocity: Ensure it is below level at which moisture carryover occurs.
- Condensate drain lines:
  - Trap: Provide to prevent flooding.
  - Size: At least that of the drain pan connection.

390 FANS AHU
- Performance: In accordance with BS 6583.
- Type of fan: Centrifugal.
- Motor mounting: Internally.
- Blow through units: Arrange section to allow uniform velocity profile downstream.
- Accessories: n/a.

405 ATTENUATOR for AHU.
- Performance requirements:
  - Standards: To BS EN ISO 7235 and BS EN ISO 11691.
  - Insertion loss: pa.
- Lining material: Inert, fire proof, inorganic and non-hygroscopic.
- Splitters: Manufacturer's standard.

410 DRAIN LINES
- Drain lines: Provide, with traps, from sections where water may collect.
- Material: Glass.

FABRICATION

510 AIR HANDLING UNIT CASING CONSTRUCTION Office AHU
- Standard: To BS EN 1886.
- Details: Submit proposals.
- Casing class: 1.
- Thermal performance of casing:
  - Thermal transmittance: T1.
  - Thermal bridging: TB1.
- Acoustic insulation of casing: yes.
- Fire protection: Category A.
- Material: Manufacturer's standard.
  - Finish: Manufacturer's standard.
- Air handling unit feet: Manufacturer's standard.
- Anti-vibration mountings: As section Y31.
- Flexible connections: As section U80.
- Special requirements: None.
520  AIR HANDLING UNIT ACCESS
• General: Provide access openings and covers complete, including opening devices.
• Seal: To prevent excessive air leakage.
• Seal durability: For normal maintenance operations over at least 10 years.
• Access type: Hinged doors.
• Access clear width (minimum): 400 mm.
• Opening device: Interlock door handles.
• Components requiring access:
  - Primary filters;
  - Cooling coils;
  - Hot water coils; and
  - Fans.

EXECUTION

610  COMPONENT ASSEMBLY
• Sealing: Provide gaskets between air handling unit sections to prevent air leakage from casing.
• Site drilling of air handling unit: Submit method statement.

620  ACCESS
• Access space: Position air-handling units to allow space for maintenance and access.

630  COIL INSTALLATION GENERALLY
• Venting and draining: Set out pipelines to and from the coils to allow venting and draining of the coils and piping.
• Support: Do not support pipelines and valves on coil connections.
• Access: Allow space to inspect and maintain the coils on both sides.

640  HOT WATER COILS INSTALLATION
• Expansion: Connect pipelines to allow free expansion of headers and tubes.

650  DRAIN LINES INSTALLATION
• Fall: 10 mm/m.
• Discharge: To a tundish or other form of air break.
• Clean-out plugs: Fit at each change of direction in the drain line.

660  SERVICES CONNECTIONS
• Entry points: Seal around electrical cable and pipeline entry points to prevent air leakage.
• Flexible cables: Provide between fan motor and local isolator.

670  ISOLATION OF AIR HANDLING UNITS
• Electrical connections: Provide means of isolating air-handling units electrically.
• Pipe connections: Provide means of isolating pipelines to air-handling units.
• Steam: Provide means of isolating steam to humidifier when access door is opened.

680  SUPPORT FOR AIR HANDLING UNITS
• Method: Builder's work base.

700  PRE-COMMISSIONING OF COILS
• Preparation: Straighten fins.
• Cleaning and chemical treatment: Use chemicals compatible with the materials in the coils.

710  AIR LEAKAGE TESTING
• Testing: In accordance with HEVAC Guide to air-handling unit leakage testing.
TESTING
- Test location: Factory.
- Test results: Submit on completion.
U82
Fans
U82 Fans

To be read with Preliminaries/ General conditions

PRODUCTS

360 | TOILET EXTRACT FANS existing
---|---
• Performance: To BS 848-1.
  - Inlet and outlet arrangement: A.
• Manufacturer: Existing
  - Product reference: Existing
• Duty
  - Air volume: Existing
  - Resistance: Existing.
  - Sound power level: Existing.
• Electrical safety: To BS EN 60335-2-80.
• Operation: Existing
• Location: Existing
• Materials: Existing
• Electrical supply type: Existing.
• Accessories:
  - Access panel: Existing
  - Controls: Speed controller to match fan, with on/off and auto-changeover.
  - Silencer.
  - Backdraught damper.
  - Anti-vibration mount.
  - Guards.

370 | CONSTRUCTION AND HANDLING
---|---
• Casings: Rigid, so there is no drumming under operating conditions.
• Lifting: Provide lifting eyebolts or similar facilities on fans or sections heavier than 20 kg.

EXECUTION

610 | INSTALLATION
---|---
• Fixing: Use fixing points provided. Do not strain the fan structure when bolts are tightened.
• Orientation: Mount impeller shaft horizontally.
• Alignment: Install fan to allow optimum air flow path.
U84
Heating and cooling coils
U84 Heating and cooling coils

To be read with Preliminaries/ General conditions

PRODUCTS

310  LOW TEMPERATURE HOT WATER HEATING COILS  AHU and FCU

- Performance: To BS 5141-2 and BS EN 1216.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Duty: As Heating and cooling coils schedule.
- Hot water flow temperature: 82 °C.
- Hot water return temperature: 71 °C.
- Materials: Manufacturer's standard.
- Tube wall thickness: At least 0.7 mm.
- Fin thickness (minimum):
  - Aluminium: 0.4 mm.
  - Copper: 0.3 mm.
- Fin spacing (maximum): 330 fins per metre.
- Thermal expansion: Allow for movement.
- Casing finish: Galvanized mild steel.
- Access doors: Hinged, airtight and watertight for maintenance.
- Draining and venting: Provide with venting and draining devices.
- Water test pressure: Up to 2.1 MPa or 1.5 times the working pressure, whichever is greater.
- Packaging: Fit protection for fins before despatch.
- Protection: Fit blank flanges or caps to pipe connections after manufacture.
- Accessories Matching pipeline flanges.
CHILLED WATER COOLING COILS AHU and FCU

- Performance: To BS 5141-1 and BS EN 1216.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Duty: As Heating and cooling coils schedule.
- Chilled water flow temperature: 6 ° C.
- Chilled water return temperature: 12 ° C.
- Materials: Manufacturer's standard.
- Tube wall thickness: At least 0.7 mm.
- Fin thickness (minimum):
  - Aluminium: 0.4 mm.
  - Copper: 0.3 mm.
- Fin spacing (maximum): 330 fins per metre.
- Casing:
  - Finish: Hot dipped galvanized.
  - Return bends: Provide removable covers. Lag and vapour seal the bends.
- Condensate drain trays:
  - Vertical interval spacing (maximum): 1 m.
  - Construction: Black mild steel at least 2 mm thick, galvanized after manufacture, and then coated on the inside with bituminized paint.
  - Drain connection size (minimum): 22 mm.
- Eliminator plates: Install downstream of coils if face velocity will exceed 2.25 m/s.
  - Material: Match coil casing.
- Draining and venting: Provide with venting and draining devices.
- Access doors: Hinged, airtight and watertight for maintenance.
- Water test pressure: Up to 2.1 MPa or 1.5 times the working pressure, whichever is greater.
- Packaging: Fit protection for fins before despatch.
- Protection: Fit blank flanges or caps to pipe connections after manufacture.
- Accessories Matching pipeline flanges.

DRAIN TRAPS

- Material: Glass.

EXECUTION

INSTALLATION

- Equipment, controls and instruments positioned next to heating coils: Protect from thermal radiation.
- Fixings: Support coils independently of ductwork.

ELIMINATOR PLATES INSTALLATION

- General: Fit to allow removal from coil casing.

DRAIN TRAP INSTALLATION

- Air break: Locate between trap outlet and drainage system.
- Traps under suction: Install the outlet below the inlet by a depth equivalent to at least one and a half times working pressure.
- Traps under positive pressure: Install inlet and outlet at same level.
U85
Heat recovery
U85 Heat recovery

To be read with Preliminaries/ General conditions

PRODUCTS

330 THERMAL WHEELS AHU
- Manufacturer: Submit proposals.
- Product reference: Submit proposals.
- Duty: Submit proposals.
- Rotor: Hygroscopic.
- Access doors: Hinged, airtight and watertight for maintenance.
- Accessories: Speed controller.

EXECUTION

610 SUPPORT
- Fixings: Support heat recovery devices independently of ductwork.

620 INSTALLING ELIMINATOR PLATES
- General: Fit to allow removal from coil casing.
- Locate: Downstream.

630 INSTALLING DRAIN TRAPS
- Air break: Locate between trap outlet and drainage system.
- Traps under suction: Install the outlet below the inlet by a depth equivalent to at least one and a half times working pressure.
- Traps under positive pressure: Install inlet and outlet at same level.
Silencers and acoustic treatment
U87 Silencers and acoustic treatment

To be read with Preliminaries/General conditions

PRODUCTS

310 CIRCULAR SILENCERS generally
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Application: Supply.
- Performance requirements: To BS EN ISO 7235 and BS EN ISO 11691.
  - Insertion loss: See Silencer schedule.
  - Air flow: See Silencer schedule.
  - Permissible pressure loss: Submit proposals.
- Casing material: Metal.
- Lining material: Inert, fire proof, inorganic and non-hygroscopic.
- Duct connections: Manufacturer's standard.
- Markings: Show direction of air flow on silencer.

320 RECTANGULAR SILENCERS generally
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Application: Supply.
- Performance requirements: To BS EN ISO 7235 and BS EN ISO 11691.
  - Insertion loss: See Silencer schedule.
  - Air flow: See Silencer schedule.
  - Permissible pressure loss: Submit proposals.
- Casing material: Metal.
- Lining material: Inert, fire proof, inorganic and non-hygroscopic.
- Duct connections: Manufacturer's standard.
- Splitters: Low loss fairings on entry only.
- Markings: Show direction of air flow on silencer.

330 AIR TRANSFER AND CROSS TALK ATTENUATORS Meeting rooms
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Performance requirements: To BS EN ISO 7235 and BS EN ISO 11691.
  - Insertion loss: Submit proposals.
  - Air flow: Submit proposals.
  - Permissible pressure loss: Submit proposals.
- Casing material: Metal.
- Lining material: Inert, fire proof, inorganic and non-hygroscopic.
- Duct connections: Manufacturer's standard.

EXECUTION

610 ACOUSTIC LININGS
- Access: Where personnel access is provided, protect acoustic linings to prevent damage.

620 INSTALLING LOUVRES
- Positioning: In accordance with CIBSE TM21.
Air terminal devices
U88 Air terminal devices

To be read with Preliminaries/General conditions

PRODUCTS

330 DIFFUSERS generally
- Performance:
  - Mixed flow applications: To BS EN 12238.
  - Sound power levels: To BS EN ISO 5135.
- Application: Supply.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Duty: As Grille and diffuser schedule.
- Core velocity (maximum): As Grille and diffuser schedule.
- Sound power levels: As Grille and diffuser schedule.
- Diffuser: Multi-core.
- Shape: Rectangular.
- Arrangement: Non-adjustable.
- Position: Ceiling.
- Material: Aluminium.
  - Finish: Epoxy resin powder/hardener coating.

360 DIFFUSERS, LINEAR Generally
- Performance:
  - Mixed flow applications: To BS EN 12238.
  - Sound power levels: To BS EN ISO 5135.
- Application: Supply.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Duty: As Grille and diffuser schedule.
- Core velocity (maximum): As Grille and diffuser schedule.
- Sound power levels: As Grille and diffuser schedule.
- Diffuser: Rectangular linear.
- Arrangement: Non-adjustable.
- Position: Ceiling.
- Material: Aluminium.
  - Finish: Epoxy resin powder/hardener coating.

380 EXTERNAL LOUVRES AHU
- Application: Supply+Extract.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Duty: As Louvre schedule.
- Construction: Robust with purpose made subframe. Provide integral drainage channels and drip cills.
- Configuration: In modular panel form.
- Screen: Bird-screen across inside face of louvres.
390  GRILLES  generally
   •  Performance:
     - Mixed flow applications: To BS EN 12238.
     - Displacement flow applications: To BS EN 12239.
     - Sound power levels: To BS EN ISO 5135.
   •  Application: Extract.
   •  Manufacturer: Submit proposals.
     - Product reference: Submit proposals.
   •  Duty: As Grille and diffuser schedule.
   •  Core velocity (maximum): As Grille and diffuser schedule.
   •  Sound power levels: As Grille and diffuser schedule.
   •  Shape: Rectangular.
   •  Grille type: Fixed bar.
   •  Position: Ceiling.
   •  Material: Aluminium.
     - Finish: Epoxy resin powder/ hardener coating.

410  PLENUM BOXES, CEILING OR WALL MOUNTED  Generally
   •  Duty: As Grille and diffuser schedule.
   •  Configuration: Single plenum box or a series of plenum boxes butted together to form a continuous length.
   •  Construction: Sturdy and rigid with circular inlet spigots of 65 mm minimum length.
   •  Fixing: Incorporate means for fixing to, or suspending from, building or other construction.

430  VENTILATED CEILINGS  Generally
   •  Manufacturer: Submit proposals.
     - Product reference: Submit proposals.
   •  Duty: As Grille and diffuser schedule.
   •  Core velocity (maximum): As Grille and diffuser schedule.
   •  Sound power levels: As Grille and diffuser schedule.
   •  Application: Extract.
   •  Air distribution: Mixed flow.

EXECUTION

610  INSTALLATION
   •  General: Do not distort air terminal devices. Fix securely.
   •  Air leakage: Prevent. Seal joints with self adhesive foam strip or equivalent.
   •  Appearance: Finish visible edge joints neatly. Do not leave sharp edges and protruding screws.

620  FIXING CIRCULAR AND RECTANGULAR DIFFUSERS
   •  Method: Hidden screw.

640  FIXING LINEAR AND SLOT DIFFUSERS
   •  Method: Bracket from plenum box.

660  FIXING GRILLES
   •  Method: Concealed with rear bracket.

670  OPERATION
   •  General: Fit so that moving parts operate correctly and removable cores can be taken out and replaced.
   •  High level and ceiling applications: On removable cores, provide safety wires with quick release ends.
680 BLANKING PLATES
   • Location: Where needed to restrict projection of air flow from section of grille or diffuser.

690 INSTALLING LOUVRES
   • Positioning: In accordance with CIBSE TM21.

COMPLETION

910 SPARES
   • Loose keys: Supply for adjusting each size and type of grille, and for operating accessories.
     - Quantity: 2.
Y

General engineering services
Y10
Pipelines
Y10 Pipelines

To be read with Preliminaries/ General conditions.

GENERAL

110 STEEL PIPELINES FOR CHILLED WATER SYSTEMS and FOR LOW TEMPERATURE HOT WATER HEATING SYSTEMS
- Thickness series for tubes to BS EN 10255: Medium.
- Quality for tubes to BS EN 10216-1 or BS EN 10217-1: TR1.
- Finish: Varnish.
- Jointing method:
  - Permanently concealed: Welded class 1.
  - Accessible: Screwed up to and including 50 mm.
- Pipe supports: As section Y31.

120 COPPER PIPELINES
- FOR COLD FEED AND VENTS;
- FOR COLD WATER SUPPLY SYSTEMS;
- FOR HOT WATER SUPPLY SYSTEMS; and
- FOR HOT AND COLD WATER SUPPLY SYSTEMS
- Standard: To BS EN 1057
- Grade: R250.
- Finish: Chrome and Plain.
- Jointing method:
  - Permanently concealed: Brazed.
  - Accessible: Brazed.
- Pipe supports: Required.

136 PLASTICS CONDENSATE DRAINAGE PIPELINES generally
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Pipe and fittings: PE-X.
  - Classification to BS 7291-1: Not applicable.
  - Classification to BS EN ISO 15875-1 or BS EN ISO 15877-1: Not applicable.
  - Colour: Contractor's choice.
- Jointing method: To suit tube.
- Pipe supports: As section Y31.

PRODUCTS

310 STEEL TUBES
- < 150 mm: To BS EN 10255.
- 150 mm and above: To BS EN 10216-1 and BS EN 10217-1.

320 JOINTING MATERIALS FOR STEEL TUBES
- Jointing compound: To BS 6956-5.
- PTFE tape: To BS EN 751-3.
- Flange jointing rings: To BS EN 1514-4.
- Elastomeric gaskets: To BS EN 681-1.
- Welding rods:
  - Gas welding: To BS EN 12536.
  - Arc welding: To BS EN ISO 636.
330 FITTINGS FOR STEEL TUBES
- Malleable: To BS 143 and BS 1256.
- Flanged: To BS EN 1092-1.
- Welded: To BS EN 10253-1 and BS EN 10253-2.
- Mechanical couplings: Manufacturer's standard.

340 COPPER TUBES
- Standard: To BS EN 1057.
  - Buried R220.
  - Above ground R250.

350 JOINTING MATERIALS FOR COPPER TUBES
- Solder for capillary fittings: To BS EN ISO 9453.
- Lead free solder for capillary fittings: To BS EN ISO 9453.
- Brazing filling: To BS EN 1044.
- Flange jointing rings: To BS EN 1514-4.

360 FITTINGS FOR COPPER TUBES
- Capillary: To BS EN 1254-1.
- Compression: To BS EN 1254-2.
- Flanges: To BS EN 1092-3.
- Press fittings: To manufacturer's standard.

375 CROSS LINKED POLYETHYLENE (PE-X) TUBES
- Standard:
  - Pipe: BS 7291-3.
  - Fittings: BS 7291-3.

385 JOINTING MATERIALS FOR PLASTICS TUBES
- Standards:
  - Compression: To BS EN 1254-3.
  - Electrofusion: To BS EN 12201-3.
  - Socket and spigot: To BS EN 12201-3.
  - Solvent cement: To BS EN ISO 1452-3.
  - Elastomeric ring seal: To BS EN ISO 1452-3.

490 PIPELINE SUPPORTS Generally
- Type: Submit proposals.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Material: To suit pipeline.
EXECUTION

605 PIPELINES INSTALLATION GENERALLY
- Installation: In accordance with the latest edition of HVCA TR/20.
- Appearance: Install exposed pipe runs parallel with other pipe or service runs and building structure, taking account of gradients for draining or venting. Set vertical pipes plumb, or follow building line.
- Gradients: Install with gradients to allow drainage and air release.
- Air venting: Provide vents at high points.
- Draining: Provide drains at low points.
- Pipeline expansion and contraction: Arrange supports and fixings to accommodate pipeline movement caused by the thermal changes. Allow for movement at branch connections.
- Pipeline support: Arrange supports and accessories for equipment, appliances and ancillary fitments in pipelines, so that no undue strain is imposed upon pipes.
- Dirt, insects and rodents: Prevent ingress.

610 SPACING OF PIPELINES
- Minimum clearance between insulated pipelines and:
  - Wall finish: 25 mm.
  - Ceiling finish or soffit: 100 mm.
  - Floor finish: 150 mm.
  - Electrical services: 150 mm.
  - Adjacent services: 100 mm.
  - Uninsulated pipeline: 75 mm.
  - Another insulated pipeline: 25 mm.
- Minimum clearance between uninsulated pipelines and:
  - Wall finish: 25 mm.
  - Ceiling finish or soffit: 100 mm.
  - Floor finish: 150 mm.
  - Electrical services: 150 mm.
  - Adjacent services: 150 mm.
  - Another uninsulated pipeline: 25 mm.

625 PIPELINE FITTINGS
- Reductions and enlargements:
  - On horizontal pipeline runs: Eccentric.
  - On vertical pipeline runs: Concentric.
- Bushes: Use only at radiators.
- Square tees: Provide at vent and drain points.
- Square elbows: Do not use.
- Fabricated junctions and fittings: Same material as the main pipeline.
- Demountable joints: Regularly spaced along pipeline runs and at items of equipment.

630 PIPELINE SLEEVES
- Sleeves: Fit to pipes passing through building fabric.
- Material: Match pipeline.
- Size: One or two sizes larger than pipe to allow clearance.
- Finish: Install sleeves flush with building finish. In areas where floors are washed down, install protruding 100 mm above floor finish.
- Masking plates: Fit at visible penetrations, including through false ceilings of occupied rooms.

635 DISSIMILAR METALS
- Electrolytic corrosion: Prevent.
ANCHORS GENERALLY
- Design: To resist axial stress transmitted by flexure of horizontal and vertical pipe runs, and loading on vertical pipes.
- Fixings: Provide associated backing plates, nuts, washers and bolts for attachment to, or building into building structure.
- Building structure: Suitable for transmitted stress.

ANCHORS FOR STEEL PIPES
- Anchor: Two slip on flanges welded to pipes, bolted together through a carbon steel channel section.
- Fixing: Bolted to building structure.
- Pipe restraints: Carbon steel overstraps or heavy U-bolts welded to pipes.

ANCHORS FOR COPPER PIPES
- Anchor: Two flanges fixed to copper female adaptors.
- Anchor fixing: Bolted to building structure.
- Pipe restraints: Saddle clamps.

SLIDE GUIDES
- Expansion and contraction: Direct movement from pipe anchor points towards loops, bellows or flexible inserts.
- Thrust: Linear relative to the axis of pipe.
- Friction: Apply a friction reducing material between metal faces subjected to movement.

WELDING STEEL PIPEWORK GENERALLY
- Standard: In accordance with HVCA TR/5.
- Welder identification: Mark each weld to identify operative.
- Non-destructive testing method: Not required.
- Completed welds: Wire brush and protect from corrosion.

FLANGED JOINTS IN STEEL PIPES
- Preparation:
  - Flange mating faces: Parallel.
  - Flange peripheries: Flush with each other.
  - Bolt holes: Align correctly.
- Screwed flanges: Apply jointing materials. Screw on flange. Expand tube into flange.
- Making and sealing: Insert jointing between flange mating faces. Tighten joint equally all round.

SCREWED JOINTS IN STEEL PIPES
- Preparation of plain ends: Cut square. Ream out bore. Screw, taper thread.
- Making and sealing: Coat male pipe threads with jointing compound and hemp, or PTFE tape on small sizes. Immediately after connect with female end of socket or fitting, and tighten. Remove coating intruding into pipe. Leave joint clean.

MECHANICAL JOINTS IN GROOVED STEEL AND STAINLESS STEEL PIPES
- Preparation: Cut ends square, free of bumps, dents and score marks within manufacturer's tolerances. Form groove and assemble.
- Making and sealing: Thoroughly lubricate gasket, externally and internally. Stretch over pipe end and bring pipe ends together. Slide gasket into central position over both pipe ends. Position joint half housings over gasket and insert bolts, nuts and electrical continuity clip if required. Tighten bolts. Check alignment of joint and pipework.
690 **BRAZED JOINTS IN COPPER AND COPPER ALLOY PIPES**
- Preparation, marking and sealing: In accordance with BS EN 14324.
- Brazing alloy filler: Silver.

700 **CAPILLARY JOINTS IN COPPER PIPES**
- Standard: To BS EN 1254-1.
- Preparation: Cut square and deburr. Clean plain ends using fine steel wool.

710 **COMPRESSION JOINTS IN COPPER PIPES**
- Standard: To BS EN 1254-2.
- Preparation: Cut square and deburr.
- Making and sealing:
  - Type A: Compress ring onto the wall of the tube.
  - Type B: Compress the formed portion of the tube against the formed end of the fitting.

715 **MECHANICAL JOINTS IN GROOVED COPPER PIPES**
- Preparation: Cut ends square, free of bumps, dents and score marks within manufacturer's tolerances. Form groove and assemble.
- Making and sealing: Thoroughly lubricate gasket, externally and internally. Stretch over pipe end and bring pipe ends together. Slide gasket into central position over both pipe ends. Position joint half housings over gasket and insert bolts, nuts and electrical continuity clip if required. Tighten bolts. Check alignment of joint and pipework.

**COMPLETION**

910 **GENERAL INSPECTION AND TESTING**
- Inspection of joints: Cut out, cut open and inspect.
  - Number of joints: 2.
- Safety precautions: In accordance with HSE GS4.
Y11
Pipeline ancillaries
**Y11 Pipeline ancillaries**

To be read with Preliminaries/ General conditions.

**GENERAL**

120 **PIPELINE ANCILLARIES FOR HOT AND COLD WATER SUPPLY**

- Float valves: Diaphragm type, plastics body and Floats for ball valves.
- Isolating valves: Ball valves and Gate valves, copper alloy.
- Check valves: Swing type.
- Regulating valves: Double.
- Mixing valves: Thermostatic mixing valves.
- Draining devices: Draining and venting devices - draining taps.
- Expansion devices: Submit proposals.
- Vibration isolation: Submit proposals.
- Gauges: Temperature.
- Accessories:
  - Backflow prevention devices;
  - Heat meters;
  - Pipeline strainers; and
  - Tundishes.

130 **PIPELINE ANCILLARIES FOR HEATING SYSTEMS**

- Isolating valves:
  - Ball valves, cast iron or steel;
  - Gate valves, cast iron; and
  - Globe valves, carbon steel.
- Check valves:
  - Cast iron;
  - Swing type; and
  - Globe stop and check valves, carbon steel.
- Regulating valves: Double regulating.
- Radiator valves: Thermostatic radiator valves.
- Draining and venting devices: Automatic air vents and Draining taps.
- Expansion devices: Submit proposals.
- Vibration isolation: Submit proposals.
- De-aerators: Not required.
- Separators: Not required.
- Gauges: Pressure and altitude and Temperature.
- Accessories:
  - Heat meters;
  - Pipeline strainers;
  - Safety valves;
  - Test points; and
  - Tundishes.
PIPELINE ANCILLARIES FOR CHILLED WATER AND CONDENSER WATER SYSTEMS

- Isolating valves: Ball valves, cast iron or steel and Gate valves, cast iron.
- Check valves:
  - Cast iron;
  - Swing type; and
  - Globe stop and check valves, carbon steel.
- Regulating valves: Double.
- Draining and venting devices: Automatic air vents and Draining taps.
- Expansion devices: Submit proposals.
- Vibration isolation: Submit proposals.
- De-aerators: Not required.
- Separators: Not required.
- Gauges: Pressure and altitude and Temperature.
- Accessories:
  - Heat meters;
  - Pipeline strainers; and
  - Test points.

PRODUCTS

CONNECTIONS FOR ANCILLARIES

- Capillary: To BS EN 1254-1.
- Compression for copper tubes: To BS EN 1254-2.
- Compression for plastics pipes: To BS EN 1254-3.
- Flanged for cast iron: To BS EN 1092-2.
- Flanged for copper alloy: To BS EN 1092-3.
- Threaded:
  - Where pressure-tight joints are made on the threads: To BS 21 or BS EN 10226-1.
  - Where pressure-tight joints are not made on the threads: To BS EN ISO 228-1.

WATER SUPPLY - DRAW OFF TAPS AND STOP VALVES generally

- Manufacturer: Submit proposals.
- Product reference: Submit proposals.
- Standard: To BS 1010-1.
- Type: Straight pattern.
- Material: Dezincification resistant brass (DZR) copper alloy.
- Connections: Union.

WATER SUPPLY - STOP VALVES FOR POTABLE WATER Generally

- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Standard: To BS EN 1213.
- Type: Straight.
- Material: Copper alloy.
- Connections: Compression.

FLOAT OPERATED VALVES, DIAPHRAGM TYPE, PLASTICS BODY generally

- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Standard: To BS 1212-3.
- Seat: Low pressure.
- Connections: Side entry.
331 ISOLATING VALVES - BALL VALVES, CAST IRON OR STEEL generally
• Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
• Standard: To BS ISO 7121.
• Type: Full bore.
• Material: Cast iron.
• Connections: Threaded suit pipe size.
• Options: Handwheel.

333 ISOLATING VALVES - BALL VALVES generally
• Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
• Material: Brass copper alloy.
• Connections: Compression.
• Finish: Natural.

339 ISOLATING VALVES - GATE VALVES, CAST IRON generally
• Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
• Standard: To BS EN 1171.
• Series: Isobaric.
• Stem: Non-rising.
  Body and bonnet material: Malleable.
• Connections: Flanged.
• Operation: Handwheel.
• Strength torque: Category 1

341 ISOLATING VALVES - GATE VALVES, COPPER ALLOY generally
• Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
• Standard: To BS EN 12288.
  Series: B.
• Material: Copper alloy.
• Connections: Compression.
• Options: Key.
• Accessories: Body tappings and drain plug.

343 ISOLATING VALVES - GLOBE VALVES, CARBON STEEL generally
• Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
• Standard: To BS EN 13709.
• Pattern: Straight.
• Body ends: Threaded.
• DN rating: -.
• PN Rating: -.
• Stem: Inside screw non-rising stem.
• Operation: Handwheel..
• Auxiliary connections designation: Not required
  Body tappings: Not required.
345  ISOLATING VALVES - GLOBE VALVES, CAST IRON generally
   • Manufacturer: Contractor's choice.
     - Product reference: Contractor's choice.
   • Standard: To BS EN 13789.
   • Pattern: Straight.
   • Body ends: Flanged.
   • DN rating: -.
   • PN rating: -.
   • Stem: Inside screw non-rising stem.
   • Operation: Handwheel.
   • Auxiliary connections designation: Not required.

353  CHECK VALVES, CAST IRON generally
   • Manufacturer: Contractor's choice.
     - Product reference: Contractor's choice.
   • Standard: To BS EN 12334.
   • Type: Swing.
   • Body type: Flanged.
   • Mounting: Horizontal.
   • Iron type: Grey.
   • Connections: Flanged.

357  CHECK VALVES, SWING TYPE generally
   • Manufacturer: Contractor's choice.
     - Product reference: Contractor's choice.
   • Standard: To BS 5154.
   • Type: Horizontal.
   • Series: A.
   • Material: Copper alloy.
   • Connections: Flanged.
   • Operation: Handwheel.
   • Options: Position indicator.

365  REGULATING VALVES - DOUBLE generally
   • Manufacturer: Contractor's choice.
     - Product reference: Contractor's choice.
   • Standard: To BS 7350.
   • Type: Globe.
   • Material: Steel.
   • Connections: Flanged.
   • Accessories: Independent means for positive isolation on adaptor.

367  REGULATING VALVES - FLOW MEASURING DEVICES generally
   • Manufacturer: Contractor's choice.
     - Product reference: Contractor's choice.
   • Standard: To BS 7350.
   • Type: 2.
   • Material: Steel.
   • Connections: Flanged.
   • Accessories: Position indicator.

375  THERMOSTATIC MIXING VALVES generally at basins
   • Manufacturer: Contractor's choice.
     - Product reference: Contractor's choice.
   • Standard: To BS EN 1111.
   • Type: TMV 3.
379  THERMOSTATIC MIXING VALVES, LOW PRESSURE generally
- Manufacturer: Contractor's choice.
- Standard: To BS EN 1287.
- Type: TMV 3.

385  RADIATOR VALVES generally already fitted
- Manufacturer: Contractor's choice.
- Standard: To BS 2767.
- Type: Angle pattern.
- Material: Brass copper alloy.
- Connections: Compression.
- Finish: Natural.
- Options: Lockshield.

387  THERMOSTATIC RADIATOR VALVES generally already fitted
- Manufacturer: Contractor's choice.
- Standards: To BS 7478 and BS EN 215.
- Type: Integral sensor.
- Pattern: Angle.
- Connections: Compression fittings.

401  DRAINING AND VENTING DEVICES - AUTOMATIC AIR VENTS generally at all system high points
- Manufacturer: Contractor's choice.
- Type: Vertical inlet with integral lockshield isolating valve and check valve.
- Material: Gunmetal.
- Connections: Threaded.

403  DRAINING AND VENTING DEVICES - DRAINING TAPS generally at all system low points
- Manufacturer: Contractor's choice.
- Standard: To BS 2879.
- Type: 1.
- Material: Bronze.
- Connections: Threaded.
- Accessories: Lever pattern key.

415  EXPANSION DEVICES - EXPANSION COMPENSATORS, LATERAL as required
- Manufacturer: Contractor's choice.
- Standards: In accordance with BS 6129-1 and to BS ISO 15348.
- Type: Two tie bars.
- Material:
  - Bellows: Stainless steel 1.4571 (316 Ti), to BS EN 10088-1.
  - Inner sleeve: Stainless steel 1.4541 (321), to BS EN 10088-1.
  - Tie bars: Gr 8.8, to BS EN ISO 898-1, zinc plated.
- Connections: Flanged.
421 VIBRATION ISOLATION - FLEXIBLE HOSES at fan coil units
- Manufacturer: Contractor's choice.
- Type: Contractors choice.
- Material: Stainless steel 1.44401 (316).
- Connections:
  - Rubber cored: Full male union.
  - Stainless steel: Full female union.

451 GAUGES, PRESSURE AND ALTITUDE generally
- Manufacturer: Contractor's choice.
- Type: Contractors choice.
- Standard:
  - Bourdon: To BS EN 837-1.
  - Diaphragm: To BS EN 837-3.
- Diameter: 63 mm.
- Case: Stainless steel.
- Connections: 'Ring' pattern siphon and gauge cock.

453 GAUGES, TEMPERATURE generally.
- Manufacturer: Contractor's choice.
- Standard: To BS EN 13190.
- Type: Mercury in steel.
- Diameter: 63.
- Case: Black steel.
- Connections: Straight stem.
- Integral accessories: 100 mm immersion length pocket.

465 ACCESSORIES - BACKFLOW PREVENTION DEVICES at all extended branches on the domestic water installation
- Manufacturer: Contractor's choice.
- Standards:
  - Anti-pollution check valves: To BS EN 13959.
  - Check valves: To BS 6282-1.
  - Combined check and anti-vacuum valves: To BS 6282-4.
  - Hose union: To BS EN 14454.
  - In-line anti-vacuum valves: To BS EN 14451.
  - Terminal anti-vacuum valves: To BS 6282-2.
- Type: Submit proposals.
- Material: Copper alloy.
- Connections: Compression .
466  HEAT METERS where illustrated
• Manufacturer: Contractor’s choice.
  - Product reference: Contractor’s choice.
• Standard: To BS EN 1434-1.
• Type: In line.
• Display: Remote.
• Orientation: Horizontal.
• Temperature sensors: Immersion.
• Temperature range: Submit proposals.
• Flow rate:
  - Nominal: -.
  - Maximum: -.
• Connection:
  - Type: Flanged.
  - Size: to suit application.
• Environmental class: Submit proposals.
• Enclosure:
  - Ingress protection (minimum): Submit proposals.
• Pulsed output: Required.
• Power supply: Mains 230 V.
• Communication interfaces: Submit proposals.
• Accessories: None.

467  ACCESSORIES - PIPELINE STRAINERS generally
• Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
• Type: Angle pattern.
• Material: Cast steel.
• Connections: Flanged.
• Integral accessories: Plugged connections for drain, air vent and differential pressure monitoring.

FABRICATION

510  CONTRACTOR FABRICATED ANCILLARIES
• Proposals: Submit.
• Content:
  - Overall dimensions: -.
  - Shop fabrication drawings: -.

520  EXPANSION LOOPS, COPPER generally
• Standard: To BS EN 1057.
• Type: Formed bends from single pipe length.

530  EXPANSION LOOPS, STEEL GENERALLY
• Standard: To BS EN 10255.
• Type: Formed bends from single pipe length.

540  AIR BOTTLES GENERALLY.
• Construction: A vertical extension from pipe.
• Size: Bore of pipe.
• Length: 100mm.
• Extension pipe: Copper with a manual vent cock located in an easily accessible position.
EXECUTION

610 INSTALLATION OF VALVES GENERALLY
- Installation: In accordance with BS 6683.
- Location: As drawings.
- Isolation and regulation valves: Provide at equipment and on subcircuits.
- Access: Locate valves so they can be readily operated and maintained. Locate next to equipment which is to be isolated.
- Connection to pipework: Fit with joints that suit the pipe material.

615 INSTALLATION OF VALVE STUFFING BOXES
- Adjustment: Carry out at normal plant operating temperature and pressure. Do not impair valve action, e.g. by over-tightening.

620 INSTALLATION OF DOUBLE REGULATING VALVES
- Locations: Provide 10 diameters of straight pipe upstream of valve and 5 diameters downstream.

640 INSTALLATION OF FLOW MEASUREMENT DEVICES
- Locations: Provide straight length of pipe upstream and downstream.

655 INSTALLATION OF THERMOSTATIC RADIATOR VALVES
- Locations: In areas which represent the space temperature, e.g. not behind curtains or enclosed in heating or radiator panels.

660 INSTALLATION OF VENT COCKS
- Discharge pipes: Provide at outlets of ventcocks.

665 INSTALLATION OF DISCHARGE CONNECTIONS
- Safety and relief valves: Terminate at a safe discharge point.
- Vent cocks: Terminate 150 mm above floor level.
- Air bottles: Terminate with air cock or needle valve in a convenient position.
- Automatic air vents: Terminate over a suitable gully or drain line in a visible location.

675 INSTALLATION OF EXPANSION COMPENSATORS
- Location: Submit proposals.
- Anchors and guides: Locate to contain movement and resist maximum imposed loads.

677 INSTALLATION OF FLEXIBLE HOSES
- Location: Close to the source of vibration.

690 INSTALLATION OF EXPANSION LOOPS
- Location: Submit proposals.
- Stress: Minimize.

695 INSTALLATION OF CONTROL COMPONENTS
- Locations: Submit proposals.
- Insulation: Submit details of proposed insulation method where control components are on insulated pipelines.
- Supports: Do not strain components.
- Access: Adequate for operation and maintenance.

700 VALVE TESTS
- Standard: To BS EN 12266-1.
Y12
Mechanical cleaning and chemical treatment
Y12 Mechanical cleaning and chemical treatment

To be read with Preliminaries/General conditions.

EXECUTION

610 GENERALLY
• Water analysis: Analyse water samples before treatment.
• Preliminary checks: Before cleaning or chemical treatment, complete pressure tests.
• Waste products: Neutralize, and dispose of to drain.

620 FLUSHING OF HOT AND COLD WATER SYSTEMS
• Standard: To BS EN 806-4.
• Installation checks: Thoroughly inspect pipework.
• Drainage: Provide adequate drainage, preferably direct to manhole.

630 FLUSHING OF HEATING AND CHILLED WATER SYSTEMS
• Flushing: In accordance with BSRIA 1/2001.1.
• Installation checks: Thoroughly inspect pipework.
• Drainage: Provide adequate drainage, preferably direct to manhole.

650 DISINFECTION OF HOT AND COLD WATER SYSTEMS
• Standard: To BS EN 806-4.
• Samples for analysis: Provide after flushing.

660 CHEMICAL TREATMENT FOR HEATING SYSTEMS
• Treatment: In accordance with BSRIA 2/93.

670 CHEMICAL TREATMENT FOR CHILLED WATER SYSTEMS
• Treatment: In accordance with BSRIA 2/93.

690 INSTALLING DOSING POTS
• Position: Install where there is a high differential pressure between flow and return pipework.
• Drain point: Provide adjacent to the unit.
• Fixing: Securely to a wall using mounting bracket.
Y20 Pumps

To be read with Preliminaries/ General conditions

PRODUCTS

310 PUMP SELECTION
• General: Select pump at or near the most efficient part of the performance curve for required duty.

320 PUMPS GENERALLY
• General safety standard: To BS EN 809.
• Electrical safety: To BS EN 60335-2-51.
• Dynamic balance: To BS ISO 2953.
• Test standards: To BS EN ISO 9906 and in accordance with BS EN ISO 5198.
• Belts and pulleys: To BS 3790.
• Rotodynamic pumps: To BS EN 1151-1 and BS EN 1151-2.
• Connections:
  - Flanged, copper alloy and composite: To BS EN 1092-3.
  - Flanged, cast iron: To BS EN 1092-2.
  - Threaded: To BS 21 or BS EN 10226-1.

330 CANNED ROTOR PUMPS FOR HEATING SYSTEMS and FOR CHILLED WATER SYSTEMS
• Manufacturer: Existing.
• Arrangement: Single.
• Material:
  - Impeller: Existing.
  - Housing: Existing.
• Flow rate: Existing.
• System resistance: Existing.
• Electrical supply: Existing.
• Speed control: Existing.
• Connections: Existing.
• Flexible connections: Existing.
• Anti-vibration mountings: Existing.
• Accessories: Existing.
CLOSE COUPLED END SUCTION PUMPS FOR HEATING SYSTEM and FOR CHILLED WATER SYSTEM

- Manufacturer: Existing.
- Product reference: Existing.
- Standard: To BS EN 22858.
- Arrangement: Existing.
- Flow rate: Existing.
- System resistance: Existing.
- Motor and impeller speed (maximum): Existing.
- Electrical supply: Existing.
- Speed control: Existing.
- Discharge branch: Existing.
- Casing material: Existing.
- Connections: Existing.
- Flexible connections: Existing.
- Anti-vibration mountings: Existing.
- Accessories: Existing.

EXECUTION

INSTALLATION OF PUMPS GENERALLY

- Pipeline connections: Arrange to prevent transmission of pipeline forces to pump casing.
- Pressure gauge tappings: Provide in flow and return pipeline connections and in common suction and delivery pipeline.
- Brackets: Support pipeline mounted pumps on purpose made brackets lined with vibration absorbent material.
- Alignment: Align and balance to minimize vibration.
- Belt tension: Correctly tension drive belts.
- Access: Provide adequate space for service and maintenance.
- Identification plate:
  - Type: Engraved.
  - Details: Serial number.

COMMISSIONING PREPARATION

- In-line pumps: Change impeller if necessary.
- Belt driven pumps: Change belt and pulley if necessary.
Y30
Mechanical thermal insulation
Y30 Mechanical thermal insulation

To be read with Preliminaries/ General conditions.

**GENERAL**

110 **INSULATION TO CONTROL HEAT LOSS FOR HOT WATER PIPELINES** Generally
   - Standard: To BS 5422, section 8.
   - Insulation materials: Mineral fibre pipe section, thermal conductivity 0.038 W/m·K.
   - Insulation thickness to BS 5422 (minimum): Copper and steel pipelines, low emissivity, table 17.
     - Temperature of contents: 60°C.
   - Protection: Sheet aluminium casing in plant areas, foil faced in roof voids and pipe boxes.
   - Accessories to be insulated: Insulation for valves and flanges and Insulation at load bearing pipeline supports.

120 **INSULATION TO CONTROL CONDENSATION FOR COLD WATER PIPELINES** generally
   - Standard: To BS 5422, section 7.
   - Insulation materials: Mineral fibre pipe section, thermal conductivity 0.034 W/m·K.
   - Insulation thickness to BS 5422 (minimum): Copper pipelines, high emissivity, table 7.
     - Temperature of contents: 10°C.
   - Vapour barrier: Required.
   - Protection: Self adhesive cladding and jacketing.
   - Accessories to be insulated: Insulation for valves and flanges and Insulation at load bearing pipeline supports.

130 **INSULATION TO CONTROL HEAT LOSS FOR LOW TEMPERATURE HOT WATER HEATING PIPELINES** generally
   - Standard: To BS 5422, section 8.
   - Insulation materials: Mineral fibre pipe section, thermal conductivity 0.040 W/m·K.
   - Insulation thickness to BS 5422 (minimum): Copper and steel pipes, low emissivity, table 15.
     - Temperature of contents: 75°C.
   - Protection: Sheet aluminium casing in plant areas, foil faced in roof voids and pipe boxes.
   - Accessories to be insulated: Insulation for valves and flanges and Insulation at load bearing pipeline supports.

140 **INSULATION TO CONTROL CONDENSATION FOR CHILLED WATER PIPELINES** generally
   - Standard: To BS 5422, section 7.
   - Insulation materials: Mineral fibre pipe section, thermal conductivity 0.033 W/m·K.
   - Insulation thickness to BS 5422 (minimum): Steel pipelines, high emissivity, table 6.
     - Temperature of contents: 5°C.
   - Vapour barrier: Required.
   - Protection: Sheet aluminium casing in plant areas, foil faced in roof voids and pipe boxes.
   - Accessories to be insulated: Insulation for valves and flanges and Insulation at load bearing pipeline supports.
145 INSULATION TO CONTROL HEAT GAIN FOR CHILLED WATER PIPELINES generally
   • Standard: To BS 5422, section 7.
   • Insulation materials: Mineral fibre pipe section, thermal conductivity 0.033 W/m·K.
   • Insulation thickness to BS 5422 (minimum): Low emissivity, table 10.
     - Temperature of contents: 5°C.
   • Vapour barrier: Required.
   • Protection: Sheet aluminium casing in plant areas, foil faced in roof voids and pipe boxes.
   • Accessories to be insulated: Insulation for valves and flanges and Insulation at load bearing pipeline supports.

150 INSULATION TO PROTECT AGAINST FREEZING FOR PIPELINES generally
   • Standard: To BS 5422, section 11.
   • Insulation materials: Mineral fibre pipe section, thermal conductivity 0.033 W/m·K.
   • Insulation thickness to BS 5422 (minimum): Selected domestic cold water systems (8 hour period), table 31.
     - Specified conditions: 1.
   • Protection: Sheet aluminium casing in plant areas, foil faced in roof voids and pipe boxes.
   • Accessories to be insulated: Insulation for valves and flanges and Insulation at load bearing pipeline supports.

160 INSULATION FOR CONDENSATION CONTROL ON DUCTWORK CARRYING CHILLED AIR generally
   • Standard: To BS 5422, section 8.
   • Insulation materials: Mineral fibre slabs, thermal conductivity 0.034 W/m·K at 10°C.
   • Insulation thickness to BS 5422 (minimum): Table 12.
     - Minimum air temperature inside duct: 10°C.
     - Emissivity: Medium.
   • Vapour barrier: Required.
   • Protection: Self adhesive cladding and jacketing.
   • Accessories to be insulated: dampers.

165 INSULATION TO CONTROL HEAT TRANSFER FOR CHILLED AND DUAL PURPOSE DUCTWORK
   • Standard: To BS 5422, section 8.
   • Insulation materials: Mineral fibre slabs, thermal conductivity 0.034 W/m·K.
   • Insulation thickness to BS 5422 (minimum): Table 14.
     - Emissivity: Medium.
   • Protection: Self adhesive cladding and jacketing.
   • Accessories to be insulated: dampers.

170 INSULATION TO CONTROL HEAT LOSS FOR DUCTWORK CARRYING WARM AIR generally
   • Standard: To BS 5422, section 8.
   • Insulation materials: Mineral fibre slabs, thermal conductivity 0.035 W/m·K.
   • Insulation thickness to BS 5422 (minimum): Table 13.
     - Emissivity: Medium.
   • Protection: Self adhesive cladding and jacketing.
   • Accessories to be insulated: dampers.
PRODUCTS

330 MINERAL FIBRE PIPE SECTION INSULATION GENERALLY
- Standard: To BS 3958-4.
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Recycled content: Contractor's choice.
- Finish: Aluminium foil faced.

340 MINERAL FIBRE SLABS INSULATION GENERALLY
- Standard: To BS 3958-5.
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Form: Rigid slabs.
- Recycled content: Contractor's choice.
- Finish: Aluminium foil faced.

380 VAPOUR BARRIER PERMEANCE
- Standard: To BS 5422, clause 5.6.

420 SELF ADHESIVE CLADDING AND JACKETING FOR HOT WATER PIPELINES
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Finish: Manufacturer's standard.

425 SHEET ALUMINIUM CASING PROTECTION GENERALLY in plant areas
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Finish: Manufacturer's standard.

480 INSULATION FOR VALVES AND FLANGES generally
- Insulation materials: To match pipelines insulation.
- Finish: To match pipelines finish.
- Form: Removable and reusable pads.

495 INSULATION AT LOADBEARING PIPELINE SUPPORTS
- Hot pipelines up to 120°C: 300 mm length of high density phenolic foam.
- Hot pipelines above 120°C: 300 mm length of calcium silicate.
- Cold pipelines: 300 mm length of high density phenolic foam.

EXECUTION

610 INSTALLATION GENERALLY
- Standard: In accordance with BS 5790.
- Timing: Insulate after installed system has been fully tested and joints proved sound.
- Insulation: Do not enclose adjacent units together.
- Clearance: Maintain between pipes.
- Finish: Neatly finish joints, corners, edges and overlaps.

625 INSTALLATION OF FOIL FACED MINERAL FIBRE INSULATION ON PIPELINES
- Joints: Close butt, seal with 50 mm wide class O tape on both longitudinal and circumferential joints.
- At fittings: Mitre. Secure with tape.
- Vapour seal: Tape exposed insulation membrane. Seal vapour barrier at pipe support with class O tape.
660  INSTALLATION OF FOIL FACED MINERAL FIBRE INSULATION ON DUCTWORK
  • Fixing to underside of ducting: Self adhesive stick pins. Further support with 0.7-1.0 x 50 mm mesh galvanized wire netting.
  • Joints, pin penetrations, cut outs for test holes and supports: Seal with 100 mm wide class 'O' foil tape.

665  INSTALLATION OF FOIL FACED MINERAL FIBRE LAMELLA INSULATION ON DUCTWORK
  • Fixing to underside of ducting: Self adhesive stick pins.
  • Joints, pin penetrations, cut outs for test holes and supports: Seal using 100 mm wide class 'O' foil tape.

715  INSTALLATION OF SELF ADHESIVE CLADDING AND JACKETING
  • Application: Cover insulation with self adhesive cladding and jacketing with 50 mm overlaps.

720  INSTALLATION OF SHEET ALUMINIUM PROTECTION
  • 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.
  • Expansion: Make provision.

740  INSTALLATION AT VALVES AND FLANGES
  • Application: Do not obstruct removal of nuts and bolts, or operation of valves.

750  INSTALLATION AT LOADBEARING PIPELINES SUPPORTS
  • Application: Close butt to insulation.
  • Joints: Seal with 100 mm wide class 'O' foil tape.
  • Sleeve: Provide sheet metal protective sleeve.

755  INSTALLATION AT NON-LOADBEARING PIPELINES SUPPORTS
  • Insulation: Carry through pipe support.

760  INSULATION NOT CARRIED THROUGH PIPELINES SUPPORTS
  • Insulation at supports: Provide aluminium end caps.

770  INSULATION CARRIED THROUGH DUCTWORK SUPPORTS
  • High density phenolic foam: Close butt to insulation.
  • Sleeve: Provide sheet metal protective sleeve.

800  INSTALLING VAPOUR BARRIERS
  • Integrity: Maintain throughout.
Vibration isolating mountings and support systems
Y31 Vibration isolating mountings and support systems

PRODUCTS

310 MOUNTINGS GENERALLY
- Criteria: Ensure that vibration generated by the engineering services is not transmitted to pipework, ductwork, the building and supporting structure.
- Overload capacity (minimum): 50%.
- Colour code: Identify for load and deflection rating.
- Marking: Label with load capacity.

320 SPRING ISOLATORS generally
- Type: Caged.
- Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
- Colour code: Submit proposals.
- Load: Submit proposals.
- Deflection: Submit proposals.

350 INERTIA BASES AHU
- Type: External isolator mounting brackets.
- Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
- Material: Welded steel channel perimeter frame.
- Reinforcing steelwork and mesh: Not required.
- Thickness: 100 mm.

360 FLEXIBLE HOSES FCU
- Type: Stainless steel braided.
- Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
- Connections:
  - Rubber cored: Full male union.
  - Stainless steel: Full female union.

410 SERVICES SUPPORTS generally
- Type: Unistrut support.

EXECUTION

COMPLETION

910 DOCUMENTATION
- Operation and maintenance instructions: Submit.
Y32
Mechanical plant and equipment identification
Y32 Mechanical plant and equipment identification

To be read with Preliminaries/General conditions.

PRODUCTS

310 PLANT AND EQUIPMENT IDENTIFICATION LABELS
- Standard: To BS 1710.
- Type: Metal plates.
- Manufacturer: Contractor’s choice.
  - Product reference: Contractor’s choice.
- Information: Purpose and reference number.

320 VALVE IDENTIFICATION LABELS
- Standard: To BS 1710.
- Type: Metal plates.
- Manufacturer: Contractor’s choice.
  - Product reference: Contractor’s choice.
- Information: Purpose and reference number.
- Colours: Basic and safety colour identification of associated system.

330 VALVE CHARTS AND SCHEMATICS
- Type: Plastic encapsulated.

EXECUTION

610 IDENTIFYING PIPEWORK
- Standards: To BS 1710.
- Identification type: Adhesive colour bands.
- Application of basic identification colour: Coloured bands as BS 1710 clause 3.3.
- Safety colour identification: On or next to the colour bands.
- Information:
  - Abbreviation of name;
  - Chemical symbol for gases; and
  - Colour bands as BS 1710 appendix D.
- Direction of flow: Indication arrow and the word FLOW or the letter F and Indication arrow and the word RETURN or the letter R.

620 IDENTIFYING DUCTWORK
- Standard: To HVCA DW/144 appendix B.
- Identification type: Metal labels.
- Direction of flow: Equilateral triangle, 150 mm length of side, with one apex pointing in the direction of flow.
- Information: Space served by the duct and associated plant.

630 INSTALLING PLANT AND EQUIPMENT IDENTIFICATION
- Fixing: Fix with adhesive to equipment.
- Location: On equipment.

640 INSTALLING VALVE IDENTIFICATION
- Fixing: Secure with metal chain.
INSTALLING VALVE CHARTS AND SCHEMATICS

- Fixing: Plug and screw to wall.
- Location: Boiler house and Plant room.
Y40
Mechanical engineering services control and management systems
Y40 Mechanical engineering services control and management systems

To be read with Preliminaries/ General conditions.

GENERAL

110 MECHANICAL ENGINEERING SERVICES SYSTEMS CENTRAL CONTROL AND MONITORING SYSTEM This Phase of the building is to be controlled via its own BMS system which at a later date is to be connected to the wider system governing the whole building. A separate control point specification will be produced which overrides this section.

- Description: as above.
- Link to building monitoring and management system: As section Y41.
- Systems to be controlled:
  - Water supply systems: Cold water, as section S10 and Direct hot water storage, as section S10.
  - Fuel supply systems: Natural gas supply system.
  - Steam and condensate systems: Not applicable.
  - Heating systems: Low temperature hot water, as section T10.
  - Cooling systems Chilled water system, as section T50.
  - Ventilation systems:
    - Natural, as section U10;
    - Mechanical supply, as section U10;
    - Mechanical extract, as section U10; and
    - Toilet extract, as section U10.
  - Air conditioning systems: Fan coil, as section U30.
- System control strategies:
  - Heating system;
  - Gas fired heating system;
  - Cooling system;
  - Mechanical ventilation system; and
  - Fan coil unit air conditioning system.
- Data logging:
  - Actuator;
  - Motorized valve;
  - Sensor; and
  - Thermostat.
- Monitoring:
  - Cooling plant;
  - Fan;
  - Heating plant;
  - Pressurization unit; and
  - Pump.
- Equipment:
  - Control panel;
  - Actuators; and
  - Motorized valves.
  - Sensors:
    - Flow in duct;
    - Pressure;
    - Air temperature; and
    - Water temperature.
130 LOCAL HEATING SYSTEMS CONTROLS generally

- Systems to be controlled: Low temperature hot water, as section T10.
- Description: FCU local controls.
- Control strategies: Heating system.
- Data logging:
  - Actuator;
  - Motorized valve;
  - Sensor; and
  - Thermostat.
- Monitoring:
  - Heating plant;
  - Pressurization unit; and
  - Pump.
- Equipment:
  - Control panel;
  - Actuators; and
  - Motorized valves.
- Sensors: Water temperature.

140 LOCAL COOLING SYSTEMS CONTROLS Generally____

- Systems to be controlled: Chilled water system, as section T50.
- Description: Air cooled chiller in Energy Centre to provide chilled water, communication between local panel and chiller to be through fibre link network.
- Control strategies: Cooling system.
- Data logging: Thermostat.
- Monitoring: Pump.
- Equipment: Control panel.
- Sensors: Water temperature.

150 LOCAL VENTILATION SYSTEMS CONTROLS generally

- Systems to be controlled:
  - Mechanical supply, as section U10;
  - Mechanical extract, as section U10; and
  - Toilet extract, as section U10.
- Description: Existing toilet vent to be controlled via PIR with overrun.
- Control strategies: Mechanical extract system.
- Data logging: Sensor.
- Equipment: Control panel.
- Sensors: Flow in duct.

175 ELECTRICAL CONNECTIONS BETWEEN CONTROL DEVICES AND PLANT AND EQUIPMENT generally

- Equipment interconnectivity: Wired.
- Electrical connection cable: Submit proposals.
  - Containment: Contractor's choice.
- Rewireable installations: Contractor's choice.
- Concealed installations: Contractor's choice.
SYSTEM PERFORMANCE

210 DESIGN
• Design: Complete the design of the mechanical engineering services controls and monitoring system.
• Proposals: Submit mode of 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.

220 HEATING SYSTEMS CONTROL STRATEGY LOCAL HEATING SYSTEM CONTROLS
• Start and stop control:
  - Boost fixed time;
  - Domestic hot water demand;
  - Low inside temperature interlock for building fabric and contents protection;
  - Low temperature interlock signals for plant protection;
  - Night cooling;
  - Optimum start heating;
  - Optimum stop heating;
  - Pump overrun; and
  - Time control.
• Water heating plant control strategies: Modular boilers.
• Pumps: Duplicate primary pumps (run and standby), as section Y20.
  - Primary pumps control strategies: Constant speed.
  - Secondary pumps control strategies: Constant speed.
• Pressurization system control strategies: Sealed expansion vessel.
• Outlet control strategies: Heating secondary circuits.
• Control points schedules:
  - General;
  - Heating distribution;
  - Heating plant;
  - Pressurization plant; and
  - Pump.

225 COOLING SYSTEMS CONTROL STRATEGY LOCAL COOLING SYSTEM CONTROLS
• Start and stop control:
  - Optimum start cooling;
  - Optimum stop cooling;
  - Pump overrun; and
  - Time control.
• Pressurization plant control strategies: Pump.
• Distribution control strategies: Submit proposals.
• Pumps control strategies: Variable speed.
• Water chillers control strategies: Packaged air cooled water chiller with multi-stage compressor.
• Cooling towers control strategies: n/a.
• Control points schedules:
  - Cooling plant;
  - Pressurization plant; and
  - Pump.
MECHANICAL VENTILATION SYSTEMS CONTROL STRATEGY  CENTRAL CONTROL SYSTEM

- Start and stop control:
  - Boost fixed time;
  - Fan overrun;
  - Low inside temperature interlock for building fabric and contents;
  - Low temperature interlock signals for plant protection;
  - Night cooling;
  - Optimum start heating;
  - Optimum stop heating; and
  - Time control.

- Damper control strategies: Full outside air.

- Heating coils control strategies: Low temperature hot water pre-heat coil and frost protection and Low temperature hot water heating coil.

- Heat recovery devices control strategies: Thermal wheel fixed speed with bypass damper.

- Supply fan control strategies: Constant volume.

- Extract fan control strategies: Constant volume.

- Terminal units control strategies: Constant volume air terminal unit with reheat.

- Filter control strategies: Air filter with pressure sensor.

- Supply air temperature control strategies: Supply air temperature set point scheduled to outside air temperature.

- Control points schedules:
  - Air filter;
  - Air temperature;
  - Damper;
  - Fan;
  - General;
  - Heat recovery device; and
  - Heating coil.

MECHANICAL EXTRACT SYSTEMS CONTROL STRATEGY  TOILET

- Start and stop control: PIR.

- Extract fan control strategies: Constant volume.

- Control points schedules: Not required.
FAN COIL UNIT AIR CONDITIONING SYSTEM CONTROL STRATEGY  LOCAL AIR CONDITIONING SYSTEM CONTROLS

• Start and stop control:
  - Boost fixed time;
  - Low inside temperature interlock for building fabric and contents protection;
  - Low temperature interlock signals for plant protection;
  - Optimum start cooling;
  - Optimum stop cooling;
  - Optimum start heating;
  - Optimum stop heating; and
  - Time control.

• Damper control strategies: Submit proposals.

• Heating coils control strategies: Low temperature hot water heating coil.

• Heat recovery devices control strategies: n/a.

• Cooling coil control strategies: Chilled water.

• Dehumidification control strategies: n/a.

• Supply fan control strategies: Constant volume.

• Humidifier control strategies: n/a.

• Extract fan control strategies: n/a.

• Fan coil units control strategies: Air side control and Water side control.

• Filter control strategies: Submit proposals.

• Supply air temperature control strategies: Constant air volume zone temperature control.

• Control points schedules:
  - Air temperature;
  - Fan coil unit system; and
  - Fan.

BOOST FIXED TIME generally where applicable

• Boost operation signal: Set from calendar in winter season and preset time on time clock.
  - Boost period and time: 1hr.
  - Termination: When zone reaches heating set point temperature.

DOMESTIC HOT WATER DEMAND generally

• Demand for hot water: Start valves, pumps and heat generator plant when signal received.
  - Demand signal: Temperature below storage set point.

FAN OVERRUN generally

• Operation: Activate when mechanical ventilation plant has been operated with an electric heater battery.
  - Period: 5m.

LOW INSIDE AIR TEMPERATURE INTERLOCK FOR BUILDING FABRIC AND CONTENTS PROTECTION AHU and FCU and radiators

• Low inside air temperature signal: Start all heating plant serving zone registering condition.
  - Activation set point: 10°C.
  - Termination set point: 14°C.

• Priority: Independent of low outside temperature and low primary heating return water conditions.
LOW TEMPERATURE INTERLOCK SIGNALS FOR PLANT PROTECTION

- Low outside air temperature condition: When activated start duty primary and secondary circuit heating and cooling pumps. Open primary and secondary heating circuit valves to allow water to circulate through circuits unless plant is in operating mode.
  - Activation set point: Below 3°C.
  - Termination set point: Activation set point plus 2°C.
- Low primary heating return water temperature condition: When activated start heat source and primary and secondary heating pumps if not already enabled.
  - Activation set point: Below 8°C.
  - Termination set point: 55°C where non-condensing boilers are used.

NIGHT COOLING AHU

- Type: Mechanical.
- Activation: Average afternoon temperature greater than 20°C.
  - Period of operation: When zone temperature remains above outside air temperature plus 2°C when using mechanical ventilation.
  - Availability: Throughout entire non-occupied period.
- Wind speed limit: Shut down passive night cooling when wind speed exceeds: n/a.
- Rain sensor: Shut inlet and outlet vents when rain is detected.

OPTIMUM START COOLING AHU and FCU

- Optimum start time: 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. Operate plant at maximum output. Take account of day of week and holidays. Following learning period, achieve temperature set point within +/- 15 minutes of start of occupancy.
  - Zone cooling set point: 24°C.
  - Maximum precool time: 2h.
- Air handling plant start: Use separate control for each air handling plant. Start air handling plant and cooling system.

OPTIMUM STOP COOLING AHU and FCU

- Optimum stop time: Use a self-adaptive algorithm to calculate the earliest time prior to end of occupancy when plant can be shut down. Disable normal plant operation signal. Take account of day of week and holidays. Following learning period, achieve maximum temperature within +/- 15 minutes of end of occupancy.
  - Maximum acceptable temperature during occupied period: 26°C.
  - Maximum period between stop and end of occupied period: 2 h.

OPTIMUM START HEATING AHU, FCU and radiators

- Optimum start time: 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. Operate plant at maximum output. Take account of day of week and holidays. Following learning period, achieve temperature set point within +/- 15 minutes of start of occupancy.
  - Zone heating set point: 21°C.
  - Maximum preheat time: 4 h.
- Air handling plant start: Use separate control for each air handling plant. Start air handling plant and boiler heating system.
290 OPTIMUM STOP HEATING AHU, FCU and radiators
   • Optimum stop time: Use a self-adaptive algorithm to calculate the earliest time prior to end of occupancy when plant can be shutdown. Disable normal plant operation signal. Take account of day of week and holidays. Following learning period, achieve minimum temperature within +/- 15 minutes of end of occupancy.
      - Minimum acceptable temperature during occupied period: 19°C.
      - Maximum period between stop and end of occupied period: 2 h.

292 PUMP OVERRUN generally
   • Operation: Activate when heating plant has been operating, distributing to primary and secondary circuits.
      - Period: 5m.

294 TIME CONTROL Generally
   • Time clock: Provide clock and calendar programmed with periods of normal operation. Automatically change between GMT and British summer time and allow for leap years.
   • Extension of plant operation: Allow manual override, for normal operation, activated by push button switch.
      - Period: 1 hr.
   • Winter mode: Between 1 October and 30 April.
      - Outside temperature: Above 17°C for at least 30 minutes.
PRODUCTS

304 MODULAR BOILERS CONTROL STRATEGY  Plantroom

• Number of boilers: 2 gas fired boilers, as section T20.
• Directly linked plant: n/a.
• Boiler off condition: Disable boiler and primary pumps provided overrun is finished.
• Boiler firing: On/off.
• Primary flow: Prove before starting lead boiler. If not proved, disable boiler and use following boiler in sequence as lead boiler.
  - Start up period: 15 s.
• Sequence control strategy:
  - Enable lead boiler when primary return temperature is 3°C or more below primary return temperature set point, 82°C;
  - Enable next boiler after the primary return water temperature is 9°C or more below return water set point, 73°C; and
  - 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.
  - Primary return temperature under full load: 71°C.
  - Nominal flow temperature: 82°C.
  - Primary return temperature set point: 82°C.
  - Start up delay: Enable next boiler after 3 minutes of previous boiler firing.
  - Shedding time delay: Allow 5 minutes before disabling successive boilers.
  - Boiler enabled set point deadband: 4°C.
  - Boiler sequence selection: Change Every 7 days when plant is off and When boiler fails.

Boiler sequence override: Provide a switch to inhibit the boiler sequence routine.

• High limit temperature control thermostat: When flow temperature exceeds set point disable fuel supply and lock-out boiler. Keep isolating valves open for run on period.
  - High limit temperature set point: 93°C.
• Boiler interlocks: Following boiler lock-out, reset via a switch on: Motor control panel.
• Panic buttons: Disable fuel supplies to boilers when pressed and raise a fuel valve closed alarm.
  - Position: At exit from boiler house.
• Fuel detection: Gas detector above boiler.
  - Activation: Hard wire interlocks. Disable fuel supply and shut down boiler via: Central control panel.
• Fire alarm: When activated, disable fuel supply and stop all plant.
• Alarm: Boiler lock out and High limit temperature alarm.
  - Manual alarm reset: At boiler.
• Linked equipment: n/a.
SEAL D EXPANSION VESSEL PRESSURIZATION UNIT CONTROL STRATEGY

- **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.
  - Set point: Submit proposals.
- **High pressure switch**: When activated, disable boiler and close fuel valve. Allow primary and secondary pumps to continue for run on period.
  - Run on period: Submit proposals.
- **Low pressure switch**: When activated, disable boiler and close fuel valve, disable primary and secondary pumps. Raise a low pressure alarm. Hard wire interlocks.
  - Reset: Submit proposals.
- **Water level**: If water level falls below a predetermined level, disable the boiler and close the fuel valve. Raise alarm. Hard wire interlocks.
  - Pre-determined level: Submit proposals.
  - Reset: Submit proposals.

HEATING SECONDARY CIRCUITS CONTROL STRATEGY VT circuit

- **Circuit**: Constant volume, variable temperature with mixing valve on flow to secondary circuit before secondary pump.
- **Operation**: Hold valves in full bypass until primary return water temperature rises above low limit set point. When set point is reached start duty secondary pump and open valves to maintain primary return temperature at set point.
  - Low limit set point: 40°C.
  - Set point: 50°C.
  - Alarm: Modulate secondary circuit mixing valve to maintain set point and display a warning if water temperature falls below set point.
- **Mixing valve control mode**: Compensated temperature control.
  - Set points: Zone air temperature set point, 21°C and High limit water temperature set point, 82°C.

STORAGE CALORIFIER CONTROL STRATEGY Office plant room

- **Non-operation**: Open bypass port of control valve and close isolating valve.
  - Secondary pump: Submit proposals.
- **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.
  - Set point: 60°C.
  - Upper limit temperature: 65°C.
- **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.
- **High limit thermostat**: 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.
  - Set point: 90°C.
  - Overrun period: 5 minutes.
- **Secondary circuit pump failure**: Set control valve to bypass and shut isolating valve.
- **Electric heater**: 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.
CONSTANT SPEED PUMPS CONTROL STRATEGY

Generally
- Function: Duty and standby.
- Plant shut down: Turn pumps off and fully close valves serving loads.
  - Long shutdown period: Run pumps for 5 minutes on a daily basis when shut down is longer than 2 days.
- Operation: Run pumps on receipt of signal.
- Duty and standby:
  - Change lead pump: Daily.
- Prove flow: Use a flow measurement device to prove flow. Start standby pump and raise alarm if flow is not proved in specified time.
  - Specified time: 15 s.
  - Failure: If flow is not proved after standby pump start, raise alarm.
  - Reset: Submit proposals.

VARIABLE SPEED PUMPS CONTROL STRATEGY

Generally
- Function: Shared duty.
- Plant shut down: Turn pumps off and fully close valves serving loads closed.
  - Long shutdown period: Run pumps for 5 minutes on a daily basis when shut down is longer than 2 days.
- 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.
  - Differential set point: 100 kPa.
- 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.

PACKAGED AIR COOLED WATER CHILLER CONTROL STRATEGY

Chiller farm
- Equipment to be controlled: Packaged air cooled chiller and Duplicate chilled water pumps (run and standby).
  - Pressurization system: Sealed expansion vessel.
- Chilled water flow: Start chilled water circulation pumps and prove flow before enabling chiller.
  - Pump failure: If flow is not proved within 30 s of pump being started, enable standby pump. If flow is still not proved after 30 s of pump being started, disable chiller including condenser fans.
- Refrigerant solenoid valve: Open following start signal when the chilled water entering temperature is above the set point.
  - Chilled water entering temperature set point: 6°C.
- Control of compressor stages: Submit proposals.
  - Compressor start delay: Submit proposals.
  - Compressor crank case oil heater: Controlled by chiller controls.
- Condenser fans: Use fans to maintain a constant pressure and temperature of refrigerant gas entering condenser.
  - Control Submit proposals.
- Chilled water low limit condition: Close refrigerant valve when chilled water temperature falls below low limit set point. Open refrigerant valve when chilled water low limit end is achieved.
  - Chilled water low limit set point: 2°C.
  - Chilled water low limit end: 4°C.
- Chiller off condition: Disable chiller following a night cooling signal or optimum start heating signal.
353 HIGH TEMPERATURE HOT WATER HEATING COIL CONTROL STRATEGY AHU
- Equipment to be controlled: High temperature hot water (HTHW) heating coil and three port valve.
- Normal operation: If the zone is at its low temperature set point or the outside air temperature is low, prove fan operation and modulate the three port valve under PI control to maintain the required temperature.
- Low zone temperature condition: If the zone is at its low temperature set point or the outside air temperature is low, prove fan operation and modulate the three port valve under PI control to maintain the low zone temperature set point.
- Boost, optimum start heating, low return temperature and low outside temperature: Prove fan operation and fully open the three port valve.
- Shut down, optimum cooling start or night cooling mode: Three port valve on full bypass.

356 THERMAL WHEEL, FIXED SPEED WITH BYPASS DAMPER, CONTROL STRATEGY AHU
- Equipment to be controlled: Fixed speed thermal wheel, face and bypass dampers.
- 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.
- Start condition: Operate the thermal wheel when the temperature differential between the outside air and return air is greater than set value.
  - Set value: ±2°C.
- Dampers: When the wheel is not operating, close the face damper and open the bypass damper. When the wheel is operating the face damper is opened and the bypass damper closed. Use a PI signal to control the dampers to provide the required condition.
  - Required condition: Zone air temperature set point of 21/25°C.
- Maximum speed: Do not rotate wheel faster than setting.
  - Setting: Manufacturer's standard.
- 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 it's maximum speed.

359 CHILLED WATER COOLING COIL CONTROL STRATEGY AHU
- Equipment to be controlled: Chilled water cooling coil and three port mixing valve.
- Optimum cooling start: Fully open three port valve when fan operation is proved.
- Normal: Prove fan operation. Modulate three port valve under PI control when free cooling has been used and when signal requires.
  - Signal: Zone air temperature is above the set point of 22°C.
- Cooling plant shut down: Position three port valve on full bypass.
- Low outside air temperature during shut down: Fully open three port valve.
- Low outside air temperature during operation: Position three port valve on full bypass.
- Boost, optimum start heating and night cooling: Position three port valve on full bypass.

366 CONSTANT VOLUME SUPPLY FAN CONTROL STRATEGY AHU
- Equipment to be controlled: Constant volume supply fan, hand/off/auto switch hardwired to motor and to extract fan fail.
- Additional start and stop control: Freeze thermostat trip from pre-heater.
- Normal operation: Enable fan and start on receipt of damper open signal.
- 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.
  - Activate switch: When the differential pressure between the duct and atmosphere rises above 500 Pa.
  - Failure time: 30 s.
- Shut down: Disable fan.
CONSTANT VOLUME EXTRACT FAN CONTROL STRATEGY  AHU

- Equipment to be controlled: Constant volume extract fan interlocked with associated supply fan and hand/off/auto switch hardwired to motor.
- Additional start and stop control: Freeze thermostat trip from pre-heater.
- Normal operation: Enable fan and start on receipt of damper open signal.
- 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.
  - Activate switch: When the differential pressure between the duct and atmosphere rises above 500 Pa.
  - Failure time: 30 s.
- Shut down: Disable fan.

FAN COIL UNIT, AIR SIDE CONTROL STRATEGY  Office FCU

- Equipment to be controlled: Fan coil unit or group of fan coil units with fans, heating coils and cooling coils.
  - Motor speed: Constant.
- Start and stop control: Air handling unit operation.
- Shut down: Submit proposals.
- Low outside temperature or low return water temperature condition: Open valves.
- Fan overrun operation: Close cooling valve, position dampers to supply air over heating coil.
  - Heater: Disable heater battery.
  - Fan: Run fan.
- Optimum start heating, boost or low zone temperature condition: Fully open heating damper and close cooling valve.
  - Fan: Run.
  - Heater: Operate heater battery.
- Optimum start cooling: Fully open cooling damper and valve and disable heating.
  - Fan: Run.
- Night cooling: Close valves and disable heating, position dampers to supply air without passing over cooling or heating coils.
  - Fan: Run.
- Normal operation: Modulate the dampers under PI control to provide the zone heating and cooling temperature set points. The cooling damper operates in reverse to the heating damper.
  - Cooling set point: 25.
  - Fan: Run.
  - Heater: Operate the heater battery.
FAN COIL UNIT, WATER SIDE CONTROL STRATEGY Office FCU

- Equipment to be controlled: Fan coil unit or group of fan coil units with fans, heating coils and cooling coils.
  - Motor speed: Constant.
- Shut down: Submit proposals.
- Low outside temperature or low return water temperature condition: Open valves.
- Fan overrun operation: Close cooling valve.
  - Heater: Disable heater battery.
  - Fan: Run fan.
- Optimum start heating, boost or low zone temperature condition: Close cooling valve.
  - Heater: Operate heater battery.
  - Fan: Run.
- Optimum start cooling: Fully open cooling valve and disable heating.
  - Fan: Run.
- Night cooling: Close valves and disable heating.
  - Fan: Run.
- Normal operation: Modulate the heating and cooling valve positions under PI control to provide the zone heating and cooling temperature set points.
  - Cooling set point: 25.
  - Fan: Run.

AIR FILTER WITH PRESSURE SENSOR CONTROL STRATEGY general

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

CONSTANT AIR VOLUME SYSTEM, ZONE TEMPERATURE CONTROL OF PRIMARY SUPPLY AIR TEMPERATURE CONTROL STRATEGY AHU

- Shutdown: Supply air temperature control inactive.
- Optimum start, boost or night cooling: Supply air temperature control inactive.
- Normal operation or low zone temperature condition: Schedule the supply air temperature linearly in relation to the common return air temperature subject to upper and lower supply air temperature set points.
  - Maximum set point: 25°C when average zone temperature is at or below 19°C.
  - Minimum set point: 15°C when average zone temperature is at or above 24°C.
  - Zone reheaters: Operate zone reheaters to maintain set points.
  - Zone coolers: Operate zone coolers to maintain set points.
- Sequence: Operate heat recovery devices before air heater coil and Use mixing dampers to provide free cooling before air cooling coil.
- High/low temperature warning: Generate a warning signal if supply air temperature rises above high limit or drops below low limit.
  - High limit: 30°C.
  - Low limit: 12°C.
SUPPLY AIR TEMPERATURE SET POINT, SCHEDULED TO OUTSIDE AIR TEMPERATURE CONTROL STRATEGY AHU

- Shutdown: Supply air temperature control inactive.
- Optimum start heating, boost or low zone temperature condition: Set supply air temperature set point to maximum limit.
- Optimum start cooling or night cooling condition: Set supply air temperature set point to minimum limit.
- Normal operation or fan overrun condition: Schedule the supply air temperature set point linearly in relation to the outside air temperature, subject to upper and lower supply air temperature set points.
  - Upper set point: 22°C when outside air temperature is at or below 12°C.
  - Lower set point: 15°C when outside air temperature is at or above 21°C.
- Sequence: Operate heat recovery devices before air heater coil and use mixing dampers to provide free cooling before air cooling coil.
- High/low temperature warning: Generate a warning signal if supply air temperature rises above high limit or drops below low limit.
  - High limit: 30°C.
  - Low limit: 12°C.

ZONE AIR TEMPERATURE CONTROL Generally

- Set point adjustment: Provide temperature setback during periods when zone is unoccupied.
  - Zone air temperature heating set point reduction: 2°C.
  - Zone air temperature cooling set point increase: 3°C.
- Sensor: Occupancy detector
- Time delay:
  - Time from detection that occupancy has ended to set point adjusting: 10 minutes.
  - Time from detection that occupancy has resumed to set point adjusting: 10 minutes.
- Start up set point adjustment: Operative.
CONTROL PANEL Office

- Standards: To BS 7671, BS EN 60439-1 and -3.
- Manufacturer: Submit proposals.
  - Product reference: Submit proposals.
- Assembly: Fully factory tested.
  - Approval: ASTA certified.
  - Evidence of certification: Required.
- Internal separation: Form 4 to BS EN 60439-1 National Annex.
- Voltage: 400 V.
- Phase: Three.
- Assembly:
  - Standard: To BS EN 62208.
  - Ingress protection to BS EN 60529: Contractor's choice.
  - Material: Contractor's choice.
  - Finish: Contractor's choice.
  - Colour: Contractor's choice.
  - Intended location: Indoor.
  - Mechanical protection to BS EN 62262: submit proposals.
  - Incoming cabling access: determine on site.
  - Outgoing cabling access: determine on site.
- Locking mechanism: Cylinder locks with a standard key type.
- Incoming device: Switch-disconnector to BS EN 60947-3.
  - Interlock: Cannot be opened except with the isolator in the off position.
  - Rating: Contractor's choice.
  - Poles: Contractor's choice.
- Outgoing devices: Submit proposals.
- Identification:
  - Full length internal earth bar: Required.
  - Size: Submit proposals.
- Internal busbars and wiring:
  - Type: PVC insulated.
  - Size (minimum): 1 mm².
- Internal wiring: Segregate power and signal cabling. Contain within slotted trunking.
  - Wiring capacity (maximum): 45% full by volume.
- Busbars and connections: Fully shrouded.
- Accessories: Indicator lamps and Submit proposals.

INDICATOR LAMPS
- Lamp type: Clustered LED with bezel. Standardize lamp type.
- Lens colour: To BS EN 60073.
- Lamp mounting: Recessed.
- Common lamp test facility: Required.
- Access for lamp replacement: Externally from enclosure front.

ACTUATORS generally
- Standard: To BS EN 60730-2-8.
- Manufacturer: Contractor's choice.
  - Product reference: Contractor's choice.
- Type: Electric.
- Action: Submit proposals.
- Operation: Submit proposals.
- Electricity supply: Contractor's choice.
- Ancillaries: Submit proposals.
MOTORIZED VALVES generally
- Standard: To BS EN 60730-2-8.
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Type: Submit proposals.
- Valve authority:
  - Design Submit proposals.
  - Minimum: 0.25.
- Material: Contractor's choice.
- Connections: Contractor's choice.
- Electricity supply: Contractor's choice.

SENSORS, PRESSURE generally
- Standard: To BS EN 60730-2-6.
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Type: Contractor's choice.
- Application: Submit proposals.
- Accuracy: Submit proposals.
- Equipment interconnectivity: Wired.

SENSORS, AIR TEMPERATURE generally
- Standard: To BS EN 60730-2-9.
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Application: Submit proposals.
- Range: -10°C to 40°C.
- Accuracy: ±0.5°C.
- Equipment interconnectivity: Wired.

SENSORS, WATER TEMPERATURE generally
- Standard: To BS EN 60730-2-9.
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Type: Contractor's choice.
- Application: Pipe mounted immersion.
- Range: -10°C to 150°C.
- Accuracy: Submit proposals.
- Equipment interconnectivity: Wired.

EXECUTION

STRIPPING OUT
- Extent of stripping out as detailed in drawing package.

INSTALLATION OF SENSORS GENERALLY
- Standard: In accordance with Building Controls Industry Association (BCIA) Guide Control sensor installation.
- Screening: Screen from direct sunlight.
- Immersion: Immerse the sensor adequately in the medium.
- Immersion pockets: Provide for pipe sensors. Fill with thermal conductive compound.
- Cable: Flexible. Allow sufficient spare cable to allow for removal of sensor.
- Stratification: Install more than one sensor or an averaging sensor if necessary.
- Positions of sensors: as drawings and site conditions.
630 LOCATION OF ACTUATORS
  • Position: Top of valve.

640 LOCATION OF MOTORIZED VALVES
  • Spindles: Vertical.

680 LOCATION OF SENSORS, PRESSURE
  • Tapping points: Do not locate in turbulent flow.
    - Position: Locate an adequate distance from bends or fittings.
  • Vibration: Install on vibration free surface.

690 LOCATION OF SENSORS, TEMPERATURE
  • Room sensors:
    - Height: 1.5 m above floor.
    - Away from corners and doors.
    - Away from heat sources and draughts.
    - Away from direct solar radiation.
    - Not on external walls.
    - In the area controlled.
  • Pipe mounted immersion sensors:
    - Immerse full length of sensor in water.
    - Locate an adequate distance from bends or fittings.
  • 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.
  • Surface temperature sensors: Provide clean contact with surface and thermal conducting compound.
  • Outside air sensors:
    - Fix to north-facing wall.
    - Do not locate next to extract points, above windows or under eaves.
  • Frost protection sensors: Locate downstream of the first coil.

700 INSTALLING CONTROL PANELS
  • Control gear cubicles: Arrange in modular form to facilitate future extension.
  • Clearance (minimum):
    - Front access control panels: 1000 mm in front of control gear.
    - Rear access control panels: 1000 mm in front of and behind control gear.
  • Fixing equipment: Fix independently of wiring installation, with zinc electroplated fasteners.
    - Indoor equipment: Fix with internal lugs.
    - Outdoor equipment: Fix with external lugs.
  • Extension boxes: Provide where necessary.
  • Gland plates: Nonferrous for single core electrical cables.
  • Close coupled control panels: Interconnect.
    - Cable type: -.
    - Containment: -.
710  CABLE INSTALLATION GENERALLY

- Standard: To BS 7671.
- Timing: Do not start internal cabling until building enclosure provides permanently dry conditions.
- Cables: Install in one uninterrupted run with jointing at equipment and terminal fittings only.
- Arrangement: Position vertically and horizontally in line with equipment served, and parallel with building lines. Provide drip loop to prevent water entering equipment.
- Orientation: Dress cables flat, free from twists, kinks and strain.
- Cable pulling: Do not overstress.
  - Installation method: Submit proposals.
- Cables routes generally:
  - Concealed cable runs to wall accessories: Run vertically from the accessory.
  - Exposed cable runs: Submit proposals.
- Cables from other systems: Segregate and cross at right angles.
  - Distance from steam and low temperature hot water systems running parallel: 500 mm minimum.
- Terminations: Support cable within 150 mm of termination.
- Balanced twisted-pair cabling:
  - Maximum untwist at terminations: 12 mm.

COMPLETION

910  INSPECTION AND TESTING

- Standard: To BS 7671.
- Notice before commencing tests (minimum): 24 h.
- Certificates: Submit.
  - Number of copies: 2.
- Test equipment identity: Record on test certificates.
- Certificates of calibration: Submit for each test instrument.
- Control panel test certificates: Submit.
  - Number of copies: 2.

915  START UP AND COMMISSIONING

- Standard: In accordance with BCIA System start up and commissioning guide.

920  SPARES

- Spare fuses: Mount within each control panel.
  - Number: 2 of each type used.
- Spare devices: Supply.
  - Number: 2 of each type used.
- Spare lamps: Mount within control panel.
  - Number: 2 of each type and colour used.

930  KEYS

- Control panel doors: Supply.
  - Number: 2 of each type used.

940  DOCUMENTATION

- Operation and maintenance instructions: Submit.
- Record drawings: Submit.

950  MAINTENANCE

- Servicing and maintenance: Undertake.
  - Duration: Until 12 months after Practical Completion.
Y50
Mechanical commissioning
Y50 Mechanical commissioning

To be read with Preliminaries/ General conditions.

EXECUTION

610 COMMISSIONING PROGRAMME
• Submission: One week (minimum) before commissioning commences.
• Commissioning manager: Submit details with programme.

620 COMMISSIONING OF HOT AND COLD WATER SUPPLY SYSTEMS
• Pre-commissioning: In accordance with BSRIA 2/89.3 and CIBSE Commissioning Code W.
• Commissioning: In accordance with BS EN 806-4, BSRIA 2/89.3 and CIBSE Commissioning Code W.
• Notice (minimum): 48 h.
• Equipment: Check and adjust operation of equipment, controls and safety devices.
• Outlets: Check operation of outlets for satisfactory rate of flow and temperature.

630 COMMISSIONING OF WATER HEATING SYSTEMS
• Pre-commissioning: In accordance with BSRIA 2/89.3 and CIBSE Commissioning Code W.
• Commissioning: In accordance with BSRIA 2/89.3 and CIBSE Commissioning Code W.
• Variable flow systems: In accordance with CIBSE KS09 Commissioning variable flow pipework systems.
• Notice (minimum): 48 h.

650 COMMISSIONING OF BOILER PLANT
• Pre-commissioning: In accordance with CIBSE Commissioning Code B.
• Commissioning: In accordance with CIBSE Commissioning Code B.
• Notice (minimum): 48 h.

660 COMMISSIONING OF CHILLED WATER SYSTEMS
• Pre-commissioning: In accordance with BSRIA 2/89.3 and CIBSE Commissioning Code W.
• Commissioning: In accordance with BSRIA 2/89.3 and CIBSE Commissioning Code W.
• Variable flow systems: In accordance with CIBSE KS09 Commissioning variable flow pipework systems.
• Notice (minimum): 48 h.

680 COMMISSIONING OF AIR DISTRIBUTION SYSTEMS
• Pre-commissioning: In accordance with BSRIA 3/89.3 and CIBSE Commissioning Code A.
• Commissioning: In accordance with BSRIA 3/89.3 and CIBSE Commissioning Code A.
• Notice (minimum): 48 h.

690 COMMISSIONING OF CENTRAL CONTROLS AND BUILDING MANAGEMENT SYSTEMS
• Pre-commissioning: In accordance with CIBSE Commissioning Code C.
• Commissioning: In accordance with CIBSE Commissioning Code C.
• Notice (minimum): 48 h.

700 PERFORMANCE TESTING PROGRAMME
• Submission: One week (minimum) before performance testing commences.
• Performance testing manager: Submit details with programme.
710 PERFORMANCE TESTING
- General: Demonstrate the performance of the installations.
- Guaranteed efficiency: Submit proposals.
- Environmental tests: Carry out environmental testing. If necessary, use artificial loads to simulate operating conditions.
- Recorders:
  - Type: Supply and maintain portable seven day space temperature and relative humidity recorders, complete with charts.
  - Number: Two.
  - Duration of loan: Two weeks.
- Reports: Submit on completion.

750 INSPECTION AND TEST RECORDS
- Reports:
  - Construction phase: System design is commissionable.
- Records for water systems: In accordance with BSRIA 2/89.3.
- Records for air systems: In accordance with BSRIA 3/89.3.
- Record sheets:
  - Submission: On completion.
  - Number of copies: Three.

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