Ingleton Wood

Princes Risborough Community Centre

Mechanical & Electrical Specification

Job: 111712

15th November 2019

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50-10-05/120 Above ground wastewater drainage system with internal stacks

System outline

50-10-05/120 Above ground wastewater drainage system with internal stacks

- **Description:** The contractor is to allow for the supply and installation of the new above ground drainage system as per mechanical drawings.

  All Soil Waste & Vent Pipes (SWVP's) and Waste vent Pipes (WVP's) stacks shall have been designed as far as is practicable to be located / concealed within any service zones provided, or dropping on columns.

  All soil waste and ventilation pipework shall be in uPVC for general toilet areas, sinks and WHB's.

  The contractor shall include for all equipment, accessories, controls, supports and ancillaries necessary to enable the works to function correctly.

  The contractor shall produce co-ordinated working and installation drawings, and issue these to the client's advisers for comment, prior to starting work on site.

  The tender information for the Above Ground Drainage design has been based upon the sanitary fittings as shown on the architectural layout drawings.

  Fixing to the structure & Builders Work in connection with the MEP services.

  The Contractor shall design for all supports and fixings necessary to install the works.

  The Contractor shall design and locate the position of expansion anchors and guide locations.

  All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

  The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

  Fire Stopping and Acoustic Treatment of Services Penetrations

  The Contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework material.

  The contractor is responsible for design and provision of all expansion and contraction requirements and is deemed to have included for all necessary requirements appropriate to the pipework material.

  The contractor shall ensure that all services penetrations throughout the building whether through

ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

It is the contractor's responsibility to ensure all working drawings and details are submitted in sufficient time to allow time for review without being detrimental to the construction programme.

- **Floor drainage:**
  - **Preparation to existing floors:** Cutting out chases in existing concrete.
  - **Floor channels and gullies:** 90-05-20/306 Floor gullies.
- **Sanitary pipework:**
  - **Small diameter branch discharge pipework:**

    Traps: 90-10-60/410 Sanitary appliance traps.

    Pipelines and fittings: 90-10-20/354 Unplasticized polyvinyl chloride (PVC-U) above ground drainage pipes.

    Accessories for jointing: Solvent welding cement.

    Supports: 90-10-20/340 Brackets and clips for above ground drainage pipes.

    Fixings: Contractor's design.
  - **Large diameter branch discharge pipework:**

    Pipelines and fittings: 90-10-20/354 Unplasticized polyvinyl chloride (PVC-U) above ground drainage pipes.

    Accessories for jointing: Solvent welding cement.

    Supports: 90-10-20/340 Brackets and clips for above ground drainage pipes.

    Fixings: Contractor's design.

    Insulation: 90-90-40/330 Mineral wool pipe section insulation.
  - **Discharge stack pipework:**

    Pipelines and fittings: 90-10-20/354 Unplasticized polyvinyl chloride (PVC-U) above ground drainage pipes.

    Accessories for jointing: Solvent welding cement.

    Supports: 90-10-20/340 Brackets and clips for above ground drainage pipes.

    Fixings: Contractor's design.

    Insulation: 90-90-40/330 Mineral wool pipe section insulation.
- **Ventilating pipework:**
  - **Ventilating branch pipework:**

    Pipelines and fittings: 90-10-20/354 Unplasticized polyvinyl chloride (PVC-U) above ground drainage pipes.

    Accessories for jointing: Solvent welding cement.

    Supports: 90-10-20/340 Brackets and clips for above ground drainage pipes.

    Fixings: Contractor's design.
  - **Ventilating stack pipework:**

    Pipelines and fittings: 90-10-20/354 Unplasticized polyvinyl chloride (PVC-U) above ground drainage pipes.

    Accessories for jointing: Solvent welding cement.

Supports: 90-10-20/340 Brackets and clips for above ground drainage pipes.

Fixings: Contractor's design.

- **Overflow pipework:**
  - **Pipelines and fittings:** 90-10-20/354 Unplasticized polyvinyl chloride (PVC-U) above ground drainage pipes.
  - **Accessories for jointing:** Solvent welding cement.
  - **Supports:** 90-10-20/340 Brackets and clips for above ground drainage pipes.
  - **Fixings:** Contractor's design.
- **Pipework identification:** 90-90-55/430 Identifying pipework and 90-90-55/480 Mechanical plant and equipment identification labels.
- **Fire stopping:**
  - **Floor penetrations:** 45-45-70/433 Flexible intumescent gap sealer and 45-55-50/325 Intumescent mortar.
  - **Wall penetrations:** 45-55-50/325 Intumescent mortar and 90-10-60/405 Pipe sleeves.
- **System accessories:** 90-10-90/400 Air admittance valves and 90-10-60/437 Discharge and ventilating stack terminations.
- **Execution:** 50-10-05/614 Installing above ground wastewater drainage discharge branch pipework; 50-10-05/616 Installing above ground wastewater drainage discharge stack pipework generally; and 50-10-05/610 Installing above ground wastewater drainage systems.
- **System completion:** 50-10-05/820 Above ground wastewater drainage system pipework airtightness test; 50-10-05/840 Above ground wastewater drainage system pre-handover checks; 50-10-05/830 Above ground wastewater drainage system siphonage and back pressure tests; 50-10-05/850 Above ground wastewater drainage system submittals; 50-10-05/860 Documentation; and 50-10-05/810 Testing above ground wastewater drainage systems.

Products

45-45-70/433 Flexible intumescent gap sealer

- **Fire performance:** To comply with fire strategy.

45-55-50/325 Intumescent mortar

- **Material:** Cement based.
- **Fire resistance:** 120 minutes.

90-05-20/306 Floor gullies

- **Standard:** To BS EN 1253-1.
- **Body:**
  - **Configuration:** P-trapped.
  - **Material:** Manufacturer's standard.
- **Cover or grating:**
  - **Cover or grating type:** Solid covers.

- **Material:** Manufacturer's standard.
- **Finish:** Manufacturer's standard.

- **Outlet:** Manufacturer's standard.
- **Load class (minimum):** Manufacturer's standard.
- **Integral accessories:** Manufacturer's standard.
- **Execution:** 90-05-20/620 Installing gullies.

90-10-20/340 Brackets and clips for above ground drainage pipes

- **Form:** Stand off pipe clips.
- **Material:** Plastics.
- **Finish:** Self-finished.

90-10-20/354 Unplasticized polyvinyl chloride (PVC-U) above ground drainage pipes

- **Standard:** To BS EN 1329-1 and the weathering resistance requirements of BS 4514.
- **Third party product certification:** BSI Kitemark or Agrément certified.
- **Nominal sizes:** DN 32;
  DN 40;
  DN 50;
  and DN 110.
- **Colour:** Grey.
- **Integral accessories:** Access fittings;
  Air admittance valves;
  and Plastics cages.
- **Execution:** 90-10-20/630 Fixing and jointing rainwater and above ground drainage pipes.

90-10-60/405 Pipe sleeves

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Material:** Manufacturer's standard.
- **Form:** Manufacturer's standard.

90-10-60/410 Sanitary appliance traps

- **Standard:** To BS EN 274-1.
- **Third party product certification:** BSI Kitemark certified.
- **Trap:** Anti-siphon bottle trap.
- **Jointing:** Manufacturer's standard.
- **Material:** As branch discharge pipework.
- **Colour:** As branch discharge pipework.
- **Size:** As branch discharge pipework.
- **Depth of water seal (minimum):** Manufacturer's standard.
- **Integral accessories:** Manufacturer's standard.

90-10-60/437 Discharge and ventilating stack terminations

- **Arrangement:** Perforated cover or cage that does not restrict airflow.
- **Material:** Plastics, as discharge stack.

90-10-90/400 Air admittance valves

- **Standard:** To BS EN 12380.
- **Material:** Manufacturer's standard.
- **Size:** 32 mm;
  40 mm;
  50 mm;
  and 110 mm.
- **Jointing:** Compression joint.
- **Minimum air flow rate:** To BS EN 12056-2.
- **Execution:** 90-10-90/660 Installation of discharge connections.

90-90-40/330 Mineral wool pipe section insulation

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Standard:** To BS EN 14303.
- **Recycled content:** Manufacturer's standard.
- **Thermal conductivity:** 0.032 W/m·K at 0°C.
  0.034 W/m·K at 10°C.
  0.037 W/m·K at 50°C.
  0.040 W/m·K at 75°C.
  0.044 W/m·K at 100°C.
- **Finish:** Aluminium foil faced.
- **Reaction to fire classification:** Manufacturer's standard.
- **Insulation thickness (minimum):** To BS 5422.
- **Vapour barrier:**
  - **Material:** Manufacturer's standard.
  - **Vapour permeability:** To BS 5422, clause 5.6.
- **Protection:** Isogenopak
- **Accessories:** 90-90-40/480 Insulation for valves and flanges and 90-90-40/485 Insulation at loadbearing pipeline supports.
- **Execution:** 90-90-40/625 Installing foil faced mineral wool insulation on pipelines.

90-90-40/480 Insulation for valves and flanges

- **Form:** Removable and reusable pads.
- **Finish:** Aluminium foil faced. Isogenopak within plant room
- **Execution:** 90-90-40/740 Installing at valves and flanges.

90-90-40/485 Insulation at loadbearing pipeline supports

- **Pipelines carrying fluids at temperature up to 120°C:** Manufacturer's standard.
- **Pipelines carrying cold fluids:** Manufacturer's standard.
- **Execution:** 90-90-40/750 Installing at loadbearing pipelines supports.

90-90-55/430 Identifying pipework

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; and 55-40-40/140 Instantaneous hot water supply system.

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS 1710.
- **Identification type:** Manufacturer's standard.
- **Execution:** 90-90-55/660 Installing identification on pipework.

90-90-55/480 Mechanical plant and equipment identification labels

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; and 55-40-40/140 Instantaneous hot water supply system.

- **Material:** Face engraved rigid plastic laminate.
- **Label size:** Manufacturer's standard.
- **Colour:**
  - **Background:** White.
  - **Lettering:** Black.
- **Typography:**
  - **Font:** Manufacturer's standard.
  - **Size:** Manufacturer's standard.
- **Information to be included:** Equipment name;
  Equipment reference number;
  and Service.
- **Execution:** 90-90-55/610 Installing mechanical plant and equipment identification.

Execution

50-10-05/610 Installing above ground wastewater drainage systems

- **Standards:** To BS EN 12056-2 and BS EN 12056-5.
- **Collection and distribution of wastewater:**
  - **General:** Quick, quiet and complete; self-cleansing in normal use, without blockage, crossflow, backfall, leakage, odours, noise nuisance or risk to health.
  - **Pressure fluctuations in pipework (maximum):** ±38 mm water gauge.
  - **Water seal retained in traps (minimum):** 25 mm.
- **Pipelines:** Plumb and/ or true to line.
  - **Routes:**

Routes generally: The shortest practical, with as few bends as possible.

Routes not shown on drawings: Submit proposals.

- **Jointing:** Joint with materials, fittings and techniques intended for the purpose and that will make effective and durable connections.

- **Allowance for thermal and building movement:** Provide and maintain clearance as fixing and jointing proceeds.
- **Concealed or inaccessible surfaces:** Decorate before starting work specified in clauses from this section.
- **Electrolytic corrosion:** Avoid contact between dissimilar metals where corrosion may occur.
- **Protection:**
  - **Purpose made temporary caps:** Fit to prevent ingress of debris.
  - **Access covers, cleaning eyes and blanking plates:** Fit as the work proceeds.

50-10-05/614 Installing above ground wastewater drainage discharge branch pipework

- **Pipework:**
  - **Alignment:** Fix securely plumb and/ or true to line.
  - **Branches and low gradient sections:** Fix with uniform and adequate falls to drain efficiently.
  - **Socketed pipes and fittings:** Fix with sockets facing upstream.
  - **Additional supports:** Provide as necessary to support junctions and changes in direction.
- **Wall and floor penetrations:**
  - **Isolating pipework:** Isolate pipework from structure, e.g. with pipe sleeves.
  - **Masking plates:** Fix at penetrations if visible in the finished work.

50-10-05/616 Installing above ground wastewater drainage discharge stack pipework generally

- **Pipework:**
  - **Alignment:** Fix securely plumb and true to line.
  - **Externally socketed pipes and fittings:** Fix with sockets facing upstream.
  - **Vertical pipes:** Provide a loadbearing support not less than every storey level. Locate at or close below socket collar or coupling. Tighten fixings as work proceeds so that every storey is self-supporting.
  - **Additional supports:** Provide as necessary to support junctions and changes in direction.
- **Wall and floor penetrations:**
  - **Isolating pipework:** Isolate pipework from structure, e.g. with pipe sleeves.
  - **Masking plates:** Fix at penetrations if visible in the finished work.
- **Expansion joint sockets:** Fix rigidly to the building.
- **Fixings:** Allow the pipe to slide.

90-05-20/620 Installing gullies

- **Alignment:** Submit proposals.
- **Bedding:**
  - **Material:**
  - **Thickness (minimum):**
- **Surround:**

- **Material:**
- **Width (minimum):**
- **Depth:**

90-10-20/630 Fixing and jointing rainwater and above ground drainage pipes

- **Fixing:**
  - **Supports:**

    Stability: Fix securely.

    Fixing centres (nominal):
  - **Pipework:**

    Alignment: Plumb and/ or true to line.

    Externally socketed pipes and fittings: Fix with socket ends forming inlet for each individual pipe.
- **Jointing:**
  - **Jointing differing pipework systems:** Use adaptors intended for the purpose.
  - **Cut ends of pipes:** Clean and square. Remove burrs and swarf. Chamfer ends of plastics pipes before inserting into ring seal sockets. Where metal pipes are to be used, recoat bare metal with appropriate primer and paint.
  - **Jointing or mating surfaces:** Clean and, where necessary, use jointing lubricant immediately to allow safe and efficient jointing assembly.
  - **Unsealed joints:** Wedge unsealed joints to cast pipes with timber or sheet lead cut-offs to centralize pipe joints and reduce rattling.
  - **Expansion joint pipe sockets:** Fix rigidly to buildings. Elsewhere, provide brackets and fixings that allow pipes to slide.
  - **Solvent welded pipelines:** Install ring seal joints in all long runs of solvent welded pipework, as movement joints.
- **Spacing (maximum):**
- **Wall and floor penetrations:**

90-10-90/610 Installation of valves generally

Shared by: 90-10-90/330 Ball valves; 90-10-90/370 Thermostatic mixing valves; 90-10-90/374 Draining taps; 90-10-90/415 Pressure relief valves; 90-10-90/440 Backflow prevention check valves; 90-10-90/620 Installation of double regulating valves; 90-10-90/660 Installation of discharge connections; and 90-10-90/670 Installation of check valves.

- **Installation:** In accordance with BS 6683.
- **Position:** Contractor's choice.
- **Isolation and regulation valves:** Provide at equipment and on sub-circuits.
- **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.

90-10-90/660 Installation of discharge connections

- **General requirements:** 90-10-90/610 Installation of valves generally.

- **Safety and relief valves:**
- **Vent cocks:**
- **Air bottles:**
- **Automatic air vents:**

90-90-40/610 Installing insulation and protection products generally

Shared by: 90-90-40/625 Installing foil faced mineral wool insulation on pipelines; and 90-90-40/660 Installing foil faced mineral wool insulation on ductwork.

- **Standard:** In accordance with BS 5970.
- **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.

90-90-40/625 Installing foil faced mineral wool insulation on pipelines

- **General requirements:** 90-90-40/610 Installing insulation and protection products generally.
- **Joints:** Close butt; seal with 50 mm wide class 0 foil 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 0 foil tape.

90-90-40/740 Installing at valves and flanges

- **Application:** Do not obstruct removal of nuts and bolts, or operation of valves.

90-90-40/750 Installing at loadbearing pipelines supports

- **Application:** Close butt to insulation.
- **Joints:** Seal with 100 mm wide class 0 foil tape.
- **Sleeve:** Provide sheet metal protection sleeve.

90-90-55/610 Installing mechanical plant and equipment identification

- **Fixing:** Fix with adhesive to equipment.
- **Position:** On equipment.

90-90-55/660 Installing identification on pipework

- **Application of basic identification colour:** Coloured bands as BS 1710.
- **Safety colour identification:** Contractor's choice.
- **Information:** Colour bands as BS 1710 and Name of contents in full.
- **Direction of flow:** Indication arrow and the word FLOW or the letter F and Indication arrow and the word RETURN or the letter R.

System completion

50-10-05/810 Testing above ground wastewater drainage systems

- **Dates for testing:**
  - **Notice:** Required.
  - **Period of notice (minimum):**
- **Preparation:**
  - **Pipework:** Securely fixed and free from obstruction and debris.
  - **Traps:** Fill with clean water.
- **Testing:**
  - **Water for testing:** Supply clean water, assistance and apparatus.
  - **Smoke for testing:** Do not use.
- **Records of tests:** Submit.

50-10-05/820 Above ground wastewater drainage system pipework airtightness test

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

50-10-05/830 Above ground wastewater drainage system siphonage and back pressure tests

- **Method:**
  - **WC pans:** Test by flushing.
  - **Other appliances:** Test by filling to overflow level, then removing the plug.
- **Number of tests:** Test each appliance three times. Recharge traps before each test.
- **Self siphonage testing:** Test each appliance individually.
- **Induced siphonage and back pressure testing:** Test by discharging the following appliances simultaneously on each stack.
  - **WCs:** [..]
  - **Washbasins:** [..]
  - **Sinks:** [..]

50-10-05/840 Above ground wastewater drainage system pre-handover checks

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

50-10-05/850 Above ground wastewater drainage system submittals

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

50-10-05/860 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Paper copy.
  - **Number of copies:**
- **Record drawings:**
  - **Content:**
  - **Format:**
  - **Number of copies:**
- **Submittal date:** At handover.

Ω End of system

55-40-40/120 Cold water supply system

System outline

55-40-40/120 Cold water supply system

- **Description:** Teh contractor shall investigate the existing community centre to establish the location of the incoming mains cold water supply and its distribution pipework to best ascertain a location to connect the required supplies to the new extension.

  A new water meter (pulsed) shall be installed on the supply to the cafe, including isolaing valves to allow replacement.

  The contractor shall provide CWS to each outlet in accordance with the WRAS, ACOP L8 and CIBSE guidelines.

  The new CWS pipework shall be concealed where possible and insulated using foil faced mineral wool insulation, if pipework is visible the contractor is to use an Isogenapac finish (in the plant room).

  The contractor shall install an Inline water Conditioner such as supplied by 'Aqua Bion' or equal and approved, the water conditoner is to be installed on the incoming mains cold water within the existing community centre.

  All pipework drops are to be concealed within IPS Panelling or boxed in to the Architects recommendation.

  The contractor will be responsible for providing all necessary fire stopping in accordance with the fire plan, the contractor shall also be responsible for determining all services support system and expansion/contraction devices.

  The domestic water services pipework shall be in copper pipework as detailed in this specification. The installation of the MCWS pipework shall comply with the manufacturer's recommendations for, support, brackets, pressure testing and fittings.

  Isolation vales shall be provided on each appliance and branch runs to minimise risk of water loss or loss of service in the event of a pipework fault or routine maintenance. Full access shall be provided to valves.

  The MCWS system shall be fully cleaned and disinfected prior to completing the project and a chlorination test certificate shall be provided.

  A UKAS or NAMAS accredited laboratory shall be used for sample testing prior to works commencing and upon completion, copies of test certificates shall be provided to the local water authority and shall include:

  * Full Bacteriological
  * Taste and Odour
  * Turbidity
  * Aesthetic

Fixing to the structure & Builders Work in connection with the MEP services.

The Contractor shall design for all supports and fixings necessary to install the works.

The Contractor shall design and locate the position of expansion anchors and guide locations.

All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

Fire Stopping and Acoustic Treatment of Services Penetrations

The contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework material.

The contractor is responsible for design and provision of all expansion and contraction requirements and is deemed to have included for all necessary requirements appropriate to the pipework material.

The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

It is the contractor's responsibility to ensure all working drawings and details are submitted in sufficient time to allow time for review without being detrimental to the construction programme.

- **Arrangement:** Mains.
- **Water meters:** 90-65-55/470 Water meters.
- **Water treatment plant:** Aqua Bion on line water conditoner
- **Pipelines:**
  - **Above ground:** 90-10-65/310 Copper pipelines.
- **Valves:**
  - **Backflow prevention devices:** 90-10-90/440 Backflow prevention check valves.
  - **Isolating valves:** 90-10-90/330 Ball valves.
  - **Check valves:** 90-10-90/352 Copper alloy check valves.
  - **Regulating valves:** 90-10-90/356 Double regulating valves and 90-10-90/415 Pressure relief valves.
  - **Mixing valves:** 90-10-90/370 Thermostatic mixing valves.
  - **Draining devices:** 90-10-90/374 Draining taps.
- **Fire stopping:** Individual services penetrations fire stopping system.
- **Thermal insulation:**
  - **Pipelines:** 90-90-40/330 Mineral wool pipe section insulation.

- **Vibration isolation:** Contractor's design.
- **Outlets:** 45-35-70/371 Taps and water supply fittings for wash basins and troughs.
- **Execution:** 55-40-40/620 Installing hot and cold water systems generally and 55-40-40/670 Disinfection of hot and cold water systems.
- **System completion:** 55-40-40/810 Commissioning of hot and cold water supply systems; 55-40-40/820 Inspection and test records; and 55-40-40/850 Water quality tests.

Products

45-35-70/371 Taps and water supply fittings for wash basins and troughs

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Manufacturer:** As per architects schedule
- **Approval:** Water Regulations Advisory Scheme (WRAS) approved.
- **Water supply temperature (maximum):** 43°C.
- **Integral accessories:** Manufacturer's standard.

90-10-65/310 Copper pipelines

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **General requirements:** 90-10-65/320 Copper pipeline jointing materials and 90-10-65/315 Copper pipeline fittings.
- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 1057.
- **Grade:** Manufacturer's standard.
- **Finish:** Plain.
- **Execution:** 90-10-65/630 Installing copper pipelines.

90-10-65/315 Copper pipeline fittings

- **Manufacturer:** Contractor's choice.
- **Standards:**
  - **Capillary:** Manufacturer's standard.
  - **Compression:** Manufacturer's standard.
  - **Flanges:** To BS EN 1092-3
  - **Press fittings:** Manufacturer's standard.

90-10-65/320 Copper pipeline jointing materials

- **Standards:**
  - **Lead free solder for capillary fittings:** To BS EN ISO 9453.

90-10-90/330 Ball valves

Shared by: 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Connections:** Compression to BS EN 1254-2.
- **Finish:** Natural.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-10-90/352 Copper alloy check valves

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Standard:** To BS 5154.
- **Material:** Copper alloy.
- **Connections:** Compression to BS EN 1254-2.
- **Operation:** Contractor's choice.
- **Execution:** 90-10-90/670 Installation of check valves.

90-10-90/356 Double regulating valves

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS 7350.
- **Arrangement:** Globe.
- **Material:** Copper alloy.
- **Execution:** 90-10-90/620 Installation of double regulating valves.

90-10-90/370 Thermostatic mixing valves

- **Manufacturer:** Horne
- **Standard:** To BS EN 1111.
- **Arrangement:** Manufacturer's standard.
- **Connections:** Threaded to BS EN ISO 228-1.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-10-90/374 Draining taps

Shared by: 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Standard:** To BS 2879.
- **Material:** Copper alloy.
- **Connections:** Threaded joints to BS EN 10226-1.
- **Accessories:** Manufacturer's standard.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-10-90/415 Pressure relief valves

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 1074-5.
- **Third party certification:** WRAS approval.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-10-90/440 Backflow prevention check valves

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 13959.
- **Third party certification:** WRAS approval.
- **Pressure class:** PN 10.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-65-55/470 Water meters

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS EN ISO 4064-1 and BS EN ISO 4064-4.
- **Format:** In-line meters.
- **Connections:** Manufacturer's standard.
- **Indicating device:** Type 3 - combination of analogue and digital.
- **Features:** Pulsed output for remote monitoring.
- **Accessories:** Manufacturer's standard.
- **Execution:** 90-65-55/670 Installing water meters.

90-90-40/330 Mineral wool pipe section insulation

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Standard:** To BS EN 14303.
- **Recycled content:** Manufacturer's standard.
- **Thermal conductivity:** 0.032 W/m·K at 0°C.
  0.034 W/m·K at 10°C.
  0.037 W/m·K at 50°C.
  0.040 W/m·K at 75°C.
  0.044 W/m·K at 100°C.
- **Finish:** Aluminium foil faced.
- **Reaction to fire classification:** Manufacturer's standard.
- **Insulation thickness (minimum):** To BS 5422.
- **Vapour barrier:**
  - **Material:** Manufacturer's standard.
  - **Vapour permeability:** To BS 5422, clause 5.6.
- **Protection:** Isogenopak
- **Accessories:** 90-90-40/480 Insulation for valves and flanges and 90-90-40/485 Insulation at loadbearing pipeline supports.
- **Execution:** 90-90-40/625 Installing foil faced mineral wool insulation on pipelines.

90-90-40/480 Insulation for valves and flanges

- **Form:** Removable and reusable pads.

- **Finish:** Aluminium foil faced. Isogenopak within plant room
- **Execution:** 90-90-40/740 Installing at valves and flanges.

90-90-40/485 Insulation at loadbearing pipeline supports

- **Pipelines carrying fluids at temperature up to 120°C:** Manufacturer's standard.
- **Pipelines carrying cold fluids:** Manufacturer's standard.
- **Execution:** 90-90-40/750 Installing at loadbearing pipelines supports.

Execution

55-40-40/620 Installing hot and cold water systems generally

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Standard:** To BS 8558 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.

55-40-40/670 Disinfection of hot and cold water systems

- **Standard:** To BS EN 806-4.
- **Samples for analysis:** Provide after disinfection and flushing.

90-10-65/610 Pipelines installation generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; 90-10-65/665 Installing refrigerant pipework; and 90-10-65/680 Installing steel pipelines.

- **Standard:** BESATechnical Report TR/20/4 Hot water service.
- **Dissimilar metals:** Prevent electrolytic corrosion.

90-10-65/615 Installing pipeline fittings

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Bushes:** Contractor's choice.
- **Fabricated junctions and fittings:** Contractor's choice.
- **Demountable joints:** Contractor's choice.

90-10-65/620 Installing anchors generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Purpose:** 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.
- **Fixing to building structure:** Submit proposals.
- **Building structure:** Submit proposals.

90-10-65/625 Installing slide guides

Shared by: 90-10-65/630 Installing copper pipelines; and 90-10-65/680 Installing steel pipelines.

- **Expansion and contraction:** Direct movement from pipe anchor points towards loops, bellows or flexible inserts.
- **Thrust:** Linear relative to the axis of pipe.
- **Friction:** Contractor's choice.

90-10-65/630 Installing copper pipelines

- **General requirements:** 90-10-65/690 Spacing of pipelines;
  90-10-65/625 Installing slide guides;
  90-10-65/615 Installing pipeline fittings;
  90-10-65/610 Pipelines installation generally;
  90-10-65/710 General inspection and testing;
  and 90-10-65/620 Installing anchors generally.
- **Standard:** In accordance with CDA publications 88 Copper tube in buildings.
- **Expansion loops:** Formed bends from single pipe length.

90-10-65/710 General inspection and testing

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Inspection of joints:**
  - **Joints:** Submit proposals.
- **Safety precautions:** In accordance with HSEGS 4.

90-10-90/610 Installation of valves generally

Shared by: 90-10-90/330 Ball valves; 90-10-90/370 Thermostatic mixing valves; 90-10-90/374 Draining taps; 90-10-90/415 Pressure relief valves; 90-10-90/440 Backflow prevention check valves; 90-10-90/620 Installation of double regulating valves; 90-10-90/660 Installation of discharge connections; and 90-10-90/670 Installation of check valves.

- **Installation:** In accordance with BS 6683.
- **Position:** Contractor's choice.
- **Isolation and regulation valves:** Provide at equipment and on sub-circuits.
- **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.

90-10-90/620 Installation of double regulating valves

- **General requirements:** 90-10-90/610 Installation of valves generally.
- **Position:**

90-10-90/670 Installation of check valves

- **General requirements:** 90-10-90/610 Installation of valves generally.
- **Lift type:** Install in direction of flow as indicated on the body.
- **Disc type:** With spring, fit in any plane. Without spring, fit in vertical plane with flow from bottom to top.
- **Wafer type:** Install between flanges. Fit in horizontal plane or vertical upward flow.
- **Split disc:** Install between flanges. Fit in horizontal plane or vertical upward flow.

90-65-55/670 Installing water meters

- **Standards:** To BS EN ISO 4064-5.

90-90-40/610 Installing insulation and protection products generally

Shared by: 90-90-40/625 Installing foil faced mineral wool insulation on pipelines; and 90-90-40/660 Installing foil faced mineral wool insulation on ductwork.

- **Standard:** In accordance with BS 5970.
- **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.

90-90-40/625 Installing foil faced mineral wool insulation on pipelines

- **General requirements:** 90-90-40/610 Installing insulation and protection products generally.
- **Joints:** Close butt; seal with 50 mm wide class 0 foil 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 0 foil tape.

90-90-40/740 Installing at valves and flanges

- **Application:** Do not obstruct removal of nuts and bolts, or operation of valves.

90-90-40/750 Installing at loadbearing pipelines supports

- **Application:** Close butt to insulation.
- **Joints:** Seal with 100 mm wide class 0 foil tape.
- **Sleeve:** Provide sheet metal protection sleeve.

System completion

55-40-40/810 Commissioning of hot and cold water supply systems

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Pre-commissioning:** In accordance with BSRIABG 2/2010 and CIBSECommissioning Code W.
- **Commissioning:** In accordance with BS EN 806-4, BSRIABG 2/2010 and CIBSECommissioning 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.

55-40-40/820 Inspection and test records

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Construction phase reports:** System design is commissionable.
- **Records for water systems:** In accordance with BSRIABG 2/2010.
- **Record sheets:**
  - **Submission:** On completion
  - **Number of copies:** Three.

55-40-40/850 Water quality tests

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Standard:** To BS EN 806-4.
- **Samples:**
  - **Sample points:** Main supply to site.
  - **Samples for analysis:** Submit samples for bacteriological analysis.
- **Water temperature:** Record at each sampling point at the time of taking the sample.
- **Test results:**
  - **Record:** Details of all analyses.
  - **Submit:** On completion.
  - **Number of copies:** Three.

Ω End of system

55-40-40/140 Instantaneous hot water supply system

System outline

55-40-40/140 Instantaneous hot water supply system

- **Description:** The contractor is to extend the existing MCWS from the existing commuinty centre to serve the new instantaneous hot water heaters within the new extension.

  The contractor is to supply and install the following within the new extension:

  1No. 30 litre Heatrea Sadia Multipoint Eco hot water heater complete with 3kW immersion heater serving 3No. WHB's within Male W.C as per mechanical drawings.

  1No. 30 litre Heatrea Sadia Multipoint Eco hot water heater complete with 3kW immersion heater serving 3No. WHB's within Female W.C as per mechanical drawings.

  1No. 10 litre Heatrea Sadia Multipoint hot water heater complete with 3kW immersion heater serving 1No. WHB's within Disabled W.C as per mechanical drawings.

  1No. 30 litre Heatrea Sadia Multipoint Eco hot water heater complete with 3kW immersion heater serving 2No. WHB's for the Cafe Disabled W.C's as per mechanical drawings.

  The contractor is to box in each hot water heater and pipework where stated on the mechanical drawings to Architects recommendations. The contrator is to ensure the hot water heaters are accessable for maintanance.

  The contractor will allow for all fixtures, fittings, valves, components and ancillaries as required to complete the installation. The installation is to be in copper pipework and insulated using foil faced mineral wool.

  It is recommended that the contractor takes water samples for lab testing prior to works commencing to establish system condition. This will provide system water quality bench marking for post water quality testing certificates. This will also provide any early warnings associated with the existing domestic water system.

  The contractor shall include for all commissioning of the new system, and any re-commissioning of the existing system as required. Pressure testing and water quality testing certificates are to be provided.

  The contractor shall provide 'As installed' drawings of the system prior to handover in electronic format and a paper copy within each O&M Manual.

  <u>Fixing to the structure & Builders Work in connection with the MEP services.</u>

  The Contractor shall design for all supports and fixings necessary to install the works.

  The Contractor shall design and locate the position of expansion anchors and guide locations.

All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to ensure that vibration from equipment is not transmitted to the building, other supporting structure,pipework or ductwork.

The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

Fire Stopping and Acoustic Treatment of Services Penetrations

The Contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework material.

The contractor is responsible for design and provision of all expansion and contraction requirements and is deemed to have included for all necessary requirements appropriate to the pipework material.

The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

- **System performance:** 55-40-40/230 Instantaneous hot water supply.
- **Instantaneous water heater:** 90-15-35/400 Instantaneous water heaters, electric and 90-10-95/430 Buffer tanks.
- **Pipelines:** 90-10-65/310 Copper pipelines.
- **Pipeline accessories:** 90-10-60/405 Pipe sleeves.
- **Valves:**
  - **Isolating valves:** 90-10-90/330 Ball valves.
  - **Check valves:** 90-10-90/352 Copper alloy check valves.
  - **Draining devices:** 90-10-90/374 Draining taps.
  - **Accessories:** 90-10-90/360 Test points.
- **Fire stopping:** Individual services penetrations fire stopping system.
- **Thermal insulation:** 90-90-40/330 Mineral wool pipe section insulation.
- **Outlets:** 45-35-70/371 Taps and water supply fittings for wash basins and troughs.
- **Plant and equipment identification:** 90-90-55/430 Identifying pipework; 90-90-55/480 Mechanical plant and equipment identification labels; and 90-90-55/495 Valve identification labels.
- **Execution:** 55-40-40/620 Installing hot and cold water systems generally.
- **System completion:** 55-40-40/810 Commissioning of hot and cold water supply systems; 55-40-40/820 Inspection and test records; and 55-40-40/850 Water quality tests.

System performance

55-40-40/230 Instantaneous hot water supply

- **Type of water heater:** Electric.
- **Water supply:** Mains.

Products

45-35-70/371 Taps and water supply fittings for wash basins and troughs

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Manufacturer:** As per architects schedule
- **Approval:** Water Regulations Advisory Scheme (WRAS) approved.
- **Water supply temperature (maximum):** 43°C.
- **Integral accessories:** Manufacturer's standard.

90-10-60/405 Pipe sleeves

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Material:** Manufacturer's standard.
- **Form:** Manufacturer's standard.

90-10-65/310 Copper pipelines

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **General requirements:** 90-10-65/320 Copper pipeline jointing materials and 90-10-65/315 Copper pipeline fittings.
- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 1057.
- **Grade:** Manufacturer's standard.
- **Finish:** Plain.
- **Execution:** 90-10-65/630 Installing copper pipelines.

90-10-65/315 Copper pipeline fittings

- **Manufacturer:** Contractor's choice.
- **Standards:**
  - **Capillary:** Manufacturer's standard.
  - **Compression:** Manufacturer's standard.
  - **Flanges:** To BS EN 1092-3
  - **Press fittings:** Manufacturer's standard.

90-10-65/320 Copper pipeline jointing materials

- **Standards:**
  - **Lead free solder for capillary fittings:** To BS EN ISO 9453.

90-10-90/330 Ball valves

Shared by: 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Connections:** Compression to BS EN 1254-2.
- **Finish:** Natural.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-10-90/352 Copper alloy check valves

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Standard:** To BS 5154.
- **Material:** Copper alloy.
- **Connections:** Compression to BS EN 1254-2.
- **Operation:** Contractor's choice.
- **Execution:** 90-10-90/670 Installation of check valves.

90-10-90/360 Test points

Shared by: 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Arrangement:** Self-sealing.
- **Material:** Contractor's choice.
- **Connections:** Manufacturer's standard.

90-10-90/374 Draining taps

Shared by: 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Standard:** To BS 2879.
- **Material:** Copper alloy.
- **Connections:** Threaded joints to BS EN 10226-1.
- **Accessories:** Manufacturer's standard.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-10-95/430 Buffer tanks

- **Manufacturer:** Heatrea Sadia
- **Material:** Manufacturer's standard.
- **Accessories:** Manufacturer's standard.

90-15-35/400 Instantaneous water heaters, electric

- **Manufacturer:** Heatrea Sadia
- **Standards:** To BS EN 60335-1 and BS EN 60335-2-35.
- **Arrangement:** Multipoint – mains supply.
- **Rating:** 3 kW.
- **Control:** Manufacturer's standard.
- **Outlets:** Multi-point and Single point.
- **Casing finish:** Manufacturer's standard.
- **Accessories:** Manufacturer's standard.

90-90-40/330 Mineral wool pipe section insulation

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Standard:** To BS EN 14303.
- **Recycled content:** Manufacturer's standard.
- **Thermal conductivity:** 0.032 W/m·K at 0°C.
  0.034 W/m·K at 10°C.
  0.037 W/m·K at 50°C.
  0.040 W/m·K at 75°C.
  0.044 W/m·K at 100°C.
- **Finish:** Aluminium foil faced.
- **Reaction to fire classification:** Manufacturer's standard.
- **Insulation thickness (minimum):** To BS 5422.
- **Vapour barrier:**
  - **Material:** Manufacturer's standard.
  - **Vapour permeability:** To BS 5422, clause 5.6.
- **Protection:** Isogenopak
- **Accessories:** 90-90-40/480 Insulation for valves and flanges and 90-90-40/485 Insulation at loadbearing pipeline supports.
- **Execution:** 90-90-40/625 Installing foil faced mineral wool insulation on pipelines.

90-90-40/480 Insulation for valves and flanges

- **Form:** Removable and reusable pads.
- **Finish:** Aluminium foil faced. Isogenopak within plant room
- **Execution:** 90-90-40/740 Installing at valves and flanges.

90-90-40/485 Insulation at loadbearing pipeline supports

- **Pipelines carrying fluids at temperature up to 120°C:** Manufacturer's standard.
- **Pipelines carrying cold fluids:** Manufacturer's standard.
- **Execution:** 90-90-40/750 Installing at loadbearing pipelines supports.

90-90-55/430 Identifying pipework

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; and 55-40-40/140 Instantaneous hot water supply system.

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS 1710.
- **Identification type:** Manufacturer's standard.
- **Execution:** 90-90-55/660 Installing identification on pipework.

90-90-55/480 Mechanical plant and equipment identification labels

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; and 55-40-40/140 Instantaneous hot water supply system.

- **Material:** Face engraved rigid plastic laminate.
- **Label size:** Manufacturer's standard.
- **Colour:**
  - **Background:** White.
  - **Lettering:** Black.
- **Typography:**
  - **Font:** Manufacturer's standard.
  - **Size:** Manufacturer's standard.
- **Information to be included:** Equipment name;
  Equipment reference number;
  and Service.
- **Execution:** 90-90-55/610 Installing mechanical plant and equipment identification.

90-90-55/495 Valve identification labels

- **Material:** Reverse engraved and coloured transparent rigid plastic.
- **Colour:**
  - **Background:** White.
  - **Lettering:** Black.
- **Information:** Purpose and reference number.
- **Execution:** 90-90-55/630 Installing valve identification labels.

Execution

55-40-40/620 Installing hot and cold water systems generally

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Standard:** To BS 8558 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.

90-10-65/610 Pipelines installation generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; 90-10-65/665 Installing refrigerant pipework; and 90-10-65/680 Installing steel pipelines.

- **Standard:** BESATechnical Report TR/20/4 Hot water service.
- **Dissimilar metals:** Prevent electrolytic corrosion.

90-10-65/615 Installing pipeline fittings

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Bushes:** Contractor's choice.
- **Fabricated junctions and fittings:** Contractor's choice.
- **Demountable joints:** Contractor's choice.

90-10-65/620 Installing anchors generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Purpose:** 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.
- **Fixing to building structure:** Submit proposals.
- **Building structure:** Submit proposals.

90-10-65/625 Installing slide guides

Shared by: 90-10-65/630 Installing copper pipelines; and 90-10-65/680 Installing steel pipelines.

- **Expansion and contraction:** Direct movement from pipe anchor points towards loops, bellows or flexible inserts.
- **Thrust:** Linear relative to the axis of pipe.
- **Friction:** Contractor's choice.

90-10-65/630 Installing copper pipelines

- **General requirements:** 90-10-65/690 Spacing of pipelines;
  90-10-65/625 Installing slide guides;
  90-10-65/615 Installing pipeline fittings;
  90-10-65/610 Pipelines installation generally;
  90-10-65/710 General inspection and testing;
  and 90-10-65/620 Installing anchors generally.
- **Standard:** In accordance with CDA publications 88 Copper tube in buildings.
- **Expansion loops:** Formed bends from single pipe length.

90-10-65/710 General inspection and testing

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Inspection of joints:**
  - **Joints:** Submit proposals.
- **Safety precautions:** In accordance with HSEGS 4.

90-10-90/610 Installation of valves generally

Shared by: 90-10-90/330 Ball valves; 90-10-90/370 Thermostatic mixing valves; 90-10-90/374 Draining taps; 90-10-90/415 Pressure relief valves; 90-10-90/440 Backflow prevention check valves; 90-10-90/620 Installation of double regulating valves; 90-10-90/660 Installation of discharge connections; and 90-10-90/670 Installation of check valves.

- **Installation:** In accordance with BS 6683.
- **Position:** Contractor's choice.
- **Isolation and regulation valves:** Provide at equipment and on sub-circuits.
- **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.

90-10-90/670 Installation of check valves

- **General requirements:** 90-10-90/610 Installation of valves generally.
- **Lift type:** Install in direction of flow as indicated on the body.
- **Disc type:** With spring, fit in any plane. Without spring, fit in vertical plane with flow from bottom to top.
- **Wafer type:** Install between flanges. Fit in horizontal plane or vertical upward flow.
- **Split disc:** Install between flanges. Fit in horizontal plane or vertical upward flow.

90-90-40/610 Installing insulation and protection products generally

Shared by: 90-90-40/625 Installing foil faced mineral wool insulation on pipelines; and 90-90-40/660 Installing foil faced mineral wool insulation on ductwork.

- **Standard:** In accordance with BS 5970.
- **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.

90-90-40/625 Installing foil faced mineral wool insulation on pipelines

- **General requirements:** 90-90-40/610 Installing insulation and protection products generally.
- **Joints:** Close butt; seal with 50 mm wide class 0 foil 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 0 foil tape.

90-90-40/740 Installing at valves and flanges

- **Application:** Do not obstruct removal of nuts and bolts, or operation of valves.

90-90-40/750 Installing at loadbearing pipelines supports

- **Application:** Close butt to insulation.
- **Joints:** Seal with 100 mm wide class 0 foil tape.
- **Sleeve:** Provide sheet metal protection sleeve.

90-90-55/610 Installing mechanical plant and equipment identification

- **Fixing:** Fix with adhesive to equipment.
- **Position:** On equipment.

90-90-55/630 Installing valve identification labels

- **Fixing:** Secure with metal chain and Secure with tie wrap.

90-90-55/660 Installing identification on pipework

- **Application of basic identification colour:** Coloured bands as BS 1710.
- **Safety colour identification:** Contractor's choice.
- **Information:** Colour bands as BS 1710 and Name of contents in full.
- **Direction of flow:** Indication arrow and the word FLOW or the letter F and Indication arrow and the word RETURN or the letter R.

System completion

55-40-40/810 Commissioning of hot and cold water supply systems

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Pre-commissioning:** In accordance with BSRIABG 2/2010 and CIBSECommissioning Code W.
- **Commissioning:** In accordance with BS EN 806-4, BSRIABG 2/2010 and CIBSECommissioning 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.

55-40-40/820 Inspection and test records

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Construction phase reports:** System design is commissionable.
- **Records for water systems:** In accordance with BSRIABG 2/2010.
- **Record sheets:**
  - **Submission:** On completion
  - **Number of copies:** Three.

55-40-40/850 Water quality tests

Shared by: 55-40-40/120 Cold water supply system; and 55-40-40/140 Instantaneous hot water supply system.

- **Standard:** To BS EN 806-4.
- **Samples:**
  - **Sample points:** Main supply to site.
  - **Samples for analysis:** Submit samples for bacteriological analysis.
- **Water temperature:** Record at each sampling point at the time of taking the sample.
- **Test results:**
  - **Record:** Details of all analyses.
  - **Submit:** On completion.
  - **Number of copies:** Three.

Ω End of system

60-45-40/110 Low temperature hot water heating system

System outline

60-45-40/110 Low temperature hot water heating system

- **Description: <u>Existing Community Centre</u>**

  The contractor shall strip out the boiler plant and associated flues within the existing community centre plant room ensuring that the current LTHW pipework is valved and capped ready for reconnection to the new boilers.

  The contractor shall install new gas condensing boilers including all associated accessories and equipment as indicated on the mechanical drawings. The existing LTHW circuits from the community centre are to be reconnected to the new boiler plate heat exchanger.

  The new boilers are to be provided with integral controls to allow timed on/off and a preheat in the morning.

  The contractor shall install a Mikrofill 3 pressurisation unit c/w 12 litre expansion vessel in the existing plant room for the primary pipework from the boilers.

  The contractor shall include for all valves, fittings and accessories needed to install the new boilers to the existing system.
  The contractor shall provide all labour, tooling, equipment, components, pipes, fixtures and fittings required for the striping out and installation, and carry out all testing and commissioning of the new heating and existing circuits as necessary.

  The contractor will be responsible for any remedial works to the existing circuits as required following the new installation

  The contractor shall be responsible for cleaning and flushing of the existing heating system and for filling and introducing the correct dose of scale and corrosion inhibitors, which are to be of the same product as the existing system, the contractor shall allow for water testing to establish existing product used, if no products are present the contractor shall contact 'Adey' to advise on the correct inhibitor required based on the water sample results.

  The modified heating system is to be set to operate within specified working hours including a pre heat period in the morning.

  All testing and commissioning records are to be provided for inclusion in the O&M manuals.

  <u>Fixing to the structure & Builders Work in connection with the MEP services.</u>

  The Contractor shall design for all supports and fixings necessary to install the works.

  The Contractor shall design and locate expansion anchors and guide locations.

All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings or bases to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

Fire Stopping and Acoustic Treatment of Services Penetrations

The contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed
to have included for all necessary requirements in this respect appropriate to the pipework material.

The contractor is responsible for design and provision of all expansion and contraction requirements and is deemed to have included for all necessary requirements appropriate to the pipework material.

The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

The building has been assessed for fire risk. Specific fire rating criteria is available for all surfaces throughout the building. It is the contractors' responsibility to obtain all necessary information and to ensure all requirements are met.

The Contractor shall generate typical acoustic and fire stopping details to meet with each different acoustic performance and Fire Rating criteria. All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

It is the contractor's responsibility to ensure all working drawings and details are submitted in sufficient time to allow time for review without being detrimental to the construction programme.

- **Arrangement:** Two-pipe.
- **Distribution:** Existing.
- **Heat source:** 90-40-05/340 Gas-fired condensing boilers.
- **Fuel:** Natural gas.
- **Pressurization units:** 90-10-70/400 Pressurization units. on primary pipework
- **Feed and expansion tanks:** Existing. on secondary pipework
- **Pumps:** Existing. and integral to boilers
- **Pipelines:** Existing.
- **Vibration isolation:** Contractor's design.
- **Heat emitters:** Existing.
- **Controls:** integral to boilers
- **System accessories:** Existing.
- **Execution:** 60-45-40/610 Removing heating systems;
  60-45-40/620 Installing water based heating systems;
  60-45-40/670 Installing water treatment for heating systems;
  60-45-40/650 Filling and pressure testing of water based heating systems;
  and 60-45-40/660 Flushing and pre-commission cleaning of heating systems.

- **System completion:** 60-45-40/830 Commissioning boiler plant;
  60-45-40/810 Commissioning water heating systems;
  60-45-40/840 Performance testing;
  and 60-45-40/880 Servicing and maintenance.

Products

90-10-70/400 Pressurization units

- **Manufacturer:** Mikrofill 3, refer to mechanical drawings
- **Standards:**
  - **General:** To BS EN 13831.
  - **Domestic heating and hot water supply:** In accordance with BS 7074-1.
  - **Low and medium temperature hot water heating:** In accordance with BS 7074-2.
  - **Chilled water and condenser water:** In accordance with BS 7074-3.
- **Format:** Fully automatic pre-wired packaged unit on common base plate.
- **Arrangement:** Manufacturer's standard.
- **Accessories:** low height mounting frame, plate heat exchanger
- **Execution:**

90-40-05/340 Gas-fired condensing boilers

- **Manufacturer:** Ideal, Evomax 2.
- **Output:** 2No. 60kW (120kW)
- **Mounting:** Floor mounted.
- **Heat exchanger:** Manufacturer's standard.
- **Fuel:** Natural gas.
- **Electrical supply type:** Single phase.
- **Accessories:** plate heat exchanger, low height frame
- **Execution:** 90-40-05/610 Installing gas and oil-fired boilers.

Execution

60-45-40/610 Removing heating systems

- **Scope:** Remove existing gas boilers and amend the existing LTHW and Gas pipework to suit new boiler arrangement.

60-45-40/620 Installing water based heating systems

- **Standard:** To BS EN 14336.

60-45-40/650 Filling and pressure testing of water based heating systems

- **Testing:** Water tightness test in accordance with BS EN 14336, Annex A;

Pressure testing in accordance with BS EN 14336, Annex B;
and Procedure for filling and pressure testing in accordance with BSRIA BG 29/2012.

- **Notice (minimum):** 48 h.
- **Pressure:** 1.5 times working pressure.
- **Inspection and witnessing:** In accordance with the procedure in BSRIA BG 29/2012.
- **Duration of test:** 1 h.

60-45-40/660 Flushing and pre-commission cleaning of heating systems

- **Preliminary checks:** Thoroughly inspect pipework. Complete pressure tests before cleaning.
- **Flushing:** In accordance with BSRIA BG 29/2012.
- **Cleaning:** In accordance with BSRIA BG 29/2012 and BSRIA BG 50/2013.
- **Waste products:** Neutralize, and dispose of to drain. Preferably direct to manhole.

60-45-40/670 Installing water treatment for heating systems

- **Treatment:** Closed circuit systems in accordance with BSRIA BG 50/2013.
- **Water sampling:** In accordance with BS 8552.

90-40-05/610 Installing gas and oil-fired boilers

- **Standards:**
  - **Gas fired boilers:** In accordance with BS 6798 or BS 6644.
  - **Oil fired boilers:** In accordance with BS 5410-1 or BS 5410-2.
- **Position:** As per manufactueres instructions
- **Space around boiler:** As per manufactueres instructions
- **Preparation:** Pressure test joints immediately before installing lagging and casing. Submit test results.
- **Fixing of equipment, components and accessories:** Fix securely to purpose-made bases or supports.
- **Access:** Provide for inspection and servicing of boilers and ancillary equipment.

System completion

60-45-40/810 Commissioning water heating systems

- **Pre-commissioning:** In accordance with BSRIA BG 2/2010 and CIBSE Commissioning Code W.
- **Commissioning:** In accordance with BSRIA BG 2/2010 and CIBSE Commissioning Code W.
- **Seasonal commissioning:** In accordance with BSRIA BG 44/2013.
- **Variable flow systems:** In accordance with CIBSE Knowledge Series KS09.
- **Notice (minimum):** 48 h.

60-45-40/830 Commissioning boiler plant

- **Pre-commissioning:** In accordance with CIBSE Commissioning Code B.
- **Commissioning:** In accordance with CIBSE Commissioning Code B.
- **Notice (minimum):** 48 h.

60-45-40/840 Performance testing

- **General:** Demonstrate the performance of the installations.
- **Environmental tests:** Carry out environmental testing. If necessary, use artificial loads to simulate operating conditions.
- **Reports:** Submit on completion.

60-45-40/880 Servicing and maintenance

- **Requirement:** Undertake for 12 months after completion.

Ω End of system

60-45-90/110 Low temperature hot water underfloor heating

System outline

60-45-90/110 Low temperature hot water underfloor heating

- **Description: <u>Community Centre Extension</u>**

  The Contractor shall install a new internal Air Source Heat Pump including all associated accessories and equipment as indicated on the mechanical drawings. The new LTHW CT circuit from the plant room is rise to drop within the ceiling void to distribut to each new under floor heating manifold.

  The contractor shall liase with Oventrop (ref CQ6113) to provide an under floor heating system and manifolds as indicated on the mechanical drawings.

  The contractor shall install a Mikrofill 3 pressurisation unit c/w 12 litre expansion vessel in the new plant room for the primary pipework from the ASHP.

  The contractor shall install a primary pump to the heating system as shown on the mechancial drawing.

  The contractor shall allow for insulating the LTHW F&R pipework with foil faced mineral wool. All heating pipework drops are to be concealed where possible or boxed in to the Architects recommendations. All pipework within the plant room is to be finished using isogenapac.

  The contractor shall be responsible for cleaning and flushing of the newly installed heating system and for filling and introducing the correct dose of scale and corrosion inhibitor, (inhibitor to be as per recommend by ASHP manufacturer).

  The Contractor shall employ a controls specialist to design and install a mechanical control panel within the new plant room as indciated on the emchanical drawings.

  The ASHP heating system is to be set to operate continously, within specified working hours including a pre heat period in the morning the system shall operate to provide the required temperatures in each space. During out of hours the heating system shall operate at a 'set back' temperature of 16°C to each space.

  The contractor shall provide all labour, tooling, equipment, components, pipes, fixtures and fittings required for the installation and carry out all testing and commissioning of the new heating system and circuits as necessary.

  The contractor shall provide 'As installed' drawings of the system prior to handover in electronic format and a paper copy within each O&M Manual. All testing and commissioning records are also to be provided for inclusion in the O&M manuals.

  <u>Fixing to the structure & Builders Work in connection with the MEP services.</u>

  The Contractor shall design for all supports and fixings necessary to install the works.

The Contractor shall design and locate expansion anchors and guide locations.

All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings or bases to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

Fire Stopping and Acoustic Treatment of Services Penetrations

The contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework material.

The contractor is responsible for design and provision of all expansion and contraction requirements and is deemed to have included for all necessary requirements appropriate to the pipework material.

The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

The building has been assessed for fire risk. Specific fire rating criteria is available for all surfaces throughout the building. It is the contractors' responsibility to obtain all necessary information and to ensure all requirements are met.

The Contractor shall generate typical acoustic and fire stopping details to meet with each different acoustic performance and Fire Rating criteria. All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

It is the contractor's responsibility to ensure all working drawings and details are submitted in sufficient time to allow time for review without being detrimental to the construction programme.

- **System manufacturer:** Oventrop
- **Heat source:** 90-40-40/320 Air-to-water heat pumps.
- **Pumps:** 90-10-70/340 Canned rotor pumps and Integral with manifold.
- **Pipes:**
  - **Distribution:** 90-10-65/415 Steel pipelines.
  - **Underfloor:** 90-10-65/350 Cross-linked polyethylene (PE-X) pipelines.
  - **Insulation:** 90-90-40/330 Mineral wool pipe section insulation.
- **Pipeline accessories:** 90-10-60/405 Pipe sleeves;
  90-10-60/310 Automatic air vents;
  90-10-60/370 Pressure gauges;
  90-10-60/380 Temperature gauges;
  and 90-10-60/400 Pipeline strainers.
- **Valves:** 90-10-90/330 Ball valves;
  90-10-90/360 Test points;
  and 90-10-90/374 Draining taps.
- **Water treatment:** 90-15-95/317 Corrosion inhibitors for closed circuit systems.

- **Controls:**
- **Execution:** 60-45-90/620 Installing underfloor systems; 60-45-90/640 Hydraulic pressure testing of underfloor systems; and 60-45-90/650 Flushing underfloor systems.
- **System completion:** 60-45-90/810 Commissioning water systems; 60-45-90/820 Commissioning boiler plant; and 60-45-90/840 Demonstrations.

Products

90-10-60/310 Automatic air vents

- **Manufacturer:** Contractor's choice.
- **Material:** Gunmetal.
- **Connections:** Threaded.

90-10-60/370 Pressure gauges

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 837-1.
- **Diameter:** Manufacturer's standard.
- **Scale subdivisions:** 20 kPa (0.2 bar) for a maximum scale value of 1000 kPa (10 bar) and 50 kPa (0.5 bar) for a scale value greater than 1000 kPa (10 bar).
- **Material:** Manufacturer's standard.
- **Connections:** 'U' pattern siphon and gauge cock.
- **Execution:** 90-10-60/630 Installing pressure gauges.

90-10-60/380 Temperature gauges

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 13190.
- **Diameter:** Manufacturer's standard.
- **Case:** Manufacturer's standard.
- **Connections:** Straight stem.
- **Integral accessories:** 100 mm immersion length pocket.

90-10-60/400 Pipeline strainers

- **Manufacturer:** Contractor's choice.
- **Pattern:** Y pattern.
- **Baskets:**
  - **Perforation size:** Manufacturer's standard.
  - **Mesh size:** Manufacturer's standard.
- **Material:** Manufacturer's standard.
- **Connections:** Compression and Threaded.

- **Integral accessories:** Plugged connections for drain, air vent and differential pressure monitoring.
- **Execution:** 90-10-60/650 Installing strainers.

90-10-60/405 Pipe sleeves

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Material:** Manufacturer's standard.
- **Form:** Manufacturer's standard.

90-10-65/350 Cross-linked polyethylene (PE-X) pipelines

- **General requirements:** 90-10-65/380 Jointing materials for plastics tubes.
- **Manufacturer:** Oventrop
- **Execution:** 90-10-65/645 Installing plastics pipelines.

90-10-65/380 Jointing materials for plastics tubes

Shared by: 90-10-65/350 Cross-linked polyethylene (PE-X) pipelines; and 90-10-65/375 Unplasticized polyvinylchloride (PVC-U) pipelines.

- **Manufacturer:** Contractor's choice.
- **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 14814.
  - **Elastomeric ring seal:** To BS EN 681-1.

90-10-65/415 Steel pipelines

- **General requirements:** 90-10-65/425 Steel pipeline jointing materials and 90-10-65/420 Steel pipeline fittings.
- **Manufacturer:** Contractor's choice.
- **Standard:**
  - **Up to 150mm:** To BS EN 10255, medium weight.
- **Finish:** Manufacturer's standard.
- **Execution:** 90-10-65/680 Installing steel pipelines.

90-10-65/420 Steel pipeline fittings

- **Manufacturer:** Contractor's choice.
- **Standards:**
  - **Malleable:** To BS 143 and 1256.
  - **Flanged:** To BS EN 1092-1.
  - **Welded:** To BS EN 10253-1 and BS EN 10253-2.
  - **Wrought:** To BS EN 10241.
  - **Mechanical couplings:** Manufacturer's standard.

90-10-65/425 Steel pipeline jointing materials

- **Manufacturer:** Contractor's choice.
- **Standards:**
  - **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 ISO 20378.

    Arc welding: To BS EN ISO 636.

90-10-70/320 Pumps generally

- **General safety standard:** To BS EN 809.
- **Electrical safety:** To BS EN 60335-1 and BS EN 60335-2-51.
- **Dynamic balance:** To BS ISO 21940-21.
- **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 16297-1 and BS EN 16644.
- **Connections:**
  - **Flanged, copper alloy and composite:** To BS EN 1092-3.
  - **Flanged, cast iron:** To BS EN 1092-2.
  - **Threaded:** To BS EN 10226-1.

90-10-70/340 Canned rotor pumps

- **General requirements:** 90-10-70/320 Pumps generally.
- **Manufacturer:** Grundfos, Magna 1 25-80
- **Arrangement:** Single.
- **Material:**
  - **Impeller:** Manufacturer's standard.
- **Duties:**
  - **Operation:** Duty.
  - **Flow rate:** 0.18 l/s
  - **Motor:**

    Nominal voltage: single phase 230V
- **Speed control:** Manufacturer's standard.
- **Connections:** Threaded.
- **Accessories:** Manufacturer's standard.
- **Execution:** 90-10-70/610 Installation of pumps generally and 90-10-70/640 Commissioning preparation.

90-10-90/330 Ball valves

Shared by: 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Connections:** Compression to BS EN 1254-2.
- **Finish:** Natural.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-10-90/360 Test points

Shared by: 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Arrangement:** Self-sealing.
- **Material:** Contractor's choice.
- **Connections:** Manufacturer's standard.

90-10-90/374 Draining taps

Shared by: 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Standard:** To BS 2879.
- **Material:** Copper alloy.
- **Connections:** Threaded joints to BS EN 10226-1.
- **Accessories:** Manufacturer's standard.
- **Execution:** 90-10-90/610 Installation of valves generally.

90-15-95/317 Corrosion inhibitors for closed circuit systems

- **Manufacturer:** As per boiler manufactures recommendation
- **Corrosion inhibitors:** Manufacturer's standard.

90-40-40/320 Air-to-water heat pumps

- **Manufacturer:** Viessman, Vitocol 350 A20
- **Standards:**
  - **Safety and environmental:** To BS EN 378-1 and BS EN 378-2.
  - **Test requirements:** To BS EN 14511-1, BS EN 14511-2, BS EN 14511-3 and BS EN 14511-4.
  - **Electrical safety:** To BS EN 60335-2-40.
- **Heat pump type:** Monobloc.
- **Mode:** Heating.
- **Output:**
  - **Heating:** 18kW
- **Electrical supply type:** Single phase.
- **Accessories:** Manufacturer's standard.
- **Refrigerant:** R407C.

90-90-40/330 Mineral wool pipe section insulation

Shared by: 50-10-05/120 Above ground wastewater drainage system with internal stacks; 55-40-40/120 Cold water supply system; 55-40-40/140 Instantaneous hot water supply system; and 60-45-90/110 Low temperature hot water underfloor heating.

- **Standard:** To BS EN 14303.
- **Recycled content:** Manufacturer's standard.
- **Thermal conductivity:** 0.032 W/m·K at 0°C.
  0.034 W/m·K at 10°C.
  0.037 W/m·K at 50°C.
  0.040 W/m·K at 75°C.
  0.044 W/m·K at 100°C.
- **Finish:** Aluminium foil faced.
- **Reaction to fire classification:** Manufacturer's standard.
- **Insulation thickness (minimum):** To BS 5422.
- **Vapour barrier:**
  - **Material:** Manufacturer's standard.
  - **Vapour permeability:** To BS 5422, clause 5.6.
- **Protection:** Isogenopak
- **Accessories:** 90-90-40/480 Insulation for valves and flanges and 90-90-40/485 Insulation at loadbearing pipeline supports.
- **Execution:** 90-90-40/625 Installing foil faced mineral wool insulation on pipelines.

90-90-40/480 Insulation for valves and flanges

- **Form:** Removable and reusable pads.
- **Finish:** Aluminium foil faced. Isogenopak within plant room
- **Execution:** 90-90-40/740 Installing at valves and flanges.

90-90-40/485 Insulation at loadbearing pipeline supports

- **Pipelines carrying fluids at temperature up to 120°C:** Manufacturer's standard.
- **Pipelines carrying cold fluids:** Manufacturer's standard.
- **Execution:** 90-90-40/750 Installing at loadbearing pipelines supports.

Execution

60-45-90/620 Installing underfloor systems

- **Standard:** To BS EN 1264-4.
- **Fixing of manifold:** Locate with access for regulation and maintenance and away from areas sensitive to noise.

60-45-90/650 Flushing underfloor systems

- **Preliminary checks:** Thoroughly inspect pipework. Complete pressure tests before cleaning.

- **Flushing:** In accordance with BSRIAGuide BG 29/2012.
- **Waste products:** Neutralize, and dispose of to drain. Preferably direct to manhole.

90-10-60/630 Installing pressure gauges

- **Position:** As indicated on mechanical drawing

90-10-60/650 Installing strainers

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

90-10-65/610 Pipelines installation generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; 90-10-65/665 Installing refrigerant pipework; and 90-10-65/680 Installing steel pipelines.

- **Standard:** BESATechnical Report TR/20/4 Hot water service.
- **Dissimilar metals:** Prevent electrolytic corrosion.

90-10-65/615 Installing pipeline fittings

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Bushes:** Contractor's choice.
- **Fabricated junctions and fittings:** Contractor's choice.
- **Demountable joints:** Contractor's choice.

90-10-65/620 Installing anchors generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Purpose:** 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.
- **Fixing to building structure:** Submit proposals.
- **Building structure:** Submit proposals.

90-10-65/625 Installing slide guides

Shared by: 90-10-65/630 Installing copper pipelines; and 90-10-65/680 Installing steel pipelines.

- **Expansion and contraction:** Direct movement from pipe anchor points towards loops, bellows or flexible inserts.
- **Thrust:** Linear relative to the axis of pipe.
- **Friction:** Contractor's choice.

90-10-65/645 Installing plastics pipelines

Shared by: 90-10-65/350 Cross-linked polyethylene (PE-X) pipelines; and 90-10-65/375 Unplasticized polyvinylchloride (PVC-U) pipelines.

- **General requirements:** 90-10-65/690 Spacing of pipelines;
  90-10-65/615 Installing pipeline fittings;
  90-10-65/610 Pipelines installation generally;
  90-10-65/710 General inspection and testing;
  and 90-10-65/620 Installing anchors generally.
- **Jointing method:** Solvent.

90-10-65/680 Installing steel pipelines

- **General requirements:** 90-10-65/690 Spacing of pipelines;
  90-10-65/625 Installing slide guides;
  90-10-65/615 Installing pipeline fittings;
  90-10-65/610 Pipelines installation generally;
  90-10-65/710 General inspection and testing;
  and 90-10-65/620 Installing anchors generally.
- **Permanently concealed joints:** Contractor's choice.
- **Accessible joints:** Screwed, up to and including 50 mm and Press fit fittings.
- **Expansion loops:** Contractor's choice.
- **Anchor:**
  - **Method:** Contractor's choice.
  - **Pipe restraints:** Contractor's choice.

90-10-65/710 General inspection and testing

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Inspection of joints:**
  - **Joints:** Submit proposals.
- **Safety precautions:** In accordance with HSEGS 4.

90-10-70/610 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.

90-10-70/640 Commissioning preparation

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

90-10-90/610 Installation of valves generally

Shared by: 90-10-90/330 Ball valves; 90-10-90/370 Thermostatic mixing valves; 90-10-90/374 Draining taps; 90-10-90/415 Pressure relief valves; 90-10-90/440 Backflow prevention check valves; 90-10-90/620 Installation of double regulating valves; 90-10-90/660 Installation of discharge connections; and 90-10-90/670 Installation of check valves.

- **Installation:** In accordance with BS 6683.
- **Position:** Contractor's choice.
- **Isolation and regulation valves:** Provide at equipment and on sub-circuits.
- **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.

90-90-40/610 Installing insulation and protection products generally

Shared by: 90-90-40/625 Installing foil faced mineral wool insulation on pipelines; and 90-90-40/660 Installing foil faced mineral wool insulation on ductwork.

- **Standard:** In accordance with BS 5970.
- **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.

90-90-40/625 Installing foil faced mineral wool insulation on pipelines

- **General requirements:** 90-90-40/610 Installing insulation and protection products generally.
- **Joints:** Close butt; seal with 50 mm wide class 0 foil 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 0 foil tape.

90-90-40/740 Installing at valves and flanges

- **Application:** Do not obstruct removal of nuts and bolts, or operation of valves.

90-90-40/750 Installing at loadbearing pipelines supports

- **Application:** Close butt to insulation.
- **Joints:** Seal with 100 mm wide class 0 foil tape.
- **Sleeve:** Provide sheet metal protection sleeve.

System completion

60-45-90/810 Commissioning water systems

- **Pre-commissioning:** In accordance with BSRIAGuide BG 2/2010 and CIBSECommissioning Code: Water distribution systems.

- **Commissioning:** In accordance with BSRIAGuide BG 2/2010 and CIBSECommissioning Code: Water distribution systems.
- **Variable flow systems:** In accordance with CIBSEKS09 Commissioning variable flow pipework systems.
- **Notice (minimum):** 48 h.

60-45-90/820 Commissioning boiler plant

- **Pre-commissioning:** In accordance with CIBSECommissioning code B.
- **Commissioning:** In accordance with CIBSECommissioning code B.
- **Notice (minimum):** 48 h.

60-45-90/840 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.

Ω End of system

65-10-95/130 Mechanical supply ventilation system

System outline

65-10-95/130 Mechanical supply ventilation system

- **Description:** The Contractor shall install a Heat Recovery Unit (HRU), including for ductwork, louvres, diffussers, grilles, dampers, fittings and accessories. within the ceiling void of the Cafe area as indicated on the mechanical drawings.

  The HRU is to run continuously, operating via time switch linked to the occupancy hours. An Eco smart control panel for the HRU unit is to be placed as indicated on the mechanical drawings. A CO2 sensor shall be incorporated into the Eco smart controls to increase the duty of the fan if required.The HRU is to be c/w 9 kW electric heating coil.

  All fresh air ductwork, up to the heat recovery units, shall be thermally insulated as necessary, with 25mm foil faced mineral wool duct wrap.

  Balancing and commissioning accessories shall be as detailed on the drawings and as described in the Specification and be located for access through grilles or diffusers or located adjacent to access points in the ceilings. Volume control dampers (VCD's) shall be multi-blade or iris type. VCD's shall be located a minimum of 5 equivalent diameters between fittings.

  All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to connections with the structure.

  The contractor shall be responsible for all making good created by the works, inclusive of any part replacements of equipment damaged as part of the works.

  The contractor shall provide 'As installed' drawings of the system prior to handover in electronic format and a paper copy within each O&M Manual.

  <u>Fixing to the structure & Builders Work in connection with the MEP services.</u>

  The Contractor shall design for all supports and fixings necessary to install the works.

  All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

  The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

  <u>Fire Stopping and Acoustic Treatment of Services Penetrations</u>

  The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

The contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework/ductwork material.

The building has been assessed for fire risk and acoustics and specific acoustic and fire rating criteria is available for all surfaces throughout the building. It is the contractors' responsibility to obtain all necessary information to ensure all requirements are met.

The Contractor shall generate typical acoustic and fire stopping details to meet with each different acoustic performance and Fire Rating criteria.

All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

It is the contractor's responsibility to ensure all working drawings and details are submitted in sufficient time to allow time for review without being detrimental to the construction programme.

- **Location of plant:** Ceiling void above the Cafe
- **Route of distribution:** Refer to Mechanical drawing
- **Type of system:** Single duct, variable volume
- **External air intake:** Roof cowls as per Mechanical Drawing.
- **Air filters:** 90-45-10/360 Panel filters.
- **Heat recovery:** 90-45-45/320 Plate recuperators.
- **Air handling units:** 90-45-15/310 Air handling unit.
- **Air ductwork and accessories:**
  - **Ductwork:** 90-45-25/365 Rectangular sheet metal ductwork and fittings.
  - **Accessories:** 90-45-25/400 Access doors;
    45-35-22/430 Bird guards;
    and 90-45-25/430 Flexible ductwork.
- **Thermal insulation on supply air ductwork:** 90-90-40/340 Mineral wool slabs insulation.
- **Vibration isolation mountings:** Contractor's design.
- **Reheat batteries:** 90-45-50/320 Electric heater batteries.
- **Room supply air terminal devices:** 90-45-20/320 Diffusers.
- **Controls:** .
- **Testing:** 90-45-25/790 Air leakage testing of plant items.
- **Execution:** 65-10-95/630 Installing ductwork on air handling units and 65-10-95/640 Ductwork systems cleaning.
- **System completion:** 65-10-95/810 Commissioning of air distribution systems;
  65-10-95/840 Demonstrations;
  and 65-10-95/850 Documentation for ventilation systems type A.

Products

90-45-15/310 Air handling unit

- **Manufacturer:** Nuaire XBC65-H-EESCP

- **Standard:** To BS EN 13053.
- **Duty:**
  - **Air volume:** 60 m^3/s
- **Environment:** Internal.
- **Method of support:** Contractor's choice.
- **Anti-vibration mountings:** Contractor's choice.
- **Components:**
  - **Re-heaters:** 90-45-50/320 Electric heater batteries.
  - **Heat recovery:**

    Heat recovery equipment: Manufacturer's standard.
  - **Attenuators:** Manufacturer's standard.
- **Flexible connections:** To BESADW/144.
- **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 clear width (minimum):** 400 mm.
- **Direction of airflow:** Horizontal.
- **Accessories:** Manufacturer's standard.
- **Execution:** 90-45-15/610 Installing air handling units;
  90-45-15/615 Access;
  and 90-45-15/650 Services connections.

90-45-20/320 Diffusers

- **Manufacturer:** Gilberts of Blackpool - DG4
- **Standards:**
  - **Mixed flow applications:** To BS EN 12238.
  - **Sound power levels:** To BS EN ISO 5135.
- **Application:** Extract and Supply.
- **Duty:**
  - **Air volume:** 300 l/s
  - **Size:** 600x600mm
- **Diffuser:** Manufacturer's standard.
- **Shape:** Rectangular.
- **Arrangement:** Manufacturer's standard.
- **Position:** Ceiling.
- **Material:** Manufacturer's standard.
- **Accessories:** 90-45-20/400 Ceiling or wall mounted plenum boxes.
- **Execution:** 90-45-20/620 Installing circular and rectangular diffusers.

90-45-20/400 Ceiling or wall mounted plenum boxes

- **Manufacturer:** Contractor's choice.
- **Duty:**
  - **Air volume:** 300 l/s
  - **Spigot size:** 350x350
  - **Spigot position:** Side.
- **Configuration:** Single plenum box.
- **Construction:** Manufacturer's standard.
- **Fixing:** Incorporate means for fixing to, or suspending from, building or other construction.

90-45-25/365 Rectangular sheet metal ductwork and fittings

- **Manufacturer:** Contractor's choice.
- **Standards:** To BESADW/144, BS EN 1505 and BS EN 1507.
- **Classification:** Manufacturer's standard.
- **Material:** Aluminium and Stainless steel to BS EN 10088-1.
- **Regulating dampers:**
  - **Standard:** To BESADW/144.
  - **Regulating function:** Balancing.
  - **Damper type:** Opposed blade.
  - **Operation:** Manufacturer's standard.
- **Access openings:**
  - **Purpose:** Inspection;
    Cleaning;
    and Maintenance.
  - **Sizes:** To BS EN 12097.
- **Execution:** 90-45-25/790 Air leakage testing of plant items;
  90-45-25/610 Air ductwork generally;
  90-45-25/640 Installing sheet metal ductwork;
  90-45-25/740 Installing control equipment and instruments in metal ductwork;
  90-45-25/670 Ductwork support for vapour seal continuity;
  and 90-45-25/795 Air leakage testing of low pressure ductwork.

90-45-25/400 Access doors

- **Manufacturer:** Contractor's choice.
- **Material:** Stainless steel.

90-90-40/340 Mineral wool slabs insulation

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 14303.
- **Form:** Rigid slabs.
- **Thermal conductivity:** 0.032 W/m·K at 0°C.
  0.034 W/m·K at 10°C.

0.037 W/m·K at 50°C.
0.040 W/m·K at 75°C.
0.044 W/m·K at 100°C.

- **Finish:** Aluminium foil faced.
- **Reaction to fire classification:** Reaction to fire classification of A1, as defined in BS EN 13501-1.
- **Insulation thickness (minimum):** To BS 5422.
- **Vapour barrier:**
  - **Vapour permeability:** To BS 5422, clause 5.6.
- **Accessories:** Manufacturer's standard.
- **Execution:** 90-90-40/660 Installing foil faced mineral wool insulation on ductwork.

Execution

65-10-95/630 Installing ductwork on air handling units

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/160 Kitchen extract ventilation system.

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

65-10-95/640 Ductwork systems cleaning

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/150 Toilet extract ventilation system
.

- **Standards:** In accordance with BESATechnical Report TR/19 and to BS EN 15780.
- **Verification:**
  - **Method:** Visual inspection.
  - **Completion report:**

    Information: System cleaned;
    Cleaning method used;
    Verification tests;
    and Pre- and post-clean photographic records.

    Format: Electronic.

    Submit: On completion.

90-45-15/610 Installing air handling units

- **Standard:** In accordance with BS EN 13053.
- **Component assembly:**
  - **Sealing:** Provide gaskets between air handling unit sections to prevent air leakage from casing.

90-45-15/615 Access

- **Access space:** Position air handling units to allow space for maintenance and access.

90-45-15/650 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.

90-45-20/610 Installing air terminal devices

Shared by: 90-45-20/620 Installing circular and rectangular diffusers; and 90-45-20/650 Installing grilles.

- **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.
- **Operation:** 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.

90-45-20/620 Installing circular and rectangular diffusers

- **General requirements:** 90-45-20/610 Installing air terminal devices.
- **Method:** Contractor's choice.

90-45-25/610 Air ductwork generally

Shared by: 90-45-25/310 Circular plastics ductwork and fittings; 90-45-25/315 Circular sheet metal ductwork and fittings; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

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

90-45-25/640 Installing sheet metal ductwork

Shared by: 90-45-25/315 Circular sheet metal ductwork and fittings; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

- **Standard:** To BESADW/144.
- **Hangers and supports:** Install in accordance with BSRIABG 10/2010 and Strength requirements to BS EN 12236.

90-45-25/740 Installing control equipment and instruments in metal ductwork

- **General:** Fit sensors, damper motors and other control equipment.
- **Connections:** Connect control equipment and instruments.

90-45-25/790 Air leakage testing of plant items

Shared by: 65-10-95/130 Mechanical supply ventilation system; 65-10-95/150 Toilet extract ventilation system; 65-10-95/160 Kitchen extract ventilation system; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

- **Standard:** To BESADW/144.
- **Report:**
  - **Format:** Electronic.
  - **Submit:** On completion.

90-45-25/795 Air leakage testing of low pressure ductwork

- **Standard:** To BESADW/144 and DW/143.
- **Extent:** Random testing of 10% maximum of the ductwork system.
  Carry out tests as work proceeds before thermal insulation is installed.

Where a test fails, select two further sections for testing.
Carry out remedial work where tests fail.

- **Test pressure:** To BESADW/144, Table 22.
- **Documentation:** Air leakage test sheet.
- **Report:**
  - **Format:** Electronic.
  - **Submit:** On completion.

90-90-40/610 Installing insulation and protection products generally

Shared by: 90-90-40/625 Installing foil faced mineral wool insulation on pipelines; and 90-90-40/660 Installing foil faced mineral wool insulation on ductwork.

- **Standard:** In accordance with BS 5970.
- **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.

90-90-40/660 Installing foil faced mineral wool insulation on ductwork

- **General requirements:** 90-90-40/610 Installing insulation and protection products generally.
- **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 0 foil tape.

System completion

65-10-95/810 Commissioning of air distribution systems

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/150 Toilet extract ventilation system
.

- **Pre-commissioning:** In accordance with BSRIABG 49/2015 and CIBSECommissioning code A.
- **Commissioning:** In accordance with BSRIABG 49/2015 and CIBSECommissioning code A.
- **Notice (minimum):** 48 h.

65-10-95/840 Demonstrations

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

65-10-95/850 Documentation for ventilation systems type A

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/160 Kitchen extract ventilation system.

- **Operating and maintenance instructions:**

- **Scope:** Submit for the system as a whole giving optimum settings for controls.
- **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
- **Format:** Electronic.

- **Record drawings:**
  - **Content:** Location and arrangement of plant in plant rooms;
    Location, size and route of ductwork;
    Location and identification of regulating dampers and fire dampers;
    and Location of outlets.
  - **Format:** Electronic.
- **Submittal date:** At handover.

Ω End of system

65-10-95/140 Mechanical extract ventilation system

System outline

65-10-95/140 Mechanical extract ventilation system

- **Description:** Refer to Mechancial Supply ventilation system 65-10-95/130.

Ω End of system

65-10-95/150 Toilet extract ventilation system

System outline

65-10-95/150 Toilet extract ventilation system

- **Description:** The contractor shall install extract fans to all WC's as shown on the mechanical drawings.

  All terminations are to be through the roof to atmosphere with the manufactures proprietary roof cowl systems. Locations and details of the toilet extract fans can be found on the mechanical drawing.

  All extract fans are to operate continuously in a trickle function (6 l/s per WC), boosting to the required speeds (15 l/s per WC) upon lighting circuit activation (PIR/Switched).

  All extract fans are to be operated via the local lighting circuits and be c/w a 10 minute run on timer.

  All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to connections with the structure.

  The contractor shall be responsible for all making good created by the works, inclusive of any part replacements of equipment damaged as part of the works.

  The contractor shall provide 'As installed' drawings of the system prior to handover in electronic format and a paper copy within each O&M Manual.

  Fixing to the structure & Builders Work in connection with the MEP services.

  The Contractor shall design for all supports and fixings necessary to install the works.

  The Contractor shall design and position expansion anchors and guide locations.

  All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

  The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

  Fire Stopping and Acoustic Treatment of Services Penetrations

  The contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework material.

  The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

  The building has been assessed for fire risk and acoustics and specific acoustic and fire rating criteria is

available for all surfaces throughout the building. It is the contractors' responsibility to obtain all necessary information to ensure all requirements are met.

The Contractor shall generate typical acoustic and fire stopping details to meet with each different acoustic performance and Fire Rating criteria.

All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

It is the contractor's responsibility to ensure all working drawings and details are submitted in sufficient time to allow time for review without being detrimental to the construction programme.

- **Room extract air terminal devices:** 90-45-20/380 Grilles.
- **Air ductwork and accessories:**
  - **Ductwork:** 90-45-25/310 Circular plastics ductwork and fittings and 90-45-25/315 Circular sheet metal ductwork and fittings.
- **Fire stopping:** Individual services penetrations fire stopping system.
- **Vibration isolation mountings:** Contractor's design.
- **Extract fans:** 90-45-30/380 Toilet extract fans.
- **Testing:** 90-45-25/790 Air leakage testing of plant items.
- **Execution:** 65-10-95/640 Ductwork systems cleaning.
- **System completion:** 65-10-95/810 Commissioning of air distribution systems and 65-10-95/850 Documentation for ventilation systems type B.

Products

90-45-20/380 Grilles

- **Manufacturer:** Refer to schedule on mechanical drawing
- **Standards:**
  - **Mixed flow applications:** To BS EN 12238.
  - **Displacement flow applications:** To BS EN 12239.
  - **Sound power levels:** To BS EN ISO 5135.
- **Application:** Extract.
- **Duty:**
  - **Air volume:** 15 l/s
  - **Size:** Refer to schedule on mechanical drawing
- **Position:** Ceiling.
- **Execution:** 90-45-20/650 Installing grilles.

90-45-25/310 Circular plastics ductwork and fittings

- **Manufacturer:** Contractor's choice.
- **Standard:** To BESADW/154.
- **Execution:** 90-45-25/610 Air ductwork generally.

90-45-25/315 Circular sheet metal ductwork and fittings

Shared by: 65-10-95/150 Toilet extract ventilation system; and 65-10-95/160 Kitchen extract ventilation system.

- **Manufacturer:** Contractor's choice.
- **Standards:** To BESADW/144, BS EN 1506 and BS EN 12237.
- **Execution:** 90-45-25/610 Air ductwork generally and 90-45-25/640 Installing sheet metal ductwork.

90-45-30/380 Toilet extract fans

- **Manufacturer:** Refer to schedule on mechanical drawing
- **Standards:**
  - **Performance:** To BS EN ISO 5801.
  - **Electrical safety:** To BS EN 60335-1 and BS EN 60335-2-80.
- **Position:** Ceiling mounted and Duct mounted.
- **Electrical supply:** Single phase.
- **Accessories:**
  - **Controls:** Speed controller to match fan, with on/ off and auto-changeover.
  - **Anti-vibration mountings:** Contractor's choice.
- **Execution:** 90-45-30/610 Installing fans generally.

Execution

65-10-95/640 Ductwork systems cleaning

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/150 Toilet extract ventilation system
.

- **Standards:** In accordance with BESATechnical Report TR/19 and to BS EN 15780.
- **Verification:**
  - **Method:** Visual inspection.
  - **Completion report:**

    Information: System cleaned;
    Cleaning method used;
    Verification tests;
    and Pre- and post-clean photographic records.

    Format: Electronic.

    Submit: On completion.

90-45-20/610 Installing air terminal devices

Shared by: 90-45-20/620 Installing circular and rectangular diffusers; and 90-45-20/650 Installing grilles.

- **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.

- **Operation:** 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.

90-45-20/650 Installing grilles

- **General requirements:** 90-45-20/610 Installing air terminal devices.

90-45-25/610 Air ductwork generally

Shared by: 90-45-25/310 Circular plastics ductwork and fittings; 90-45-25/315 Circular sheet metal ductwork and fittings; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

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

90-45-25/640 Installing sheet metal ductwork

Shared by: 90-45-25/315 Circular sheet metal ductwork and fittings; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

- **Standard:** To BESADW/144.
- **Hangers and supports:** Install in accordance with BSRIABG 10/2010 and Strength requirements to BS EN 12236.

90-45-25/790 Air leakage testing of plant items

Shared by: 65-10-95/130 Mechanical supply ventilation system; 65-10-95/150 Toilet extract ventilation system; 65-10-95/160 Kitchen extract ventilation system; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

- **Standard:** To BESADW/144.
- **Report:**
  - **Format:** Electronic.
  - **Submit:** On completion.

90-45-30/610 Installing fans generally

- **Fixing:** Use fixing points provided. Do not strain the fan structure when bolts are tightened.
- **Alignment:** Install fan to allow optimum air flow path.

System completion

65-10-95/810 Commissioning of air distribution systems

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/150 Toilet extract ventilation system .

- **Pre-commissioning:** In accordance with BSRIABG 49/2015 and CIBSECommissioning code A.
- **Commissioning:** In accordance with BSRIABG 49/2015 and CIBSECommissioning code A.
- **Notice (minimum):** 48 h.

65-10-95/850 Documentation for ventilation systems type B

- **Operating and maintenance instructions:**

- **Scope:** Submit for the system as a whole giving optimum settings for controls.
- **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
- **Format:** Paper copy.
- **Number of copies:** Two.

- **Record drawings:**
  - **Content:** Location and arrangement of plant in plant rooms;
    Location, size and route of ductwork;
    Location and identification of regulating dampers and fire dampers;
    and Location of outlets.
  - **Format:** A1 paper print and Electronic.
  - **Number of copies:** Two.
- **Submittal date:** At handover.

Ω End of system

65-10-95/160 Kitchen extract ventilation system

System outline

65-10-95/160 Kitchen extract ventilation system

- **Description:** The contractor shall install extract fans to 2No. Kitchen's as shown on the mechanical drawings.

  All terminations are to be through the roof to atmosphere with the manufactures proprietary roof cowl systems.

  Locations and details of the kitchen extract fans can be found on the mechanical drawing.

  Extract fans are to operate only when manually activated via counter top switch.

  All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to connections with the structure.

  The contractor shall be responsible for all making good created by the works, inclusive of any part replacements of equipment damaged as part of the works.

  The contractor shall provide 'As installed' drawings of the system prior to handover in electronic format and a paper copy within each O&M Manual.

  Fixing to the structure & Builders Work in connection with the MEP services.

  The Contractor shall design for all supports and fixings necessary to install the works.

  The Contractor shall design and position expansion anchors and guide locations.

  All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

  The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

  Fire Stopping and Acoustic Treatment of Services Penetrations

  The contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework material.

  The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

  The building has been assessed for fire risk and acoustics and specific acoustic and fire rating criteria is

available for all surfaces throughout the building. It is the contractors' responsibility to obtain all necessary information to ensure all requirements are met.

The Contractor shall generate typical acoustic and fire stopping details to meet with each different acoustic performance and Fire Rating criteria.

All details shall be issued to the CA for approval prior to installation. Under no circumstances should penetrations be made in any walls without the stopping detail being approved and accepted in advance.

- **Room extract air terminal devices:** 45-25-38/305 Air transfer grilles.
- **Air ductwork and accessories:**
  - **Ductwork:** 90-45-25/315 Circular sheet metal ductwork and fittings.
- **Fire stopping:** Individual services penetrations fire stopping system.
- **Vibration isolation mountings:** Contractor's design.
- **Extract fans:** Refer to schedule on Mechanical Drawings
- **External exhaust air terminals:** Refer to schedule on Mechanical Drawings
- **Testing:** 90-45-25/790 Air leakage testing of plant items.
- **Execution:** 65-10-95/630 Installing ductwork on air handling units.
- **System completion:** 65-10-95/850 Documentation for ventilation systems type A.

Products

45-25-38/305 Air transfer grilles

- **Manufacturer:** Refer to schedule on Mechanical Drawings
- **Standard:** To BS EN 13141-1.

90-45-25/315 Circular sheet metal ductwork and fittings

Shared by: 65-10-95/150 Toilet extract ventilation system; and 65-10-95/160 Kitchen extract ventilation system.

- **Manufacturer:** Contractor's choice.
- **Standards:** To BESADW/144, BS EN 1506 and BS EN 12237.
- **Execution:** 90-45-25/610 Air ductwork generally and 90-45-25/640 Installing sheet metal ductwork.

Execution

65-10-95/630 Installing ductwork on air handling units

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/160 Kitchen extract ventilation system.

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

90-45-25/610 Air ductwork generally

Shared by: 90-45-25/310 Circular plastics ductwork and fittings; 90-45-25/315 Circular sheet metal ductwork and fittings; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

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

90-45-25/640 Installing sheet metal ductwork

Shared by: 90-45-25/315 Circular sheet metal ductwork and fittings; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

- **Standard:** To BESADW/144.
- **Hangers and supports:** Install in accordance with BSRIABG 10/2010 and Strength requirements to BS EN 12236.

90-45-25/790 Air leakage testing of plant items

Shared by: 65-10-95/130 Mechanical supply ventilation system; 65-10-95/150 Toilet extract ventilation system; 65-10-95/160 Kitchen extract ventilation system; and 90-45-25/365 Rectangular sheet metal ductwork and fittings.

- **Standard:** To BESADW/144.
- **Report:**
  - **Format:** Electronic.
  - **Submit:** On completion.

System completion

65-10-95/850 Documentation for ventilation systems type A

Shared by: 65-10-95/130 Mechanical supply ventilation system; and 65-10-95/160 Kitchen extract ventilation system.

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system as a whole giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Electronic.
- **Record drawings:**
  - **Content:** Location and arrangement of plant in plant rooms;
    Location, size and route of ductwork;
    Location and identification of regulating dampers and fire dampers;
    and Location of outlets.
  - **Format:** Electronic.
- **Submittal date:** At handover.

Ω End of system

65-70-45/110 Room air conditioning system

System outline

65-70-45/110 Room air conditioning system

- **Description:** The contractor shall supply, install, test and commission a Variable Refrigerant Flow (VRF) heating and cooling system as described within this specification and on the associated mechanical drawings.

  The contractor shall install a VRF split system within the Beer cellar to provide heating and cooling in order to maintain a room temperature of 10°C (+/-2 °C).

  The system shall comprise of a wall mounted indoor unit matched to an outdoor condenser unit located externally as indicated on the drawings.

  The refrigerant gas and liquid lines shall be routed from the beer cellars indoor unit to the external outdoor unit as indicated on the drawings. all Horizontal refrigerant pipework is to be support on trays untill the pipework drops down the external wall to the condensing unit.

  The condensate drainage from the internal unit is to discharge to the nearest local waste pipework in the bar area. The minimum size of condensate pipes to be 25mm, pumped or by gravity from the unit to run at 1:45 minimum fall.

  All pipework shall be insulated using Phenolic foam to ensuring a continuous vapour barrier is created. External pipework shall be finished/protected using a PVC containment system. All final surface pipework routes shall be agreed with the Architect before installation.

  The contractor is responsible for the design, coordination and provision of the entire engineering services support systems.

  The VRF system shall be controlled by the manufacturers proprietary local control systems comprising a local wall mounted room control. The controllers shall include the following features as a minimum:
  " On/Off Temperature adjustment,
  " Set-point parameter adjustment

  The contractor shall be responsible for all making good created by the works, inclusive of any part replacements of equipment damaged as part of the works.

  The contractor shall provide 'As installed' drawings of the system prior to handover in electronic format and a paper copy within each O&M Manual.

  <u>Fixing to the structure & Builders Work in connection with the MEP services.</u>

  The Contractor shall design for all supports and fixings necessary to install the works.

  The Contractor shall design and locate expansion anchors and guide locations.

All items of mechanical plant incorporating moving parts shall have appropriate vibration couplings to ensure that vibration from equipment is not transmitted to the building, other supporting structure, pipework or ductwork.

The Contractor shall indicate positions of main fixing points and supports where they have significance to the structural design.

Fire Stopping and Acoustic Treatment of Services Penetrations

The contractor is responsible for determining all fire stopping requirements by reference to the fire plans and is deemed to have included for all necessary requirements in this respect appropriate to the pipework material.

The contractor is responsible for design and provision of all expansion and contraction requirements and is deemed to have included for all necessary requirements appropriate to the pipework material.

The contractor shall ensure that all services penetrations throughout the building whether through ceilings, walls or floor shall maintain the fire and acoustic integrity of each space.

It is the contractor's responsibility to ensure all working drawings and details are submitted in sufficient time to allow time for review without being detrimental to the construction programme.

- **System manufacturer:** Mitsubishi Electric
- **Air conditioning units:** 90-45-05/370 Split coil remote air cooled condensing units.
- **Refrigerant pipeline:** 90-10-65/390 Refrigerant pipelines and fittings.
- **Condensate pipelines:** 90-10-65/375 Unplasticized polyvinylchloride (PVC-U) pipelines.
- **Execution:** 65-70-45/620 Installing local air conditioning refrigeration.
- **System completion:** 65-70-45/815 Commissioning of refrigeration systems;
  65-70-45/830 Inspection and test records;
  and 65-70-45/850 Documentation.

Products

90-10-65/375 Unplasticized polyvinylchloride (PVC-U) pipelines

- **General requirements:** 90-10-65/380 Jointing materials for plastics tubes.
- **Manufacturer:** Contractor's choice.
- **Standards:**
  - **Pipe:** To BS EN ISO 1452-2.
  - **Fittings:** To BS EN ISO 1452-3.
- **Execution:** 90-10-65/645 Installing plastics pipelines.

90-10-65/380 Jointing materials for plastics tubes

Shared by: 90-10-65/350 Cross-linked polyethylene (PE-X) pipelines; and 90-10-65/375 Unplasticized polyvinylchloride (PVC-U) pipelines.

- **Manufacturer:** Contractor's choice.

- **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 14814.
  - **Elastomeric ring seal:** To BS EN 681-1.

90-10-65/390 Refrigerant pipelines and fittings

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 378-2.
- **Pipelines:** To BS EN 12735-1.
- **Execution:** 90-10-65/665 Installing refrigerant pipework.

90-45-05/370 Split coil remote air cooled condensing units

- **Manufacturer:** Mitsubishi Electric
- **Standards:**
  - **Performance:** To BS EN 378-1 and BS EN 378-2.
  - **Electrical safety:** To BS EN 60335-1 and BS EN 60335-2-40.
- **Duty:** Match split coil room air conditioning unit.
- **Electrical supply:** Single phase.
- **Arrangement:** One unit serves a single room unit.
- **Mounting:** Wall.
- **Execution:** 90-45-05/610 Installing drain lines.

Execution

65-70-45/620 Installing local air conditioning refrigeration

- **Standard:** To BS EN 378-3.

90-10-65/610 Pipelines installation generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; 90-10-65/665 Installing refrigerant pipework; and 90-10-65/680 Installing steel pipelines.

- **Standard:** BESATechnical Report TR/20/4 Hot water service.
- **Dissimilar metals:** Prevent electrolytic corrosion.

90-10-65/615 Installing pipeline fittings

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Bushes:** Contractor's choice.
- **Fabricated junctions and fittings:** Contractor's choice.
- **Demountable joints:** Contractor's choice.

90-10-65/620 Installing anchors generally

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Purpose:** 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.
- **Fixing to building structure:** Submit proposals.
- **Building structure:** Submit proposals.

90-10-65/645 Installing plastics pipelines

Shared by: 90-10-65/350 Cross-linked polyethylene (PE-X) pipelines; and 90-10-65/375 Unplasticized polyvinylchloride (PVC-U) pipelines.

- **General requirements:** 90-10-65/690 Spacing of pipelines;
  90-10-65/615 Installing pipeline fittings;
  90-10-65/610 Pipelines installation generally;
  90-10-65/710 General inspection and testing;
  and 90-10-65/620 Installing anchors generally.
- **Jointing method:** Solvent.

90-10-65/665 Installing refrigerant pipework

- **General requirements:** 90-10-65/610 Pipelines installation generally.
- **Standards:** To BS EN 378-3 and BS EN 378-4.
- **Refrigerant lines:** Contractor's choice.

90-10-65/710 General inspection and testing

Shared by: 90-10-65/630 Installing copper pipelines; 90-10-65/645 Installing plastics pipelines; and 90-10-65/680 Installing steel pipelines.

- **Inspection of joints:**
  - **Joints:** Submit proposals.
- **Safety precautions:** In accordance with HSEGS 4.

90-45-05/610 Installing drain lines

- **Drain connections:** Connect drainline flush with bottom of drip tray.
- **Drain line material:** Plastics.

System completion

65-70-45/815 Commissioning of refrigeration systems

- **Pre-commissioning:** In accordance with CIBSECommissioning Code R.
- **Commissioning:** In accordance with CIBSECommissioning Code R.

- **Notice (minimum):** 48 h.

65-70-45/830 Inspection and test records

- **Construction phase reports:** Post-installation.
- **Records for water systems:** In accordance with BSRIABG 2/2010.
- **Records for air systems:** In accordance with BSRIABG 49/2015.
- **Record sheets:**
  - **Submission:** On completion.

65-70-45/850 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system as a whole giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Electronic and Paper copy.
  - **Number of copies:** Two.
- **Record drawings:**
  - **Content:** Location and arrangement of plant in plant rooms and Location and arrangement of mechanical services.
  - **Format:** A1 paper print and Electronic.
  - **Number of copies:** Two.
- **Submittal date:** At handover.

Ω End of system

70-50-45/110 Incoming low voltage electricity supply

System outline

70-50-45/110 Incoming low voltage electricity supply

- **Description:** The existing TPN service head is currently fused to 60A.

  The contractor shall liase with UKPN or appointed service providor to increase the fuse ratings to 100A for each phase whilst retaining the original supply service and cable - subject to confirmation from the utility provider.

  The incoming supply shall be have a minimum rating of 100A.

  Note: In the event that the utility provider is unable to increase the fuse ratings to 100A using the existign supply, the contrctor shall liaise with UKPN for the provision of a new 200A TPN
  TNC-S service to the same location as the existing.

  The former LV TPN supply shall be removed and discommissioned.

  All LV distributution shall be served from this location.
- **System performance:** 70-50-45/210 Design of incoming low voltage electricity supply;
  70-50-45/220 Supply characteristics;
  and 70-50-45/230 Connecting generators to the public supply network.
- **Nature of current:** Alternating.
- **Phase:** Three phase 4 wire.
- **Voltage:** 400 V.
- **Electricity distributor:** Existing.
- **Electricity supplier:** Existing.
- **Metering:** Existing.
- **Execution:** 70-50-45/610 Removing and permanent isolation;
  70-50-45/620 Temporary isolation of existing supply;
  and 70-50-45/630 Management of electricity distributor.
- **System completion:** 70-50-45/810 Site supply characteristics and 70-50-45/830 Documentation.

System performance

70-50-45/210 Design of incoming low voltage electricity supply

- **Standards:** In accordance with BS 7671 and the Electricity Distributor's guidelines.
- **Design:** Complete the design of the low voltage supply.
- **Requirement:** Submit detailed design drawings showing equipment positions and routes, technical information and calculations.
- **Evidence of agreement with Electricity Distributor:** Submit.

70-50-45/220 Supply characteristics

- **Earthing type:** TN-C-S.
- **Overcurrent device at incoming point of supply:**
  - **Type:** Fuse to BS EN 60269-1 and BS HD 60269-2 and Fuse to BS EN 60269-1 and BS HD 60269-3.
  - **Rating:** 100 A and 200 A.

70-50-45/230 Connecting generators to the public supply network

- **Standard:** In accordance with ENA G59/3.

Execution

70-50-45/610 Removing and permanent isolation

- **Scope:** Remove complete installation including service cut out, metering equipment and service cable, to site boundary.

70-50-45/620 Temporary isolation of existing supply

- **Existing low voltage supply:** Engage the Electricity Distributor to isolate and disconnect.
- **Reinstatement:** Submit proposals.

70-50-45/630 Management of electricity distributor

- **Establishing the supply:** Manage and liaise with the Electricity Distributor to establish an incoming electricity supply.
- **Evidence of liaison:** Submit.

System completion

70-50-45/810 Site supply characteristics

- **Prospective short-circuit current (Pscc):** Measure and submit results.
- **External earth fault loop impedance (Ze):** Measure and submit results.

70-50-45/830 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Contractor's choice.
  - **Format:** Electronic and Paper copy.
  - **Number of copies:** Two.
- **Record drawings:**
  - **Content:** For all low voltage distribution circuits, the cable origin at the site boundary, route to service cut out, method of installation, depth of trench, details of ducts including sizes and position of cable joints.

- **Drawing format:** A1 paper print drawing and Electronic drawing.
- **Number of copies:** Two.

- **Submittal date:** At handover.

Ω End of system

70-70-25/110 Earthing and bonding system

System outline

70-70-25/110 Earthing and bonding system

- **Description:** The Community Centre is currently served with a TNC-S earthing arrangement which will be utilised for continued use.

  A new Main Earthing Terminal (MET) shall be installed beside the incoming LV supply - refer to LV schematic for co-ordination.

  To prevent the likelihood of equipotential differences arising around the building, all installations will be appropriately connected to earth in accordance with the requirements of BS 7671.

  The Contractor shall confirm that all services entering the buildings such as water, gas, mechanical H&V systems including cold water pipework, lightning protection etc. are provided with adequate earth connections.

  Bonding shall be provided for all extraneous conductive parts as required by BS 7671. The contractor shall provide supplementary bonding as and where required by BS 7671.

  Bonding conductors shall be secured to metal cable containment throughout their entire length using proprietary fixings.

  Continuity of containment and mechancial services shall be assured and verified.

  Out going connections will be provided to the following services, but not limited too the following:

  -Incoming utility services;
  -Main protective bonding conductors
  -Mechanical plant;
  -Telecoms associated equipment (subject to providors consent and requirements)
  -Distribution boards;
  -Structural Steels;
  -Lightning Protection System;
- **System performance:** 70-70-25/210 Design of earthing and bonding systems and 70-70-25/220 Electricity distributor's requirements.
- **Main incoming earth:** Establish with the Electricity Distributor.
- **Main protective bonding conductors:** 90-55-15/346 Single core non-sheathed cables with LSHF insulation .
- **Supplementary bonding conductors:** 90-55-15/346 Single core non-sheathed cables with LSHF insulation.
- **Earth terminal type:** 90-75-50/310 Earth bars.
- **Electrical identification:** 90-90-55/390 Equipment labels and warning notices and 90-90-55/395 Electrical diagrams.

- **Execution:** 70-70-25/610 Removing earthing and bonding systems; 70-70-25/620 Measurement of characteristics of existing installations; and 70-70-25/630 General installation.
- **System completion:** 70-70-25/810 Inspection and testing and 70-70-25/820 Documentation.

System performance

70-70-25/210 Design of earthing and bonding systems

- **Standards:** In accordance with BS 7671 and BS 7430.
- **Design:** Complete the design of the earthing and bonding systems.
- **Earthing conductor:** Size to BS 7454;
  Size in accordance with BS 7671, Regulation 543.1.3;
  and Size in accordance with BS 7671, Regulation 543.1.4.
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

70-70-25/220 Electricity distributor's requirements

- **Evidence of compliance:** Submit, in accordance with the requirements of the Electricity Distributor.

Products

90-55-15/346 Single core non-sheathed cables with LSHF insulation

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-35/110 Hard wired general lighting system.

- **Manufacturer:** Batt Cables
- **Standards:** To BS EN 50525-1 and BS EN 50525-3-41.
- **Execution:** 90-55-15/635 Installing low voltage cables.

90-75-50/310 Earth bars

- **Manufacturer:** Contractor's choice.
- **Material:**
  - **Bar type:** Hard drawn copper to BS EN 13601.
- **Disconnecting links:** One.
- **Execution:** 90-75-50/610 Installing earth bars.

90-90-55/390 Equipment labels and warning notices

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Contractor's choice.

90-90-55/395 Electrical diagrams

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Material:** Engraved plastics laminate.
- **Format:** Single line engineering drawings to BS EN 61082-1.

Execution

70-70-25/610 Removing earthing and bonding systems

- **Scope:**

70-70-25/620 Measurement of characteristics of existing installations

- **External earth fault loop impedance (Ze):** Direct measurement.
- **Earth fault loop impedance (Zs):** Direct measurement.
- **Results:** Submit.

70-70-25/630 General installation

- **Standards:** In accordance with BS 7430 and BS 7671.

90-55-15/635 Installing low voltage cables

Shared by: 90-55-15/330 Fire resistant screened (LSHF) cables; 90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation; 90-55-15/346 Single core non-sheathed cables with LSHF insulation; and 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Standard:** In accordance with BS 7671.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
  Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
  - **Final circuit cables:** At electrical accessories only.
  - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
  - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-75-50/610 Installing earth bars

- **Standards:** In accordance with BS 7671 and BS 7430 and To BS EN 50522 and in accordance with BS 7430.

System completion

70-70-25/810 Inspection and testing

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

70-70-25/820 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Electronic and Paper copy.
  - **Number of copies:** Two.
- **Record drawings:**
  - **Content:** Location and arrangement of plant in plant rooms and Location of earth terminals.
  - **Format:** A1 paper print drawing and Electronic drawing.
  - **Number of copies:** Two.
- **Submittal date:** At handover.

Ω End of system

70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation

System outline

70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation

- **Description:** All new electrical installations within the Community Centre shall be Certified, Commissioned and Verified in accordance with the requirements of BS 7671 and IET Guidance Note 3.

  Upon completion of testing and inspection, the Contractor shall forward to the Contract Administrator, copies of Test and Inspection Certificates.

  Inspection and testing and commissioning of the installation shall be carried out to demonstrate compliance with the relevant British Standards to ensure a full working and safe installation.

  The results of the testing and commissioning shall be recorded in both hard copy and electronic copy following handover.
- **General requirements:**
  - **Electrical test engineer:** Electrical installation contractor.
  - **Approval:** Contractor's design.
  - **Evidence of approval:** Submit.
  - **Test equipment calibration:** UKAS approved.
- **Execution:** 70-70-40/610 Test equipment calibration and 70-70-40/620 Inspection and testing electrical installations generally.
- **System completion:** 70-70-40/860 Electrical installation certificates.

Execution

70-70-40/610 Test equipment calibration

Shared by: 70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation; and 70-70-40/130 Inspection and testing of existing electrical installations.

- **Test equipment calibration:** UKAS approved.

70-70-40/620 Inspection and testing electrical installations generally

Shared by: 70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation; and 70-70-40/130 Inspection and testing of existing electrical installations.

- **Standards:** In accordance with BS 7671 and IETGuidance Note 3.
- **Notice before commencing tests (minimum):** 24 h.

- **Installed equipment standards:** Verify and confirm compliance with the relevant equipment standards.
  Verify and confirm that all parts of the fixed installation are selected and erected correctly.
  Verify and confirm that the fixed installation is free from visible damage or otherwise defective.
- **Electronic devices:** Isolate to prevent damage during testing.
- **Continuity of protective conductors:**
  - **Parallel earth paths:** Isolate before testing.
  - **Equipment:** Continuity tester with short circuit current of at least 200 mA, and a no load d.c. or a.c. voltage between 4 V and 24 V.
- **Insulation resistance (minimum):**
  - **SELV and PELV circuits:** As per BS 7671
  - **Other circuits less than or equal to 500 V (excluding SELV and PELV):** As per BS 7671
  - **Circuits above 500 V:** As per BS 7671
- **External earth fault loop impedance (Ze):** Direct measurement.
- **Connection of test equipment to existing switchgear:** Contractor's choice.
- **Earth fault loop impedance (Zs):** As per BS 7671 and guidance note 3
- **Measurement locations:** Origin, switchgear, fixed equipment and outlets, circuit extremities.
- **Prospective fault current:**
  - **Method:** Direct measurement.
  - **Location:** Origin, and at points where protective devices are required to operate under fault conditions.
- **Phase sequence:** Verify.
- **Cable containment:** Measure electrical continuity and insulating properties of containment. Submit results.

System completion

70-70-40/860 Electrical installation certificates

- **Standard:** In accordance with BS 7671, Appendix 6.
- **Format:** A4 paper print, type written results and Electronic, type written results.
- **Test equipment identity:** Record on test certificates.
- **Certificates of calibration:** Submit for each test instrument.
- **Schedule of test results:** Submit two copies.

Ω End of system

70-70-40/130 Inspection and testing of existing electrical installations

System outline

70-70-40/130 Inspection and testing of existing electrical installations

- **Description:** Certification, Commissioning and Verification of all electrical installations within the Community Centre shall be carried out in accordance with the requirements of BS 7671 and IET Guidance Note 3.

  Under the scope of works the existing electrical installation is to be re-directed and distributed from a new panel board. The contractor shall test and verify the existing installation upon completion.

  Recorded faults, unsatifactory recorded measuremnts and results shall be rectified under the scope of works.

  Asthetic non-compliances shall be presented to the client as recommendations for repair only.

  Upon completion of testing and inspection, the Contractor shall forward to the Contract Administrator, copies of Test and Inspection Certificates.

  Inspection and testing and commissioning of the installation shall be carried out to demonstrate compliance with the relevant British Standards to ensure a full working and safe installation.

  The results of the testing and commissioning shall be recorded in both hard copy and electronic copy following handover.
- **General requirements:**
  - **Electrical test engineer:** Electrical installation contractor.
  - **Approval:** Existing.
  - **Evidence of approval:** Submit.
  - **Test equipment calibration:** UKAS approved.
- **Areas to be tested:** Existing.
- **Scope of survey:** Existing.
- **Execution:** 70-70-40/610 Test equipment calibration and 70-70-40/620 Inspection and testing electrical installations generally.
- **System completion:** 70-70-40/880 Electrical installation condition report and Installation report

Execution

70-70-40/610 Test equipment calibration

Shared by: 70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation; and 70-70-40/130 Inspection and testing of existing electrical installations.

- **Test equipment calibration:** UKAS approved.

70-70-40/620 Inspection and testing electrical installations generally

Shared by: 70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation; and 70-70-40/130 Inspection and testing of existing electrical installations.

- **Standards:** In accordance with BS 7671 and IETGuidance Note 3.
- **Notice before commencing tests (minimum):** 24 h.
- **Installed equipment standards:** Verify and confirm compliance with the relevant equipment standards.
  Verify and confirm that all parts of the fixed installation are selected and erected correctly.
  Verify and confirm that the fixed installation is free from visible damage or otherwise defective.
- **Electronic devices:** Isolate to prevent damage during testing.
- **Continuity of protective conductors:**
  - **Parallel earth paths:** Isolate before testing.
  - **Equipment:** Continuity tester with short circuit current of at least 200 mA, and a no load d.c. or a.c. voltage between 4 V and 24 V.
- **Insulation resistance (minimum):**
  - **SELV and PELV circuits:** As per BS 7671
  - **Other circuits less than or equal to 500 V (excluding SELV and PELV):** As per BS 7671
  - **Circuits above 500 V:** As per BS 7671
- **External earth fault loop impedance (Ze):** Direct measurement.
- **Connection of test equipment to existing switchgear:** Contractor's choice.
- **Earth fault loop impedance (Zs):** As per BS 7671 and guidance note 3
- **Measurement locations:** Origin, switchgear, fixed equipment and outlets, circuit extremities.
- **Prospective fault current:**
  - **Method:** Direct measurement.
  - **Location:** Origin, and at points where protective devices are required to operate under fault conditions.
- **Phase sequence:** Verify.
- **Cable containment:** Measure electrical continuity and insulating properties of containment. Submit results.

System completion

70-70-40/880 Electrical installation condition report

- **Standard:** In accordance with BS 7671, Appendix 6.
- **Format:** A4 paper print, type written results and Electronic, type written results.
- **Test equipment identity:** Record on test certificates.
- **Certificates of calibration:** Submit for each test instrument.
- **Schedule of test results:** Submit two copies.
- **Remedial works:** Submit proposals.

Ω End of system

70-70-45/110 Low voltage distribution system

System outline

70-70-45/110 Low voltage distribution system

- **Description:** The electrical contractor shall be responsible for the supply, installation and commissioning of a complete new sub-main distribution and switchgear installation.

  The installation shall generally be as detailed within this project specification and shall be complete in all respects.

  The low voltage distribution system serving the requirements of the Community Centre shall comprise of a new Schneider Electric panelboard reference: LLPB/1.

  The existing electrical distribution within the Community Centre shall be disconnected and distributed from the new Schneider panel board as detailed within IW design drawings.

  New metered three phase supplies shall be provided to serve dedicated distribution boards to the Cafe & Kitchen as per IW LV schematic.

  LLPB/2 shall distribute new sub-metered and unmetered low voltage supplies to various distribution boards as identified within IW design drawings.

  Note: The existing TPN service head is currently fused to 60A. The contractor shall liase with UKPN or appointed service providor to increase the fuse ratings to 100A for each phase whilst retaining the original supply service and cable - subject to confirmation from providor.

  In the event that an increased fuse rating is not permitted by the utility providor the contractor shall engage with UKPN to install a new maximum service rating of 200A TPN with appropriate metering.

  A 100A TPN supply is required at a minimum due too future loading requirements of the extention

  LV supplies serving the Main Fire Alarm Panel and Disable refuge Alarm shall be provided from the main panelboard and labelled "FIRE ALARM - DO NOT SWITCH OFF" and "LIFE SAFETY COMMUNICATIONS - DO NOT SWITCH OFF".

  Final circuitry and cabling including switchgear and accessories associated with all plant room mechanical services shall derive from MCP/1 and shall be designed and provided by the contractor.

  Outdoor A/C units shall be served from MCP/1. Cabling, circuit protective devices and distribution shall be provided by the contractor and installed in accordance with the requirements of BS 7671.

  Distribution boards will be placed as detailed in Ingletonwood small power layouts.

  A Furse stand-alone Type 1 Surge protective device will be installed adjacent to LLPB/1 and subject to manufacturers requirements.

Primary containment routes for Low Voltage distrubution of sub-mains supplies served from LLPB/1 shall be Legrand Heavy Duty steel galvanised cable tray.

Lighting and small power distribution shall be distributed throughout within the Community Centre via a 100 x 100mm steel galvanised trunking system.

Distribution of ELV services such as Comms, Data & security shall be carried out via steel basket systems.

Note: Provide barriers/dividers for each ELV service type.

Secondary containment such as conduit drops for LV distribution shall be carried out via steel galvanised conduit.

PVC conduit is permitted for distribution of ELV ancillary services to low level.

All meters shall have kWh meter provision for MD recording, display Voltage, Amperage, Frequency,

Meters shall be provided with pulsed output and provision for connection to the BMS.

Distribution boards shall include integral switch disconnectors and will utilise outgoing miniature circuit breakers (MCB's), residual current devices (RCD's) and combined residual current and over- current operated circuit breakers (RCBO's).

All MCCB panelboards and final circuit three phase distribution boards shall be factory assembled Schneider distribution units, complete with all necessary interconnections and moulded case circuit breakers of appropriate type and rating.

All distribution boards and MCCB panelboards shall be complete with lockable covers. locks and keys shall be standardised across the project.

Outgoing power from LLPB/1 shall generally be distributed by XLPE insulated, stranded copper armoured LSF sub-main cabling (Cu XLPE/SWA/LSF).

All sub-main cable terminations shall utilise brass type cable glands, and shall be complete with earthing tags. The earthing tags shall be fixed to gland-plates with brass bolts at both ends.

Cable trays shall generally be installed within ceiling voids, fixed to channel brackets and suspended by threaded rods, where appropriate.

Containment Concealed/Flush Areas:

In areas of the building with suspended accessible ceilings, the primary containment systems shall be installed concealed within the ceiling voids and secondary containment shall be 'chased-in' or contained within the building fabric.

In areas of the building with suspended non-accessible ceilings, the containment system will be installed concealed within the ceiling voids with access panels provided for future access for inspection and maintenance to the fixed wiring installations.

In areas of the building with plastered wall finishes, the containment systems will be installed concealed and flush down walls to the equipment and accessories usinggalvanised steel or PVC conduit.

- **System performance:** 70-70-45/210 Design of low voltage distribution systems; 70-70-45/215 Low voltage distribution circuit cables generally; and 70-70-45/220 Selection of conduit, trunking and ducting.
- **Connection to low voltage supply:** Existing.
- **Switchgear:** 90-50-45/410 Distribution boards; 90-50-45/448 Fuse-switch disconnectors; and 90-50-45/450 Switch-disconnectors.
- **Distribution circuit cabling:** 90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables; 90-55-15/330 Fire resistant screened (LSHF) cables; 90-55-15/332 Thermosetting insulated armoured fire resistant (LSHF) cables; and 90-55-15/346 Single core non-sheathed cables with LSHF insulation.
- **Containment:** 90-55-10/325 Cable baskets; 90-55-10/335 Cable trays; 90-55-10/380 Rigid conduit; and 90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting.
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Monitoring and metering:** 90-65-55/325 Digital multifunction metering equipment.
- **Electrical identification:** 90-90-55/395 Electrical diagrams and 90-90-55/390 Equipment labels and warning notices.
- **Execution:** 70-70-45/615 Alterations to existing switchgear and 70-70-45/625 Installing low voltage distribution systems.
- **System completion:** 70-70-45/810 Inspecting, testing and commissioning of switchgear generally and 70-70-45/820 Documentation.

System performance

70-70-45/210 Design of low voltage distribution systems

- **System designer:** Member of the Institution of Engineering and Technology (IET).
- **Design:** Complete the design of the low voltage distribution system.
- **Standard:** In accordance with BS 7671.
- **Provision of low voltage distribution:** Provide electrical supplies to equipment requiring power.
- **Spare capacity throughout the low voltage distribution system:** 25% of current carrying capacity.
- **Requirement:** See Tender Drawings

70-70-45/215 Low voltage distribution circuit cables generally

- **Proposed selection of low voltage distribution cables:** See Tender Drawings
- **Conductor sizes (minimum):** As per IW LV Schematic
- **Cable sizes not stated:** Submit.

70-70-45/220 Selection of conduit, trunking and ducting

- **Standard:** In accordance with BS 7671.
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
- **Conduit, trunking and ducting sizes not stated:** Submit.

Products

90-50-45/410 Distribution boards

- **Manufacturer:** Schneider Electric
- **Standards:** To BS EN 61439-1 and BS EN 61439-3.
- **Outgoing devices:**
  - **Type:** 90-60-30/330 Miniature circuit breakers and 90-60-30/350 Residual current circuit breakers with integral overcurrent protection.
  - **Quantity:** One per circuit
- **Busbars and connections:**
  - **Type:** Fully shrouded.
  - **Rated operational current (Ie):** Manufacturer's standard.
  - **Rated short-time withstand current (Icw) for 1 s:** Manufacturer's standard.
- **Neutral and earth bars:** Individual terminal for each outgoing circuit.
- **Neutral terminations:** Match current carrying capacity of phase conductor.
- **Execution:** 90-50-45/665 Installing switchgear generally.

90-50-45/448 Fuse-switch disconnectors

- **Manufacturer:** Eaton
- **Standards:** To BS EN 60947-1 and BS EN 60947-3.
- **Fuses:** 90-60-30/360 Low voltage fuses.
- **Execution:** 90-50-45/665 Installing switchgear generally.

90-50-45/450 Switch-disconnectors

- **Manufacturer:** Eaton
- **Standards:** To BS EN 60947-1 and BS EN 60947-3.
- **Execution:** 90-50-45/665 Installing switchgear generally.

90-55-10/325 Cable baskets

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; 75-45-20/110 Data distribution system; 75-60-10/110 CCTV system; 75-60-40/110 Intrusion and hold-up alarm system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.

- **Sizes:**
  - **Width:** Minimum 100mm for all service types (25% spare capacity)
- **Features:**
  - **Segregation:** Cable dividers.
- **Execution:** 90-55-10/630 Installing cable basket.

90-55-10/335 Cable trays

Shared by: 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.
- **Electrical properties:**
- **Width:** 100mm minimum (25% spare capacity)
- **Execution:** 90-55-10/620 Installing cable tray and cable ladder.

90-55-10/380 Rigid conduit

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-25/120 Amenity lighting system.

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS EN 61386-1 and BS EN 61386-21.
- **Mechanical properties:**
  - **Resistance to impact:** Very heavy.
- **Transport, installation and application:**
- **Resistance to bending:** Rigid.
- **Electrical characteristics:** With electrical continuity properties.
- **Resistance to external influences:**
  - **Protection against ingress of solid objects (minimum):** To BS EN 60529, IP3X.
  - **Protection against ingress of water (minimum):** To BS EN 60529, IPX0.
- **Sizes (OD):** 20 mm and 32 mm.
- **Execution:** 90-55-10/720 Installing rigid metallic conduit.

90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-35/110 Hard wired general lighting system.

- **Manufacturer:** Swift/Legrand
- **Standards:** To BS EN 50085-1 and BS EN 50085-2-1.
- **Installation position:** Surface mounted on the ceiling or suspended above ceiling
- **Temperature properties:**
- **Electrical properties:** With electrical continuity characteristics.
- **Protection by enclosure:**
  - **Protection against ingress of solid objects (minimum):** To BS EN 60529, IP4X.
  - **Protection against ingress of water (minimum):** To BS EN 60529, IPX1.

- **Protection against access to hazardous parts (minimum):** To BS EN 60529, IPXXD.

- **Screening:** Required.
- **Sizes:** 100 x 100 mm.
- **Accessories and fittings:**
  - **Generally:** Factory made by the cable trunking or ducting manufacturer and of the same material type and finish as the cable trunking or ducting.
- **Execution:** 90-55-10/740 Installing trunking generally.

90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables

Shared by: 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Batt Cables
- **Standard:** To BS 6724.
- **Insulation:** Manufacturer's standard.
- **Sheath colour:** Black.
- **Execution:** 90-55-15/680 Installing low voltage armoured cables type A.

90-55-15/330 Fire resistant screened (LSHF) cables

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Pirelli
- **Standard:** To BS 7629-1.
- **Execution:** 90-55-15/635 Installing low voltage cables.

90-55-15/332 Thermosetting insulated armoured fire resistant (LSHF) cables

Shared by: 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Pirelli/Draka
- **Standard:** To BS 7846.
- **Third party certification:**
- **Oversheath colour:** Black.
- **Execution:** 90-55-15/680 Installing low voltage armoured cables type B.

90-55-15/346 Single core non-sheathed cables with LSHF insulation

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-35/110 Hard wired general lighting system.

- **Manufacturer:** Batt Cables
- **Standards:** To BS EN 50525-1 and BS EN 50525-3-41.
- **Execution:** 90-55-15/635 Installing low voltage cables.

90-60-30/330 Miniature circuit breakers

- **Manufacturer:** Acti9 Schneider Electric

- **Standards:** To BS EN 60898-1;
  To BS EN 60898-1 and BS EN 60898-2;
  and To BS EN 60947-1 and BS EN 60947-2.
- **Third party certification:** ASTA Type test certification.
- **Rated short-circuit capacity (Icn):** 15kA

90-60-30/350 Residual current circuit breakers with integral overcurrent protection

- **Manufacturer:** Acti9 Schneider Electric
- **Standards:** To BS EN 61009-1 and To BS EN 61009-1 and BS EN 62423.

90-60-30/360 Low voltage fuses

- **Manufacturer:** Contractor's choice.
- **Fuse type:** System E and System G.
- **Rated breaking capacity:** 80 kA.

90-65-55/325 Digital multifunction metering equipment

- **Manufacturer:** Schneider Electric
- **Display type:** Liquid crystal display (LCD).
- **Metering functions:** Active energy (kWh);
  Active power (kW);
  Frequency (Hz);
  Phase currents (A);
  and Voltage between phases (V).
- **Execution:** 90-65-55/620 Installing electrical monitoring and metering equipment.

90-90-55/390 Equipment labels and warning notices

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Contractor's choice.

90-90-55/395 Electrical diagrams

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Material:** Engraved plastics laminate.
- **Format:** Single line engineering drawings to BS EN 61082-1.

Execution

70-70-45/615 Alterations to existing switchgear

- **Standards:** In accordance with manufacturer’s instructions and type test certification.
- **Alterations:** Submit records of alterations made to assemblies.

70-70-45/625 Installing low voltage distribution systems

- **Standard:** In accordance with BS 7671.
- **Layout:** Position cabling and equipment to provide safe and easy access for operation and maintenance.

90-50-45/665 Installing switchgear generally

Shared by: 90-50-45/410 Distribution boards; 90-50-45/448 Fuse-switch disconnectors; and 90-50-45/450 Switch-disconnectors.

- **General requirements:** 90-50-45/675 Labelling switchgear.
- **Switchgear cubicles:** Arrange in modular form to facilitate future extension.
- **Clearance (minimum):**
  - **Front access switchgear:** 1000 mm in front of switchgear.
  - **Rear access switchgear:** 1000 mm in front of and behind switchgear.
- **Fixing equipment:**
  - **Generally:** Fix independently of wiring installation with zinc electroplated fasteners.
  - **Indoor equipment:** Fix using internal lugs.
  - **Outdoor equipment:** Fix using external lugs.
- **Orientation:** Accurate and square to vertical and horizontal axes. Align adjacent items of switchgear on the same horizontal axis.
- **Extension boxes:** Provide where necessary.
- **Gland plates:** Non-ferrous for single core cables.
- **Interconnection of close coupled switchgear:**
- **Identification:**
  - **Neutral and earth bar terminals:** Label with the outgoing circuit reference.
  - **Cable terminations:** Label with circuit reference, with push-on plastics markers.

90-55-10/620 Installing cable tray and cable ladder

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Preparation:**
  - **Burrs and sharp edges:** Make smooth.
  - **Cutting:** Minimize and make good edges. Cuts to cable tray to be square along an unperforated line.
  - **Treatment of cut surface:** Extend 25 mm beyond the cut. Match finish of cable supports.
- **Access:** Provide space around cable ladder and tray to permit access for installing and maintaining cables.
- **Joints and expansion couplers:**
  - **Position:** Locate between the bracket support and the quarter point.
  - **Number of joints:** Minimize.
  - **Lengths of cable ladder and tray:** Maximize.
  - **Ends:** Blank with end plates.
- **Changes of size and direction:** Manufacturer's accessories of the same material type, pattern, finish and thickness as cable supports.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.

- **Protective covers:** Provide to cables requiring mechanical protection.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable ladder and tray:** Submit drawings showing the proposed routes of cable ladder and cable tray.

90-55-10/630 Installing cable basket

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Joints:** Cut adjacent cross basket wires. Make smooth any burrs or edges.
- **Accessories:** Form on site and connect with basket manufacturer's coupling components.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable basket:** Submit drawings showing the proposed routes.

90-55-10/700 Installing conduit, trunking and ducting

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Preparation:** Cut square. Remove burrs and sharp edges to make smooth.
- **Protection of metallic conduit, trunking and ducting:**
  - **Joints and ends:** Remove grease, oil, dirt and rust before applying protective paint. Paint immediately following installation.
  - **Protective paint:**

    Generally: Compatible with conduit, trunking and ducting finish.
- **Cross-sectional area:** Maintain throughout the conduit, trunking and ducting length.
- **Arrangement:** Position vertically and horizontally in line with equipment served, and parallel with building lines.
- **Distance from other services running parallel (minimum):**
  - **Generally:** 150 mm.
- **Drainage of conduit, trunking and ducting:** Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
- **Fire barriers:** Provide to maintain integrity of fire compartments.
- **Rewireable installations:** Enable rewiring from accessible boxes or accessories only.
- **Support:** Independently fix and support conduit, trunking and ducting from building structure.
- **Cleaning:** Clean insides of conduit, trunking and ducting before installing cables.
- **Cabling:** Install when conduit, trunking and ducting enclosure is complete.
- **Submittals:** Submit manufacturer's technical information. Submit drawings showing the proposed routes of conduit, trunking and ducting and the location of service outlets.

90-55-10/710 Installing conduit generally

- **Fixing:** Fix securely. Fix boxes independently of conduit.

- **Changes of direction:** Conduit boxes or bends site formed by machine. Do not use elbows, tees or inspection bends.
- **Joints:**
  - **Generally:** Manufacturer's jointing fittings.
  - **Number of joints:** Minimize.
  - **Lengths of conduit:** Maximize.
  - **Open ends:** Plug.
  - **At movement joints in structure:** Manufactured expansion coupling. Install adaptable boxes on both sides of joint at a maximum distance of 300 mm.
- **Connections to boxes, trunking, equipment and accessories:** Screwed couplings with rubber bushes at open ends.
- **Conduit boxes:**
  - **Generally:** Install flush with finished surfaces. Provide extension rings if required.
  - **Fixing screws:** Countersunk, or round-headed screws.
  - **Number of fixings (minimum):** Two.
  - **Lids:** Fasten with brass slot pan head screws.
- **Rear outlet boxes:** Locate where surface conduits pass through walls to external equipment.
- **Draw-in boxes:**
  - **Spacing (maximum):** 10 m.
  - **Number of bends between draw-in boxes (maximum):** Two.
  - **Floors:** Do not install draw-in boxes in floors.
- **Suspended ceiling installations:** Fasten outlet boxes to structure above ceiling.

90-55-10/720 Installing rigid metallic conduit

- **General requirements:** 90-55-10/710 Installing conduit generally and 90-55-10/700 Installing conduit, trunking and ducting.
- **Threaded conduits:** Tightly screw to ensure electrical continuity, with no thread showing.
- **Conduit connections to boxes and items of equipment, other than those with threaded entries:** Earthing coupling with male brass bush and protective conductor.

90-55-10/740 Installing trunking generally

- **Changes of direction:** Manufacturer's bends and tees.
- **Joints:**
  - **Generally:** Manufacturer's jointing fittings. Maintain rigidity of trunking across joint.
  - **Number of joints:** Minimize.
  - **Lengths of trunking:** Maximize.
  - **Open ends:** Blank using manufacturer's removable end caps.
  - **Metal edging:** Protect with PVC edging strip.
  - **Electrical continuity:** Maintain at each joint with a copper link fitted on the outside of the trunking.
- **Connections to conduit, boxes, equipment and accessories:** Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.
- **Connections to trunking covers:** Minimize.

- **Electrical continuity of covers:** Electrically continuous with the trunking or provide protective conductors.
- **Access:** Provide space around trunking to permit access for installing and maintaining cables. Set out access with covers on a continuous face to allow cabling to be laid in throughout its entire length.
- **Trunking passing through building fabric openings:** Provide fixed trunking covers. Extend covers 50 mm from both sides of the opening.
- **Cable retaining straps:** Required except when trunking cover is on top.

90-55-15/635 Installing low voltage cables

Shared by: 90-55-15/330 Fire resistant screened (LSHF) cables; 90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation; 90-55-15/346 Single core non-sheathed cables with LSHF insulation; and 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Standard:** In accordance with BS 7671.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
  Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
  - **Final circuit cables:** At electrical accessories only.
  - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
  - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/680 Installing low voltage armoured cables type A

Shared by: 90-55-15/322 Thermosetting insulated and PVC sheathed armoured cables; and 90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables.

- **General requirements:** 90-55-15/685 Jointing and terminating low voltage armoured cables and 90-55-15/635 Installing low voltage cables.
- **Earthing:** Bond armour to equipment and main earthing system.
- **Connections to apparatus:** Moisture proof, sealed glands and shrouds.

90-55-15/680 Installing low voltage armoured cables type B

- **General requirements:** 90-55-15/685 Jointing and terminating low voltage armoured cables and 90-55-15/635 Installing low voltage cables.
- **Earthing:** Bond armour to equipment and main earthing system.
- **Connections to apparatus:** Moisture proof, sealed glands and shrouds.

90-55-15/685 Jointing and terminating low voltage armoured cables

Shared by: 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Preparation:**
  - **Cable ends:** Cut immediately before jointing or terminating.
  - **Cables left unconnected for more than 24 h:** Seal to prevent moisture ingress.
- **Cable stripping:**
  - **Length of exposed cores and conductors:** Minimize. Leave no exposed conductor after termination.
  - **Strands:** Do not damage when stripping cable cores. Twist together. Do not reduce number. Secure at terminations.
- **Joints and terminations:** Use qualified cable jointers, using jointing materials, components and installation techniques recommended by the cable manufacturer and the jointing accessory manufacturer.
- **Tooling certificate:** Submit before installing connectors.
- **Cable glands:** To BS EN 62444 and fitted with shroud.
- **Cold pour resin and heat shrink joints:** To BS EN 50393.
- **Insulating tape:** To BS EN 60454-1.
- **Plastics sheathed cables:** Seal with proprietary shrink-on end caps.
- **Bolted terminal connections to equipment and switchgear without integral cable clamping terminals:** Compression type lugs, of correct bore.
- **Compression joints:** Provide in accordance with BS 7609.
- **Conductor labelling:** Identify cable conductor cores at each end of cable and at joints.
- **Unused cable cores:** Connect to earth.

90-65-55/620 Installing electrical monitoring and metering equipment

- **Standard:** In accordance with BS 7671.
- **Digital metering equipment:** Connect to building management system.

System completion

70-70-45/810 Inspecting, testing and commissioning of switchgear generally

- **Standard:** In accordance with BS 7671.
- **Switches and circuit breakers:** Clean to remove all visible traces of dust.
- **Protective devices settings:** Configure to match the grading study.
- **Switchboard monitoring:** Continuous for 30 minutes following first energizing.
- **Additional inspecting and testing:** Check levelling and alignment of assembly.
  Check operation of instruments and metering devices.
  Check and adjust tightness of busbar connections and supports.
  Check tightness of bolted connections.
  Check busbar joints with duct or resistance measurements.
  Check earth connections at compartments, switches and earth electrodes.

Check clearance of live parts from direct contact.
Check polarity and phase sequence of protective devices.
Check operation of protective devices using secondary and primary current injection.
Manually operate protective devices.
Carry out earth fault protection simulation tests.
Check functional operation of circuit breakers.
Check operation of switch tripping devices.

- **Testing and commissioning results:** Submit two copies.
- **Certificates of calibration for meters and instruments:** Submit.

70-70-45/820 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Paper copy.
  - **Number of copies:** Two.
- **Record drawings:**
  - **Content:** For all low voltage distribution circuits: the cable origin, circuit designation, route, loading, conductor material and c.s.a., insulation type and colour, number of cores per cable, number of cables in trunking and conduit;
    Location of LV switchgear including distribution boards;
    Routes of trunking, conduit, cable tray and cable ladders;
    and Schematic drawings showing all low voltage distribution circuits: the cable origin, circuit designation, cable type, size, number of cores, size and type of overcurrent protective device.
  - **Drawing format:** A1 paper print drawing and Electronic drawing.
  - **Number of copies:** Two.
- **Submittal date:** At handover.

Ω End of system

70-70-75/110 Hard wired low voltage small power system

System outline

70-70-75/110 Hard wired low voltage small power system

- **Description:** The electrical contractor shall be responsible for the supply, installation and commissioning of a complete small power installation including all cabling, containment and final accessories to the Community Centre.

  Provide power to all specialist plant / installations as required by the relevant specialists.

  Note: Kitchen and Cafe equipment fit-out is currently unknown. Liaise with client for kitchen electrical outlet requirememts. A dedicated distribution board has been provided for both the Cafe and Kitchen area.

  A roof light control panel is to be intalled within the Function room The contractor shal submit proposals and manufacturer options for approval by the design team prior to procurement.

  The contractor will be expected to co-ordinate with all other trades and specialists to ensure all power requirements are met and supplied in the correct locations.

  Final circuits for the small power installation shall be derived from the landlord general distribution boards.

  Circuits shall incorporate suitably rated MCB/RCD or RCBO miniature circuit breakers where necessary and outlets shall be generally provided in the form of twin switched socket outlets and fused connection units throughout the building as indicated on the associated drawings.

  All circuits, cabling and protective devices shall be designed supplied and installed in accordance with the requirements of BS 7671.

  All equipment shall have a suitable IP rating for the environment in which it shall be installed.

  Final circuits in plantroom areas will be distributed in single core cabling within surface mounted metal clad outlets/accessories and steel galvanised conduits.

  Small power circuits serving switched, 13A BS 1363 socket outlets shall generally be arranged as ring main and radial circuits, served from the local distribution board and protected by RCBO devices as required by BS 7671.

  Small power accessories shall be MK Logic

  Single gang switched socket outlets shall be provided to serve WI-FI data outlets as required- Subject to specialist requirements.

Final circuit cabling shall be carried out in single core LSF cabling for all LV circuits

- **System performance:** 70-70-75/210 Design of low voltage small power systems;
  70-70-75/215 Low voltage small power cables generally;
  and 70-70-75/220 Selection of conduit, trunking and ducting generally.
- **Connection to low voltage supply:** Existing.
- **Final circuit cabling:** 90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables;
  90-55-15/330 Fire resistant screened (LSHF) cables;
  90-55-15/332 Thermosetting insulated armoured fire resistant (LSHF) cables;
  and 90-55-15/346 Single core non-sheathed cables with LSHF insulation.
- **Containment:** 90-55-10/325 Cable baskets;
  90-55-10/335 Cable trays;
  90-55-10/380 Rigid conduit;
  and 90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting.
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Partial installation:** Required.
- **Electrical accessories and outlets:** MK Logic
- **Electrical identification:** 90-90-55/390 Equipment labels and warning notices and 90-90-55/395 Electrical diagrams.
- **Execution:** 70-70-75/620 Small power installation.
- **System completion:** 70-70-75/820 Documentation.

System performance

70-70-75/210 Design of low voltage small power systems

- **Provision of small power:** For fixed and portable equipment requiring power.
- **Design:** Complete for the low voltage small power systems.
- **Standards:**
- **Diversity:** In accordance with IETGuidance Note 1.
- **Spare capacity throughout the small power system:** 30%.
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

70-70-75/215 Low voltage small power cables generally

- **Standard:** In accordance with BS 7671.
- **Proposed selection of low voltage cables:** Submit drawings, technical information, calculations and manufacturers' literature.
- **Conductor sizes (minimum):** 2.5 mm^2.
- **Cable sizes not stated:** Submit.

70-70-75/220 Selection of conduit, trunking and ducting generally

- **Standard:** In accordance with BS 7671.
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
- **Conduit, trunking and ducting sizes not stated:** Submit.

Products

90-55-10/325 Cable baskets

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; 75-45-20/110 Data distribution system; 75-60-10/110 CCTV system; 75-60-40/110 Intrusion and hold-up alarm system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.
- **Sizes:**
  - **Width:** Minimum 100mm for all service types (25% spare capacity)
- **Features:**
  - **Segregation:** Cable dividers.
- **Execution:** 90-55-10/630 Installing cable basket.

90-55-10/335 Cable trays

Shared by: 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.
- **Electrical properties:**
- **Width:** 100mm minimum (25% spare capacity)
- **Execution:** 90-55-10/620 Installing cable tray and cable ladder.

90-55-10/380 Rigid conduit

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-25/120 Amenity lighting system.

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS EN 61386-1 and BS EN 61386-21.
- **Mechanical properties:**
  - **Resistance to impact:** Very heavy.
- **Transport, installation and application:**
- **Resistance to bending:** Rigid.
- **Electrical characteristics:** With electrical continuity properties.
- **Resistance to external influences:**

- **Protection against ingress of solid objects (minimum):** To BS EN 60529, IP3X.
- **Protection against ingress of water (minimum):** To BS EN 60529, IPX0.

- **Sizes (OD):** 20 mm and 32 mm.
- **Execution:** 90-55-10/720 Installing rigid metallic conduit.

90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-35/110 Hard wired general lighting system.

- **Manufacturer:** Swift/Legrand
- **Standards:** To BS EN 50085-1 and BS EN 50085-2-1.
- **Installation position:** Surface mounted on the ceiling or suspended above ceiling
- **Temperature properties:**
- **Electrical properties:** With electrical continuity characteristics.
- **Protection by enclosure:**
  - **Protection against ingress of solid objects (minimum):** To BS EN 60529, IP4X.
  - **Protection against ingress of water (minimum):** To BS EN 60529, IPX1.
  - **Protection against access to hazardous parts (minimum):** To BS EN 60529, IPXXD.
- **Screening:** Required.
- **Sizes:** 100 x 100 mm.
- **Accessories and fittings:**
  - **Generally:** Factory made by the cable trunking or ducting manufacturer and of the same material type and finish as the cable trunking or ducting.
- **Execution:** 90-55-10/740 Installing trunking generally.

90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables

Shared by: 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Batt Cables
- **Standard:** To BS 6724.
- **Insulation:** Manufacturer's standard.
- **Sheath colour:** Black.
- **Execution:** 90-55-15/680 Installing low voltage armoured cables type A.

90-55-15/330 Fire resistant screened (LSHF) cables

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Pirelli
- **Standard:** To BS 7629-1.
- **Execution:** 90-55-15/635 Installing low voltage cables.

90-55-15/332 Thermosetting insulated armoured fire resistant (LSHF) cables

Shared by: 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Pirelli/Draka
- **Standard:** To BS 7846.
- **Third party certification:**
- **Oversheath colour:** Black.
- **Execution:** 90-55-15/680 Installing low voltage armoured cables type B.

90-55-15/346 Single core non-sheathed cables with LSHF insulation

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-35/110 Hard wired general lighting system.

- **Manufacturer:** Batt Cables
- **Standards:** To BS EN 50525-1 and BS EN 50525-3-41.
- **Execution:** 90-55-15/635 Installing low voltage cables.

90-90-55/390 Equipment labels and warning notices

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Manufacturer:** Contractor's choice.

90-90-55/395 Electrical diagrams

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; and 70-70-75/110 Hard wired low voltage small power system.

- **Material:** Engraved plastics laminate.
- **Format:** Single line engineering drawings to BS EN 61082-1.

Execution

70-70-75/620 Small power installation

- **Standard:** In accordance with BS 7671.

90-55-10/620 Installing cable tray and cable ladder

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Preparation:**
  - **Burrs and sharp edges:** Make smooth.
  - **Cutting:** Minimize and make good edges. Cuts to cable tray to be square along an unperforated line.
  - **Treatment of cut surface:** Extend 25 mm beyond the cut. Match finish of cable supports.
- **Access:** Provide space around cable ladder and tray to permit access for installing and maintaining cables.
- **Joints and expansion couplers:**

- **Position:** Locate between the bracket support and the quarter point.
- **Number of joints:** Minimize.
- **Lengths of cable ladder and tray:** Maximize.
- **Ends:** Blank with end plates.

- **Changes of size and direction:** Manufacturer's accessories of the same material type, pattern, finish and thickness as cable supports.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Protective covers:** Provide to cables requiring mechanical protection.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable ladder and tray:** Submit drawings showing the proposed routes of cable ladder and cable tray.

90-55-10/630 Installing cable basket

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Joints:** Cut adjacent cross basket wires. Make smooth any burrs or edges.
- **Accessories:** Form on site and connect with basket manufacturer's coupling components.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable basket:** Submit drawings showing the proposed routes.

90-55-10/700 Installing conduit, trunking and ducting

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Preparation:** Cut square. Remove burrs and sharp edges to make smooth.
- **Protection of metallic conduit, trunking and ducting:**
  - **Joints and ends:** Remove grease, oil, dirt and rust before applying protective paint. Paint immediately following installation.
  - **Protective paint:**

    Generally: Compatible with conduit, trunking and ducting finish.
- **Cross-sectional area:** Maintain throughout the conduit, trunking and ducting length.
- **Arrangement:** Position vertically and horizontally in line with equipment served, and parallel with building lines.
- **Distance from other services running parallel (minimum):**
  - **Generally:** 150 mm.
- **Drainage of conduit, trunking and ducting:** Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
- **Fire barriers:** Provide to maintain integrity of fire compartments.
- **Rewireable installations:** Enable rewiring from accessible boxes or accessories only.
- **Support:** Independently fix and support conduit, trunking and ducting from building structure.

- **Cleaning:** Clean insides of conduit, trunking and ducting before installing cables.
- **Cabling:** Install when conduit, trunking and ducting enclosure is complete.
- **Submittals:** Submit manufacturer's technical information. Submit drawings showing the proposed routes of conduit, trunking and ducting and the location of service outlets.

90-55-10/710 Installing conduit generally

- **Fixing:** Fix securely. Fix boxes independently of conduit.
- **Changes of direction:** Conduit boxes or bends site formed by machine. Do not use elbows, tees or inspection bends.
- **Joints:**
  - **Generally:** Manufacturer's jointing fittings.
  - **Number of joints:** Minimize.
  - **Lengths of conduit:** Maximize.
  - **Open ends:** Plug.
  - **At movement joints in structure:** Manufactured expansion coupling. Install adaptable boxes on both sides of joint at a maximum distance of 300 mm.
- **Connections to boxes, trunking, equipment and accessories:** Screwed couplings with rubber bushes at open ends.
- **Conduit boxes:**
  - **Generally:** Install flush with finished surfaces. Provide extension rings if required.
  - **Fixing screws:** Countersunk, or round-headed screws.
  - **Number of fixings (minimum):** Two.
  - **Lids:** Fasten with brass slot pan head screws.
- **Rear outlet boxes:** Locate where surface conduits pass through walls to external equipment.
- **Draw-in boxes:**
  - **Spacing (maximum):** 10 m.
  - **Number of bends between draw-in boxes (maximum):** Two.
  - **Floors:** Do not install draw-in boxes in floors.
- **Suspended ceiling installations:** Fasten outlet boxes to structure above ceiling.

90-55-10/720 Installing rigid metallic conduit

- **General requirements:** 90-55-10/710 Installing conduit generally and 90-55-10/700 Installing conduit, trunking and ducting.
- **Threaded conduits:** Tightly screw to ensure electrical continuity, with no thread showing.
- **Conduit connections to boxes and items of equipment, other than those with threaded entries:** Earthing coupling with male brass bush and protective conductor.

90-55-10/740 Installing trunking generally

- **Changes of direction:** Manufacturer's bends and tees.
- **Joints:**
  - **Generally:** Manufacturer's jointing fittings. Maintain rigidity of trunking across joint.
  - **Number of joints:** Minimize.

- **Lengths of trunking:** Maximize.
- **Open ends:** Blank using manufacturer's removable end caps.
- **Metal edging:** Protect with PVC edging strip.
- **Electrical continuity:** Maintain at each joint with a copper link fitted on the outside of the trunking.

- **Connections to conduit, boxes, equipment and accessories:** Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.
- **Connections to trunking covers:** Minimize.
- **Electrical continuity of covers:** Electrically continuous with the trunking or provide protective conductors.
- **Access:** Provide space around trunking to permit access for installing and maintaining cables. Set out access with covers on a continuous face to allow cabling to be laid in throughout its entire length.
- **Trunking passing through building fabric openings:** Provide fixed trunking covers. Extend covers 50 mm from both sides of the opening.
- **Cable retaining straps:** Required except when trunking cover is on top.

90-55-15/635 Installing low voltage cables

Shared by: 90-55-15/330 Fire resistant screened (LSHF) cables; 90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation; 90-55-15/346 Single core non-sheathed cables with LSHF insulation; and 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Standard:** In accordance with BS 7671.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
  Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
  - **Final circuit cables:** At electrical accessories only.
  - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
  - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/680 Installing low voltage armoured cables type A

Shared by: 90-55-15/322 Thermosetting insulated and PVC sheathed armoured cables; and 90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables.

- **General requirements:** 90-55-15/685 Jointing and terminating low voltage armoured cables and 90-55-15/635 Installing low voltage cables.
- **Earthing:** Bond armour to equipment and main earthing system.
- **Connections to apparatus:** Moisture proof, sealed glands and shrouds.

90-55-15/680 Installing low voltage armoured cables type B

- **General requirements:** 90-55-15/685 Jointing and terminating low voltage armoured cables and 90-55-15/635 Installing low voltage cables.
- **Earthing:** Bond armour to equipment and main earthing system.
- **Connections to apparatus:** Moisture proof, sealed glands and shrouds.

90-55-15/685 Jointing and terminating low voltage armoured cables

Shared by: 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Preparation:**
  - **Cable ends:** Cut immediately before jointing or terminating.
  - **Cables left unconnected for more than 24 h:** Seal to prevent moisture ingress.
- **Cable stripping:**
  - **Length of exposed cores and conductors:** Minimize. Leave no exposed conductor after termination.
  - **Strands:** Do not damage when stripping cable cores. Twist together. Do not reduce number. Secure at terminations.
- **Joints and terminations:** Use qualified cable jointers, using jointing materials, components and installation techniques recommended by the cable manufacturer and the jointing accessory manufacturer.
- **Tooling certificate:** Submit before installing connectors.
- **Cable glands:** To BS EN 62444 and fitted with shroud.
- **Cold pour resin and heat shrink joints:** To BS EN 50393.
- **Insulating tape:** To BS EN 60454-1.
- **Plastics sheathed cables:** Seal with proprietary shrink-on end caps.
- **Bolted terminal connections to equipment and switchgear without integral cable clamping terminals:** Compression type lugs, of correct bore.
- **Compression joints:** Provide in accordance with BS 7609.
- **Conductor labelling:** Identify cable conductor cores at each end of cable and at joints.
- **Unused cable cores:** Connect to earth.

System completion

70-70-75/820 Documentation

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

- **Content:** For all low voltage final circuits, the cable origin, circuit designation, route, loading, conductor material and c.s.a, insulation type and colour, number of cores per cable, number of cables in trunking and conduit and Location of LV switchgear including distribution boards.
- **Format:** A1 paper print drawing and Electronic drawing.
- **Number of copies:** Two.

- **Submittal date:** At handover.

Ω End of system

70-80-25/120 Amenity lighting system

System outline

70-80-25/120 Amenity lighting system

- **Description:** The contractor shall install a new wall mounted external lighting installation around the perimetre of the new extension as detailed within IW design drawings and schedules.

  External lighting shall meet the reuqiremnts of BS EN 12464-2, CIBSE Guidance including the requirements of ILP Obtrusive light.

  The external lighting shall be operated by a photocell, contactor and timer control arrangement installed adjacent to the new extension distribution board.

  The control shall allow for all control circuit cabling for the external lightin controls served from the new extension distribution board.

  All external distribution shall be carried out via steel galvanised conduit.

  Note: Existing lighting circuit will need to be removed where affected by extension proposals
- **System performance:** 70-80-25/220 Amenity lighting design and 70-80-25/250 Lighting performance.
- **System manufacturer:** As per IW schedules
- **Final circuit cabling:** 90-55-15/322 Thermosetting insulated and PVC sheathed armoured cables and 90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation.
- **Containment:** 90-55-10/380 Rigid conduit.
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Luminaires:** As per IW schedule
- **Lamp types:** LED
- **Execution:** 70-80-25/610 Removing external lighting systems and 70-80-25/620 Installing roadway and amenity lighting systems generally.
- **System completion:**

System performance

70-80-25/220 Amenity lighting design

- **Design:** Complete the design of the amenity lighting system.
- **Standards:** In accordance with Guidance notes for the reduction of obtrusive light GN01 and To BS 5489-1 . & BS EN 12464-2

Products

90-55-10/380 Rigid conduit

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-25/120 Amenity lighting system.

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS EN 61386-1 and BS EN 61386-21.
- **Mechanical properties:**
  - **Resistance to impact:** Very heavy.
- **Transport, installation and application:**
- **Resistance to bending:** Rigid.
- **Electrical characteristics:** With electrical continuity properties.
- **Resistance to external influences:**
  - **Protection against ingress of solid objects (minimum):** To BS EN 60529, IP3X.
  - **Protection against ingress of water (minimum):** To BS EN 60529, IPX0.
- **Sizes (OD):** 20 mm and 32 mm.
- **Execution:** 90-55-10/720 Installing rigid metallic conduit.

90-55-15/322 Thermosetting insulated and PVC sheathed armoured cables

- **Manufacturer:** Batt Cables
- **Standard:** To BS 5467.
- **Third party certification:**
- **Sheath colour:** Black.
- **Execution:** 90-55-15/680 Installing low voltage armoured cables type A.

90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation

- **Manufacturer:** Batt Cables
- **Standards:** To BS EN 50525-1 and BS EN 50525-2-31.
- **Size:** 1.5mm minimum
- **Execution:** 90-55-15/635 Installing low voltage cables.

Execution

70-80-25/610 Removing external lighting systems

70-80-25/620 Installing roadway and amenity lighting systems generally

90-55-10/700 Installing conduit, trunking and ducting

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Preparation:** Cut square. Remove burrs and sharp edges to make smooth.
- **Protection of metallic conduit, trunking and ducting:**
  - **Joints and ends:** Remove grease, oil, dirt and rust before applying protective paint. Paint immediately following installation.
  - **Protective paint:**

    Generally: Compatible with conduit, trunking and ducting finish.
- **Cross-sectional area:** Maintain throughout the conduit, trunking and ducting length.
- **Arrangement:** Position vertically and horizontally in line with equipment served, and parallel with building lines.
- **Distance from other services running parallel (minimum):**
  - **Generally:** 150 mm.
- **Drainage of conduit, trunking and ducting:** Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
- **Fire barriers:** Provide to maintain integrity of fire compartments.
- **Rewireable installations:** Enable rewiring from accessible boxes or accessories only.
- **Support:** Independently fix and support conduit, trunking and ducting from building structure.
- **Cleaning:** Clean insides of conduit, trunking and ducting before installing cables.
- **Cabling:** Install when conduit, trunking and ducting enclosure is complete.
- **Submittals:** Submit manufacturer's technical information. Submit drawings showing the proposed routes of conduit, trunking and ducting and the location of service outlets.

90-55-10/710 Installing conduit generally

- **Fixing:** Fix securely. Fix boxes independently of conduit.
- **Changes of direction:** Conduit boxes or bends site formed by machine. Do not use elbows, tees or inspection bends.
- **Joints:**
  - **Generally:** Manufacturer's jointing fittings.
  - **Number of joints:** Minimize.
  - **Lengths of conduit:** Maximize.
  - **Open ends:** Plug.
  - **At movement joints in structure:** Manufactured expansion coupling. Install adaptable boxes on both sides of joint at a maximum distance of 300 mm.
- **Connections to boxes, trunking, equipment and accessories:** Screwed couplings with rubber bushes at open ends.
- **Conduit boxes:**
  - **Generally:** Install flush with finished surfaces. Provide extension rings if required.
  - **Fixing screws:** Countersunk, or round-headed screws.
  - **Number of fixings (minimum):** Two.
  - **Lids:** Fasten with brass slot pan head screws.

- **Rear outlet boxes:** Locate where surface conduits pass through walls to external equipment.
- **Draw-in boxes:**
  - **Spacing (maximum):** 10 m.
  - **Number of bends between draw-in boxes (maximum):** Two.
  - **Floors:** Do not install draw-in boxes in floors.
- **Suspended ceiling installations:** Fasten outlet boxes to structure above ceiling.

90-55-10/720 Installing rigid metallic conduit

- **General requirements:** 90-55-10/710 Installing conduit generally and 90-55-10/700 Installing conduit, trunking and ducting.
- **Threaded conduits:** Tightly screw to ensure electrical continuity, with no thread showing.
- **Conduit connections to boxes and items of equipment, other than those with threaded entries:** Earthing coupling with male brass bush and protective conductor.

90-55-15/635 Installing low voltage cables

Shared by: 90-55-15/330 Fire resistant screened (LSHF) cables; 90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation; 90-55-15/346 Single core non-sheathed cables with LSHF insulation; and 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Standard:** In accordance with BS 7671.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
  Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
  - **Final circuit cables:** At electrical accessories only.
  - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
  - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/680 Installing low voltage armoured cables type A

Shared by: 90-55-15/322 Thermosetting insulated and PVC sheathed armoured cables; and 90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables.

- **General requirements:** 90-55-15/685 Jointing and terminating low voltage armoured cables and 90-55-15/635 Installing low voltage cables.
- **Earthing:** Bond armour to equipment and main earthing system.
- **Connections to apparatus:** Moisture proof, sealed glands and shrouds.

90-55-15/685 Jointing and terminating low voltage armoured cables

Shared by: 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Preparation:**
  - **Cable ends:** Cut immediately before jointing or terminating.
  - **Cables left unconnected for more than 24 h:** Seal to prevent moisture ingress.
- **Cable stripping:**
  - **Length of exposed cores and conductors:** Minimize. Leave no exposed conductor after termination.
  - **Strands:** Do not damage when stripping cable cores. Twist together. Do not reduce number. Secure at terminations.
- **Joints and terminations:** Use qualified cable jointers, using jointing materials, components and installation techniques recommended by the cable manufacturer and the jointing accessory manufacturer.
- **Tooling certificate:** Submit before installing connectors.
- **Cable glands:** To BS EN 62444 and fitted with shroud.
- **Cold pour resin and heat shrink joints:** To BS EN 50393.
- **Insulating tape:** To BS EN 60454-1.
- **Plastics sheathed cables:** Seal with proprietary shrink-on end caps.
- **Bolted terminal connections to equipment and switchgear without integral cable clamping terminals:** Compression type lugs, of correct bore.
- **Compression joints:** Provide in accordance with BS 7609.
- **Conductor labelling:** Identify cable conductor cores at each end of cable and at joints.
- **Unused cable cores:** Connect to earth.

Ω End of system

70-80-35/110 Hard wired general lighting system

System outline

70-80-35/110 Hard wired general lighting system

- **Description:** The Community Centre will be provided with a complete artificial lighting installation to all internal areas of the building to the lighting levels identified within the following British and CIBSE Guidance:

  Codes:

  - CIBSE lighting guidance
  - BS 12464

  The contractor shall install energy efficient LED luminaires for all areas throughout the Community Centre as identified within the IW Luminiaire schedule.

  The majority of lighting shall be switched via a combination of presence and absence detection. Manual switching will be provided in plant areas.

  Corridors & Circulation areas shall have circular LED downlighters and will provide general illumination for the circulation areas.

  Luminaires will be aligned centrally throughout the corridors providing an even wash of light and uniformity.

  Emergency illuminated safety signage will be installed to direct the occupants out of the building through the fire escape in accordance with the building fire strategy.

  Emergency exit signage and legends shall direct occupants towards the general direction of escape.

  Emergency lighting shall be installed throughout the communnity Centre as per IW design drawings.

  Means of testing the emergency lighting shall be provided by a grid switches as per IW design drawings.

  Absence and presence detection shall be preset to 20m delay for timer off.
- **System performance:** 70-80-35/210 Design of general lighting systems and 70-80-35/215 Design of emergency lighting systems.
- **Final circuit cabling:** 90-55-15/346 Single core non-sheathed cables with LSHF insulation.
- **Containment:** 90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting.
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Luminaire types:** As per IW schedule
- **Lamp types:** LED
- **Connections to luminaires:**

- **Lighting controls:** As per IW Design and Schedules. Include Scene Setting Controls - Contractors Choice & Submit proposals
- **Execution:** 70-80-35/630 Installing general lighting systems and 70-80-35/640 Installing emergency lighting systems.
- **System completion:** 70-80-35/810 Testing and commissioning of general lighting systems and 70-80-35/812 Testing and commissioning emergency lighting systems.

System performance

70-80-35/210 Design of general lighting systems

- **Design:** Complete the design of the general lighting systems.
- **Standard:** To BS EN 12464-1.
- **Submit the following information:** Luminaire layout drawings.

70-80-35/215 Design of emergency lighting systems

- **System designer:** Contractor's choice.
- **Design:** Complete the design of the emergency lighting and signage systems.
- **Standards:** To BS EN 1838, BS EN 50172 and in accordance with BS 5266-1;
  In accordance with BS 5266-2;
  In accordance with BS 5266-4;
  and In accordance with BS 5266-6.
- **Submit the following information:** Luminaire layout drawings.
- **Emergency lighting classification:**
  - **Duration of emergency mode:** 180 minutes.

Products

90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-35/110 Hard wired general lighting system.

- **Manufacturer:** Swift/Legrand
- **Standards:** To BS EN 50085-1 and BS EN 50085-2-1.
- **Installation position:** Surface mounted on the ceiling or suspended above ceiling
- **Temperature properties:**
- **Electrical properties:** With electrical continuity characteristics.
- **Protection by enclosure:**
  - **Protection against ingress of solid objects (minimum):** To BS EN 60529, IP4X.
  - **Protection against ingress of water (minimum):** To BS EN 60529, IPX1.
  - **Protection against access to hazardous parts (minimum):** To BS EN 60529, IPXXD.
- **Screening:** Required.
- **Sizes:** 100 x 100 mm.

- **Accessories and fittings:**
  - **Generally:** Factory made by the cable trunking or ducting manufacturer and of the same material type and finish as the cable trunking or ducting.
- **Execution:** 90-55-10/740 Installing trunking generally.

90-55-15/346 Single core non-sheathed cables with LSHF insulation

Shared by: 70-70-25/110 Earthing and bonding system; 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 70-80-35/110 Hard wired general lighting system.

- **Manufacturer:** Batt Cables
- **Standards:** To BS EN 50525-1 and BS EN 50525-3-41.
- **Execution:** 90-55-15/635 Installing low voltage cables.

Execution

70-80-35/630 Installing general lighting systems

- **Standard:** In accordance with BS 7671 and CIBSECommissioning Code L.
- **Commissioning method statement:** Submit prior to commissioning.
- **Connection of luminaire supporting couplers:**
  - **General luminaires:** White plug with white cover.
  - **Flex length (maximum):** 3 m.
- **Rooms smaller than 4 m²:** Restrict lighting circuits to one electrical phase.

70-80-35/640 Installing emergency lighting systems

- **Standards:** In accordance with BS 5266-1 and BS 7671.
- **Connection of luminaire supporting couplers:**
  - **Emergency luminaires:** Red plug with red cover.
  - **Flex length (maximum):** 3 m.
- **Permanent electrical supplies to self-contained emergency luminaires:** Derive from the closest general lighting circuit.

90-55-10/740 Installing trunking generally

- **Changes of direction:** Manufacturer's bends and tees.
- **Joints:**
  - **Generally:** Manufacturer's jointing fittings. Maintain rigidity of trunking across joint.
  - **Number of joints:** Minimize.
  - **Lengths of trunking:** Maximize.
  - **Open ends:** Blank using manufacturer's removable end caps.
  - **Metal edging:** Protect with PVC edging strip.
  - **Electrical continuity:** Maintain at each joint with a copper link fitted on the outside of the trunking.
- **Connections to conduit, boxes, equipment and accessories:** Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.

- **Connections to trunking covers:** Minimize.
- **Electrical continuity of covers:** Electrically continuous with the trunking or provide protective conductors.
- **Access:** Provide space around trunking to permit access for installing and maintaining cables. Set out access with covers on a continuous face to allow cabling to be laid in throughout its entire length.
- **Trunking passing through building fabric openings:** Provide fixed trunking covers. Extend covers 50 mm from both sides of the opening.
- **Cable retaining straps:** Required except when trunking cover is on top.

90-55-15/635 Installing low voltage cables

Shared by: 90-55-15/330 Fire resistant screened (LSHF) cables; 90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation; 90-55-15/346 Single core non-sheathed cables with LSHF insulation; and 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Standard:** In accordance with BS 7671.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
  Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
  - **Final circuit cables:** At electrical accessories only.
  - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
  - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

System completion

70-80-35/810 Testing and commissioning of general lighting systems

- **Standards:** In accordance with BS 7671 and CIBSECommissioning Code L.
- **Test results:** Submit two copies of system commissioning completion certificate.
- **Certificates of calibration for meters and instruments:** Submit.

70-80-35/812 Testing and commissioning emergency lighting systems

- **Commissioning:** In accordance with BS 5266-1, Annex H and In accordance with BS 5266-1, Annex I.
- **Results:** Submit two copies of emergency lighting completion certificates, in accordance with BS 5266-1, Annex H, Figures H.1, H.2, H.3, and H.4.

- **Certificates of calibration for meters and instruments:** Submit.

Ω End of system

75-45-20/110 Data distribution system

System outline

75-45-20/110 Data distribution system

- **Description:** The electrical services contractor shall supply, install, test and commission a complete structured cabling installation, including all required equipment such as cabling hardware, termination blocks, data/telecommunication outlets, associated cable patch leads etc, as described in this Specification to ensure a fully working and operational installation to serve the new extension.

  A specialist data cabling sub-contractor shall be employed to design and install further outlet provision.

  The electrical package shall include for the active installation i.e. cables (horizontal and vertical), patch leads, patch panels, cable tidies, cabinets, containment systems, external power supplies, plate terminations (RJ 45 / line jack) etc.

  The contractor shall be responsible for providing data cabinet as required within the office areas for the provison of new data and communication connections including all modification and extensions of existing systems.

  50% spare capacity for racking shall be made available.

  The data distribution system shall consist of a structured data network serving but not limited to the following:

  - Admin / Staff RJ45 data outlets
  - Admin / Staff RJ45 telephone outlets
  - Cafe & Kitchen
  - CCTV camera positions
  - CCTV head end positions
  - CCTV monitor positions
  - WIFI access point locations.

  Cables shall be run on the ancillary services cable basket containment and shall be contained within conduit down to the final accessory positions.

  The bundling of cables on cable trays will be restricted to prevent damage to underlying cables.

  Cable should preferably be loose laid with suitable cable looms at point of access to rack systems.

  Cables shall not be attached to the ceiling grid or lighting support wires. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the client.

  The cabling and final connections shall be carried out by approved and licensed / qualified engineers so as to ensure certification.

A dedicated telephone line shall be provide for:

- Intruder Alarm System
- Fire Alarm - 'Redcare'

The client shall be responsible for ordering all lines as the end user. The contractor shall liaise with the end user to confirm the exact number of lines required and shall include for final connections to all services requiring telephone lines.

- **System performance:** 75-45-20/210 Design of data distribution systems and 75-45-20/240 Telecommunications outlets.
- **Containment:** 90-55-10/325 Cable baskets.& PVC Conduit 20mm- 32mm Contractors choice
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Execution:** 75-45-20/615 System installer;
  75-45-20/625 Installing information technology cabling;
  75-45-20/645 Installing connecting hardware;
  and 75-45-20/660 Connection to the public telephone network.
- **System completion:** 75-45-20/810 Testing and inspection of data distribution systems and 75-45-20/820 Documentation for data distribution systems.

System performance

75-45-20/210 Design of data distribution systems

- **Design:** Complete the design of the data distribution system.
- **Standards:** To BS EN 50173-1;
  To BS EN 50173-2;
  To BS EN 50173-3;
  To BS EN 50173-4;
  To BS EN 50173-5;
  To BS EN 50173-6;
  To BS EN 50174-1;
  To BS EN 50098-1;
  To BS EN 50098-2;
  and In accordance with BS 8492.
- **Requirement:** Submit proposals including detailed design drawings indicating cabinet general arrangement, cabling topology schematics, distribution point layouts, equipment room layout, interconnection diagrams and work area layout drawings. Include technical information, calculations and manufacturers' literature.

75-45-20/240 Telecommunications outlets

- **Requirements:** Contractor's choice.

Products

90-55-10/325 Cable baskets

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; 75-45-20/110 Data distribution system; 75-60-10/110 CCTV system; 75-60-40/110 Intrusion and hold-up alarm system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.
- **Sizes:**
  - **Width:** Minimum 100mm for all service types (25% spare capacity)
- **Features:**
  - **Segregation:** Cable dividers.
- **Execution:** 90-55-10/630 Installing cable basket.

Execution

75-45-20/615 System installer

- **Registration:** Corporate member of the Telecommunications Industry Association (TIA).
- **Evidence of registration:** Submit.

75-45-20/625 Installing information technology cabling

- **Standards:**
  - **Generally:** To BS 6701, BS EN 50174-1 and in accordance with BS 7671 and BS 8492.
  - **Indoor installations:** To BS EN 50174-2.
  - **Outdoor installations:** To BS EN 50174-3.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Cables:** Install in one uninterrupted run.
- **Arrangement:** Position vertically and horizontally in line with equipment served, and parallel with building lines.
- **Orientation:** Dress cables flat, free from twists, kinks and strain. Optical fibre cables to be run parallel to, or on top of, copper cables.
- **Cable pulling:** Do not overstress.
- **Cable binders:**
  - **Spacing (minimum):** Where used to tie multiple cables together, irregularly space with maximum distance on horizontal cabling runs of 1000 mm and on vertical runs of 300 mm. All cable binders to be loosely fitted.
- **Jointing:** At equipment and terminal fittings only.
- **External cabling:** Terminate within 2 m of entrance to building.
- **Cables routes generally:**

- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Exposed cable runs:** Submit proposals.

- **Cable segregation:**
  - **Cables from other systems:** Segregate from other cabling and cross at right angles. Where installed in trunking, locate in a dedicated telecommunications compartment.
  - **Distance from other cables:** To BS EN 50174-2 and BS EN 50174-3.
  - **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.

75-45-20/645 Installing connecting hardware

- **Connecting hardware:** Consistent throughout system.

75-45-20/660 Connection to the public telephone network

- **Public telephone network:** Connect to the main telecommunication cabinet.
- **Cable type:** BT specification CW1308.

90-55-10/630 Installing cable basket

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Joints:** Cut adjacent cross basket wires. Make smooth any burrs or edges.
- **Accessories:** Form on site and connect with basket manufacturer’s coupling components.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable basket:** Submit drawings showing the proposed routes.

System completion

75-45-20/810 Testing and inspection of data distribution systems

- **Standards:** To BS EN 50173-1.
- **Testing and inspection agent:** Contractor's choice.
- **Notice before commencing tests (minimum):** 24 h.
- **Inspection of cabling:** Inspect cables for kinks, bends, snags and compression and deformation damage.
- **Permanent link:** Measure length of each cabling segment (connector to connector).
- **Pin assignment and continuity:** Verify and submit results.
- **Cable temperature during testing:** Submit.
- **Results:** Submit in accordance with BS EN 50346, Annex A.
- **Certificates of calibration for meters and instruments:** Submit.

75-45-20/820 Documentation for data distribution systems

- **Standard:** To BS EN 50174-1.
- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Paper copy.
  - **Number of copies:** Two.
- **Record drawings:**
  - **Content:** Route of incoming connection cable to the public telephone network from point of entry into building and PABX;
    For all data cabling, the cable origin, circuit designation, route, conductor material and c.s.a., insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder; and General arrangement drawings.
  - **Format:** A1 paper print drawing and Electronic drawing.
  - **Number of copies:** Two.
- **System warranty:** Submit.
- **Submittal date:** At handover.
- **Cabling topology schematics:**
  - **Location:** Contractor's choice.
  - **Format:** Laminated A1 size paper print.
  - **Installation:** Wall mounted with cup and screw fixings.

Ω End of system

75-45-40/110 Audio-frequency-induction-loop system

System outline

75-45-40/110 Audio-frequency-induction-loop system

- **Description:** An induction loop hearing system with amplifier will be installed within the function room behind the Bar.

  The system will comprise of a loop amplifier, loop pad and microphone.

  Power supplies shall be provided at the loop amplifier position.

  The induction loop shall be complete with a loop advisory sticker to be positioned adjacent to the counter loop system on the public side of the counter/point.

  All equipment will meet the requirements of RNID and will be compatible with hearing aids incorporating 'T' switches. The systems will be fully compliant with BS 7594 and BS EN 60118-4.
- **System performance:** 75-45-40/210 Design of induction loop systems.
- **System manufacturer:** Contractor's choice.
- **Source equipment:** Contractor's design.
- **Distribution equipment:** Contractor's design.
- **Equipment interconnectivity:** Wired.
- **Loop cabling:**
  - **Loop arrangement:** Single loop and Multiple loops.
  - **Rewireable installation:** Required.
  - **Concealed installation:** Required.
- **Execution:** 75-45-40/630 Installing induction-loop systems generally.
- **System completion:** 75-45-40/810 Testing and commissioning induction-loop systems generally and 75-45-40/820 Documentation.

System performance

75-45-40/210 Design of induction loop systems

- **Design:** Complete the design of the induction-loop system.
- **Qualifications of designer:** Member of the Institute of Sound and Communications Engineers and Member of the Professional Lighting and Sound Association Ltd (PLASA).
- **Standard:** In accordance with BS 7594, class A3.
- **System design certificate:** Submit with design proposals.

Execution

75-45-40/630 Installing induction-loop systems generally

- **Installation:** In accordance with BS 7594 and BS 7671.
- **Equipment interconnectivity:** All components of the induction loop system to be derived from the same electrical phase.

System completion

75-45-40/810 Testing and commissioning induction-loop systems generally

- **Standard:** In accordance with BS 7594.
- **System commissioning agent:** System manufacturer.
- **Notice before commencing tests (minimum):** Two weeks.
- **System commissioning:**
  - **Magnetic field strength:** Measure.
  - **Speech transmission index value (minimum):** Measure in accordance with BS EN 60268-16.
- **Cable testing:** Measure the insulation resistance between conductors, between each conductor and earth, and between each conductor and any screen. Measure the continuity of loop cable, and earth continuity.
- **Loop circuit:** Measure the d.c. resistance.
- **Test results:** Submit at handover.

75-45-40/820 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Paper copy.
  - **Number of copies:** Two.
- **Logbook:** Submit one copy in accordance with BS 7594, Section 6, clause 27.
- **Record drawings:**
  - **Content:** General arrangement drawings showing the location of distribution equipment including equalizers, induction loop amplifiers or induction loop transformers, the type, c.s.a. and route of all induction loop cables, the position of induction loop pads, microphones and reassurance indicators or visual alarm signal devices.
  - **Format:** A1 paper print drawing and Electronic drawing.
  - **Number of copies:** Two.
- **Submittal date:** At handover.
- **Certification:**

- **Design certificate:** Submit two copies in accordance with BS 7594, Annex D.1.
- **Installation certificate:** Submit two copies in accordance with BS 7594, Annex D.2.
- **Commissioning certificate:** Submit two copies in accordance with BS 7594, Annex D.3.

Ω End of system

75-45-85/110 Telecommunications system

System outline

75-45-85/110 Telecommunications system

- **Description:** The contractor shall liaise with BT for the provision of further connection as required for the intruder alarm system and fire detection.

  Existing Communications and netwrok facilities within the Community Centre shall be extended to serve the new extension - See IW design drawings for Co-ordination
- **System performance:**
- **System manufacturer:**
- **Type of system:**
- **Method of operation:**
- **Control software:**
- **System components:**
- **Cable type:**
- **Containment:**
- **Containment accessories:**
- **Concealed installation:** Required.
- **Rewireable installation:** Required.
- **System accessories:**
- **Execution:**
- **System completion:**

Ω End of system

75-60-10/110 CCTV system

System outline

75-60-10/110 CCTV system

- **Description:** The electrical contractor shall supply and install a complete and new CCTV installation.

  Note: Provision shall be allowed fro future connections ot be added.

  The electrical contractor shall supply and install the structured cabling installation.

  The electrical contractor shall employ specialist security service sub-contractors to design, supply install test and commission the CCTV installations including, cameras, head end equipment and monitoring / storage.

  The new CCTV System shall comprise 1 No. monitor to be located in the office area.

  All CCTV associated distribution, digital recording equipment and storage shall also be housed in a data hub/server rack.

  The system shall be provided with a minimum of 30% additional spare capacity to add more cameras at a later date.

  The system shall be capable of storing 14 days worth of recording at a rate of 25 frames per second.

  The CCTV cameras shall have in-built motion detection so recording is only carried out while movement is detected within the field of view of the camera.

  The quality of the recorded images shall be to evidential quality to allow a successful prosecution in compliance with HMSO standards.

  Generally, the system shall comprise of the following:-
  - CCTV camera positions as indicated on the drawings.
  - Each camera shall be colour minimum 3MP HD
  - Digital multiplexing shall be provided as necessary.
  - Power supplies as necessary shall be provided for the equipment in the form of unswitched fused connection units shall be provided adjacent to each camera.

  It is intended to utilise the latest IP technology for transmission of the CCTV signals via the Cat 6 cabling installation.

  All CCTV cameras shall be POE. The electrical contractor shall supply a number of POE switches suitable for use with the CCTV installation and with adequate ports/load capability to support the new CCTV installation and an allowance of 30% spare for future additional CCTV cameras to be installed.

The system shall also include the facility to be accessed via the IP network to allow password authenticated and authorised users to access the CCTV images on PCs installed with the correct software.

Initially the contractor shall supply 3 No. Licences (where required) to be handed to the client for deployment as necessary.

- **System performance:** 75-60-10/210 Design of CCTV systems and 75-60-10/212 Operational requirements .
- **System manufacturer:** Submit proposals.
- **Automatic activation of cameras:** 90-75-40/345 Passive infrared detectors.
- **Surveillance equipment:** Submit proposals.
- **Control equipment:** 90-75-10/395 CCTV monitors.
- **Data storage:** 90-75-10/370 Digital video recorders.
- **Containment:** 90-55-10/325 Cable baskets & PVC Conduit 20mm- 32mm Contractors choice
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Execution:** 75-60-10/620 Installing closed circuit television systems.
- **System completion:** 75-60-10/810 Closed circuit television system testing and commissioning;
  75-60-10/850 Training;
  and 75-60-10/820 Documentation.

System performance

75-60-10/210 Design of CCTV systems

- **Design:** Complete the design of the CCTV system.
- **Standards:** In accordance with BS 8418 and In accordance with BS EN 62676-4.
- **Security grading:** To BS EN 62676-1-1, Grade 3.
- **Requirement:** Submit proposals, including positions of cameras (including field of view), detectors (including range and coverage), areas designated for parking, control rooms, power supplies and interconnections. Include technical information, calculations and manufacturers' literature.

75-60-10/212 Operational requirements

- **Standard:** In accordance with BS EN 62676-4.
- **Objectives:** Anti-social behaviour;
  Public safety;
  Property protection;
  and Site surveillance.
- **Area under surveillance:** External
- **Picture performance:** Submit proposals.
- **Period of operation:** 24hr
- **Resilience:** High
- **Image monitoring:**

- **Image storage:** Harddisk
- **Training:** Provided to all staff
- **Future expansion:** Required - full site coverage

Products

90-55-10/325 Cable baskets

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; 75-45-20/110 Data distribution system; 75-60-10/110 CCTV system; 75-60-40/110 Intrusion and hold-up alarm system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.
- **Sizes:**
  - **Width:** Minimum 100mm for all service types (25% spare capacity)
- **Features:**
  - **Segregation:** Cable dividers.
- **Execution:** 90-55-10/630 Installing cable basket.

90-75-10/370 Digital video recorders

- **Manufacturer:** Submit proposals.
- **Video system:** Manufacturer's standard.
- **Digital watermarking:** Apply at point of recording and include time and date.
- **Playback function:** Fast forward x2, x8, x16, x32;
  Fast reverse x2, x8, x16, x32;
  Frame by frame;
  and Slow motion x1/2, x1/4.
- **Alarms:** Manufacturer's standard.
- **Display resolution (minimum):** Submit proposals.
- **Storage media:**
  - **Type:** Hard disk.
- **Network connectivity:** 10/100 base T via RJ45.
- **Power supply:** 230 V a.c.
- **Mounting:** Rack.
- **Execution:** 90-75-10/650 Installing video recorders.

90-75-10/395 CCTV monitors

- **Manufacturer:** Submit proposals.
- **Third party certification:** BEAB.
- **Monitor type:** Liquid crystal display (LCD).
- **Response time (maximum):** 5 ms.
- **Mounting:** Desk and Wall.

- **Accessories:** Manufacturer's standard.
- **Execution:** 90-75-10/640 Installing CCTV monitors.

Execution

75-60-10/620 Installing closed circuit television systems

- **Standard:** In accordance with BS 8418 and In accordance with BS EN 62676-4.
- **Site survey:** Assess the site conditions and available artificial light.
- **Access:** Locate system to provide safe access for maintenance and testing.

90-55-10/630 Installing cable basket

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Joints:** Cut adjacent cross basket wires. Make smooth any burrs or edges.
- **Accessories:** Form on site and connect with basket manufacturer's coupling components.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable basket:** Submit drawings showing the proposed routes.

90-75-10/640 Installing CCTV monitors

- **Security:** Protect from interference by unauthorized individuals.
- **Monitor data and video connections:** Complete.

90-75-10/650 Installing video recorders

- **Security:** Protect from interference by unauthorized individuals.
- **Digital video recorder data and video connections:** Complete.

System completion

75-60-10/810 Closed circuit television system testing and commissioning

- **Standard:** To BS EN 62676-4.
- **Notice before commencing tests (minimum):** 24hr
- **Cable testing:**
  - **Insulation resistance:** Submit results.
  - **Earth continuity:** Submit results.
- **Camera coverage:** Adjust to obtain optimal performance with normal and infrared illumination.
- **Infrared illuminators:** Accurately adjust to suit angle of associated cameras.
- **Pan and tilt units:** Check accuracy of pre-set positions and demonstrate movement covers whole of relevant surveillance area.

- **Alarm and motion detection devices:** Verify the operation, and adjust to provide maximum coverage.
- **Image storage time:** Confirm.
- **Live and recorded images:** Demonstrate from each camera and provide digital copies for reference purposes.

75-60-10/820 Documentation

- **Standard:** In accordance with BS EN 62676-1-1.
- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Paper copy.
  - **Number of copies:** Two.
- **Secure recording area logbook:** Hard back cover embossed 'CCTV LOGBOOK' with A4 lined paper, minimum 100 pages.
- **Number of copies:** Two.
- **Record drawings:**
  - **Content:** General arrangement drawings showing the location of all control equipment, including receivers, transmitters, recorders, cameras, monitors, and associated power supply and For all control cabling, the cable origin, circuit designation, route from control equipment to receivers, transmitters, recorders, cameras, and monitors. Include conductor material and c.s.a., insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder.
  - **Format:** A1 paper print drawing and Electronic drawing.
  - **Number of copies:** Two.
- **Submittal date:** At handover.

75-60-10/850 Training

- **Operator training:**
  - **Training provider:** System supplier.
  - **Training period:** 1 day

Ω End of system

75-60-40/110 Intrusion and hold-up alarm system

System outline

75-60-40/110 Intrusion and hold-up alarm system

- **Description:** The contractor shall employ a specialist sub-contractor to supply and design a new intruder alarm system for installation throughout the Community Centre.

  The intruder alarm system shall be a 'stand-alone' intruder alarm system pending client/employers approval and detection shall extend throughout the Community Centre.

  Note: The preferred supplier is Chubb.

  Provision for the connection to BT red-care is to be made available for automatic emergency calls- subject to client approval.

  An unswitched fused connection unit is to be installed for power including a data outlet for connections to the building data and communication systems.

  A dedicated LV power supply shall be provided and design by the contractor from existing distribution boards to serve the intruder alarm system.
- **System performance:** 75-60-40/210 Design of intrusion and hold-up alarm systems and 75-60-40/238 Integration with other alarm and security systems.
- **System manufacturer:** Chubb/ADT
- **Control and indicating equipment (CIE):** 90-75-40/305 Intrusion and hold-up alarm panels.
- **Detectors:** 90-75-40/330 Combined passive infrared and microwave detectors.
- **Containment:** 90-55-10/325 Cable baskets.
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Execution:** 75-60-40/620 Installing intrusion and hold-up alarm systems.
- **System completion:** 75-60-40/810 Testing and commissioning intrusion and hold-up alarms systems and 75-60-40/820 Documentation.

System performance

75-60-40/210 Design of intrusion and hold-up alarm systems

- **Design:** Complete the design of the intrusion and hold-up alarm system.
- **Standard:** In accordance with PD 6662.
- **Power supply:** Contractor's choice.
- **Confirmation of alarm condition:**
  - **Standard:** In accordance with BS 8243.

- **Requirement:** Submit proposals In accordance with DD CLC/TS 50131-7, Annex G.

75-60-40/238 Integration with other alarm and security systems

- **Systems to be integrated:** Firer Alarm

Products

90-55-10/325 Cable baskets

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; 75-45-20/110 Data distribution system; 75-60-10/110 CCTV system; 75-60-40/110 Intrusion and hold-up alarm system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.
- **Sizes:**
  - **Width:** Minimum 100mm for all service types (25% spare capacity)
- **Features:**
  - **Segregation:** Cable dividers.
- **Execution:** 90-55-10/630 Installing cable basket.

90-75-40/305 Intrusion and hold-up alarm panels

- **Manufacturer:** Chubb/ADT
- **Standard:** To BS EN 50131-3 and BS EN 50131-6.
- **Security grading:**
- **Execution:** 90-75-40/605 Installing intrusion and hold-up alarm control and indicating equipment.

90-75-40/330 Combined passive infrared and microwave detectors

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 50131-2-4.
- **Mounting:** Wall.
- **Features:** Manufacturer's standard.
- **Execution:** 90-75-40/630 Installing combined passive infrared and microwave detectors.

Execution

75-60-40/620 Installing intrusion and hold-up alarm systems

- **Standards:** To DD CLC/TS 50131-7.

90-55-10/630 Installing cable basket

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Joints:** Cut adjacent cross basket wires. Make smooth any burrs or edges.

- **Accessories:** Form on site and connect with basket manufacturer's coupling components.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable basket:** Submit drawings showing the proposed routes.

90-75-40/605 Installing intrusion and hold-up alarm control and indicating equipment

- **Standard:** In accordance with DD CLC/TS 50131-7.
- **Position:**
- **Fixing equipment:** Fix independently of wiring installation with zinc electroplated fasteners.
- **Orientation:** Accurate and square to vertical and horizontal axes. Align control panels with adjacent items of switchgear and accessories on the same horizontal axis.
- **Main power supply:** From an unswitched fused connection unit. Permanently wire with a dedicated circuit from the building's main low voltage switchboard.

90-75-40/630 Installing combined passive infrared and microwave detectors

- **Mounting:** Surface mounted.

System completion

75-60-40/810 Testing and commissioning intrusion and hold-up alarms systems

- **Standard:** To DD CLC/TS 50131-7.
- **Cable testing:**
  - **Insulation resistance:** Submit results.
  - **Earth continuity:** Submit results.
- **Charger:** Verify operation.
- **Detection devices:** Verify the operation, and adjust to provide maximum coverage.
- **Device voltage:** Submit details of the voltage at powered devices.
- **Local warning devices:** Verify operation.
- **Remote signalling:** Verify operation.
- **Standby supply:** Verify operation in the event of a mains failure. Check capacity and submit results.
- **Tamper detection:** Verify operation.
- **Timers:** Set up and adjust entry and exit timers.
- **User codes:** Set up and commission.

75-60-40/820 Documentation

- **Standard:** To DD CLC/TS 50131-7.
- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.

- **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
- **Format:** Paper copy.
- **Number of copies:** Two.

- **Logbook:** Hardback cover embossed 'INTRUDER AND HOLD-UP ALARM SYSTEM LOGBOOK' with A4 lined paper, minimum 100 pages.
- **Number of copies:** Two.
- **Record drawings:**
  - **Content:** General arrangement drawings showing the location of all control and indicating equipment, remote key pads, detectors, sounders, visual indicators, protective switches and any associated power supply and For all control cabling, the cable origin, circuit designation, route from control and indicating equipment to detectors, sounders, keypads, and protective switches. Include conductor material and c.s.a., insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder.
  - **Format:** A1 paper print drawing and Electronic drawing.
  - **Number of copies:** Two.
- **Submittal date:** At handover.

Ω End of system

75-65-30/110 Fire detection and alarm systems in non-domestic premises

System outline

75-65-30/110 Fire detection and alarm systems in non-domestic premises

- **Description:** The electrical services contractor shall install a new fire alarm system throughout to an L1 standard.

  Any existing detection provision shall be decommissioned and removed. Existing fire alarm interfaces and services shall be re-directed to the new panel for adoption.

  A new 'Gent' fire alarm system will be installed throughout to replace any existing provision. The new system will provide a complete and comprehensive fire detection and alarm system.

  Note: Refer to Fire Engineers Strategy Report for co-ordiantion.

  The electrical services contractor shall employ the services of a specialist sub-contractor, to undertake commissioning of the fire detection and alarm installation upon completion of the works.

  The contractor shall allow for all interface unit connections and devices including associated power supplies required for life safety and protective measures such a the Cafe & Kitchen Fire Curtains.

  The new fire alarm panel shall be located at the main entrance and will be provide with a 'Red-Care' BT telecommunications line.

  The Fire Alarm system shall be designed in accordance with the requirements of BS5839-1 including amendments with Type L1 coverage, and BS EN 54-3 and BS EN 54-2.

  The system shall be agreed with the Building Control Officer and Fire Officer.

  The Fire Alarm system shall comprise the following components as a minimum:

  - Automatic detection by smoke, heat and/or dual detectors.
  - Manual Call Points.
  - Electronic sounders / visual indicators.
  - Fire alarm interfaces with mechanical plant, access control system and lifts etc.
  - Remote monitoring.
  - 'Redcare' or similar connection.

  The Contractor shall install loop isolators after every 20 devices.

  The electrical services contractor and his specialist subcontractor shall determine where voids in excess of 800mm depth occur detection is provided in accordance with BS 5839.

  The electrical services contractor shall make due allowance for demonstration of and

client end user training of the fire alarm system on a separate agreed date following the commissioning of the systems and prior to handover of the installation.

- **System performance:** 75-65-30/210 Design of fire detection and alarm systems in non-domestic premises and 75-65-30/230 Performance of fire detection and alarm systems.
- **System manufacturer:** Gent
- **System type:** Addressable.
- **Detection devices:**
  - **Types:** 90-75-30/331 Combined smoke and heat multi-sensor detectors and 90-75-30/330 Manual call points.
- **Equipment interconnectivity:** 90-55-15/330 Fire resistant screened (LSHF) cables.
- **Cable containment:** 90-55-10/325 Cable baskets or clipped direct
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **External alarms:** To alarm receiving centre (ARC);
  90-75-30/360 Sounders;
  and 90-75-30/415 Visual alarm signal devices.
- **Execution:** 75-65-30/605 Removing fire detection and alarm systems;
  75-65-30/615 Modifying existing fire detection and alarm systems in non-domestic premises;
  75-65-30/610 Installing fire detection and alarm systems in non-domestic premises;
  75-65-30/630 Installing cabling for fire detection and alarm systems in non-domestic premises;
  and 75-65-30/695 Installing interfaces to other equipment and systems.
- **System completion:** 75-65-30/805 System information;
  75-65-30/806 Device identification and testing;
  75-65-30/807 Standby battery testing;
  75-65-30/808 System soak testing;
  and 75-65-30/809 Measurement of sound pressure levels.

System performance

75-65-30/210 Design of fire detection and alarm systems in non-domestic premises

- **System designer:** System manufacturer.
- **Standards:** Complete the design of the fire detection and alarm system in accordance with BS 5839-1;
  Complete the design of the fire detection and alarm system in accordance with BS 5839-1 and HTM 05-03, Part B;
  and Complete the design of the fire detection and alarm system in accordance with BS 5839-1 and BS 6266.
- **Category:** L1.
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
- **System design certificate:** Submit with design proposals.

75-65-30/230 Performance of fire detection and alarm systems

- **Spare system capacity:** 10% of installed detection devices;

10% of installed alarm devices;
and 10% loop loading.

Products

90-55-10/325 Cable baskets

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; 75-45-20/110 Data distribution system; 75-60-10/110 CCTV system; 75-60-40/110 Intrusion and hold-up alarm system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Swift/Legrand
- **Standard:** To BS EN 61537.
- **Sizes:**
  - **Width:** Minimum 100mm for all service types (25% spare capacity)
- **Features:**
  - **Segregation:** Cable dividers.
- **Execution:** 90-55-10/630 Installing cable basket.

90-55-15/330 Fire resistant screened (LSHF) cables

Shared by: 70-70-45/110 Low voltage distribution system; 70-70-75/110 Hard wired low voltage small power system; and 75-65-30/110 Fire detection and alarm systems in non-domestic premises.

- **Manufacturer:** Pirelli
- **Standard:** To BS 7629-1.
- **Execution:** 90-55-15/635 Installing low voltage cables.

90-75-30/330 Manual call points

- **Manufacturer:** Gent
- **Designation:** Type A.
- **Frangible element:** Non-resettable.
- **Integral red visual indicator:** Required.
- **Mounting:** Fully recessed.
- **Protective covers:** Required.
- **Execution:** 90-75-30/630 Installing manual call points.

90-75-30/331 Combined smoke and heat multi-sensor detectors

- **Manufacturer:** Gent
- **Standard:** Manufacturer's standard.

90-75-30/360 Sounders

- **Manufacturer:** Gent
- **Standard:** Manufacturer's standard.
- **Sounder type:** Electronic sounder.

- **Sound patterns:** In accordance with BS 5839-1.
- **Mounting:** Surface.
- **Power supply:** From loop.
- **Execution:** 90-75-30/640 Installing sounders.

90-75-30/415 Visual alarm signal devices

- **Manufacturer:** Gent
- **Standard:** To BS EN 54-23.
- **Device type:**
- **Body colour:** Red.
- **Execution:** 90-75-30/650 Installing visual alarm signal devices.

Execution

75-65-30/605 Removing fire detection and alarm systems

- **Scope:** Complete installation.

75-65-30/610 Installing fire detection and alarm systems in non-domestic premises

Shared by: 75-65-30/110 Fire detection and alarm systems in non-domestic premises; 75-65-30/615 Modifying existing fire detection and alarm systems in non-domestic premises; 75-65-30/630 Installing cabling for fire detection and alarm systems in non-domestic premises; and 75-65-30/695 Installing interfaces to other equipment and systems.

- **Standard:** In accordance with BS 5839-1.

75-65-30/615 Modifying existing fire detection and alarm systems in non-domestic premises

- **General requirements:** 75-65-30/610 Installing fire detection and alarm systems in non-domestic premises.
- **Existing fire detection and alarm system:**
  - **Short circuit isolators:** Identify and label.
  - **End of line devices:** Identify and label.
  - **Sounders:** Identify cabling route and label.
  - **Detection devices:** Identify cabling route and label.
  - **Interfaces with other equipment:** Identify and label.
- **Connections to external and remote signalling devices:** Isolate.
- **Circuits and cabling that are to remain:** Make good and update record drawings.
- **Method:** Submit proposals.

75-65-30/630 Installing cabling for fire detection and alarm systems in non-domestic premises

- **General requirements:** 75-65-30/610 Installing fire detection and alarm systems in non-domestic premises.
- **Standard:** In accordance with BS 7671.

- **Cable route:** Segregate from other cabling. Where installed in trunking, locate in a dedicated fire cabling compartment.
- **Cable topology:**
- **Cable pulling:** Submit proposals.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Mechanical protection:**
- **Fastening cables:**
  - **To building fabric:** Metal P-clips with red plastic coating.
  - **To cable supports:** Metal bands with red plastic coating.
- **Cables passing through the building fabric:** Sleeve and seal to prevent transmission of gas and dust.
- **Jointing:** At equipment and terminal fittings only.
- **Cable terminals:**
- **Maximum circuit resistance:** Measure before concealment. Submit results.

75-65-30/695 Installing interfaces to other equipment and systems

- **General requirements:** 75-65-30/610 Installing fire detection and alarm systems in non-domestic premises.
- **Connection to equipment:** Install interconnecting wiring between interface unit and equipment controlled.
- **Interface units:** Label, describing their function.

90-55-10/630 Installing cable basket

- **Standards:** In accordance with BS 7671 and IETGuidance Note 1.
- **Joints:** Cut adjacent cross basket wires. Make smooth any burrs or edges.
- **Accessories:** Form on site and connect with basket manufacturer's coupling components.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Support:**
  - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable basket:** Submit drawings showing the proposed routes.

90-55-15/635 Installing low voltage cables

Shared by: 90-55-15/330 Fire resistant screened (LSHF) cables; 90-55-15/344 Single core heat resistant non-sheathed cables with thermoplastic PVC insulation; 90-55-15/346 Single core non-sheathed cables with LSHF insulation; and 90-55-15/680 Installing low voltage armoured cables type A and type B.

- **Standard:** In accordance with BS 7671.
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
  Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.

- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
  - **Final circuit cables:** At electrical accessories only.
  - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
  - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-75-30/630 Installing manual call points

- **Position:** Contractor's choice.
- **Test key:** Locate to allow easy test operation.
- **Labelling:**
  - **Type:** Face engraved rigid plastic laminate.
  - **Background:** White.
  - **Lettering:** Red, identifying the manual call point address.

90-75-30/640 Installing sounders

90-75-30/650 Installing visual alarm signal devices

- **Mounting height:** Contractor's choice.

System completion

75-65-30/805 System information

- **Device list:** Before commissioning, Submit proposals, including proposed device, zone and group names.
- **Zone diagram:** Before commissioning Submit proposals.

75-65-30/806 Device identification and testing

- **Device identification:** Label devices with a unique address corresponding to that used by the CIE. Label non-addressable devices with a unique reference corresponding to that shown on the record drawings.
- **Device testing:** Verify the operation of each device. Submit a schedule of devices, including the device test methods and results.

75-65-30/807 Standby battery testing

- **Mains power supply:** Isolate.
- **Quiescent mode:** Measure current supplied by standby source when fire detection and alarm system is operating in the quiescent mode. Submit results.

- **Alarm mode:** Measure current supplied by standby source when fire detection and alarm system is operating in the alarm mode. Submit results.

75-65-30/808 System soak testing

- **Soak test:** Undertake when construction works are complete, but before handover.
- **Period:** 7 days.
- **Re-test after remedial works:** Required.

75-65-30/809 Measurement of sound pressure levels

- **Sound pressure levels:** Measure throughout the building.
- **Test instrument:**
  - **Standard:** To BS EN 61672-1.
  - **Setting:** Slow response, weighting A.
- **Doors:** Close before measuring sound pressure levels.
- **Results:** Submit electronic layout drawing showing location of measurements with results.

Ω End of system

75-75-50/120 Heating systems control

System outline

75-75-50/120 Heating systems control

- **Description:** The contractor shall employ a specialist controls company to design and install a new control panel providing the following:

  1. Panel live indicator lamp
  2. Manual, hand, off, and auto switches for each item of new plant
  3. Indicate run/fault for each item of plant
  4. Contain a standard 230V single phase power outlet socket
  5. Contain all the necessary motor starters, power supplies and contactors to operate the new plant
  6. BMS interface for future connection
  7. Water, gas and heat meters

  The new panel doors shall be provided with a mechanically interlocked main power switch.
- **System performance:** 75-75-50/201 Design and 75-75-50/212 Time control.
- **Objectives:** Existing.
- **Start and stop control:** 75-75-50/205 Hand off auto switch;
  75-75-50/207 Low temperature interlock signals for plant protection;
  75-75-50/210 Optimum start and stop heating;
  and 90-65-25/380 Time switches.
- **Heating plant control strategies:** 75-75-50/226 Single boiler control strategy.
- **Pumps:**
  - **Primary pumps control strategies:** 75-75-50/237 Variable speed pumps control strategy type A.
- **Pressurization system control strategies:** 75-75-50/229 Sealed expansion vessel pressurization unit control strategy.
- **Water distribution control strategies:** Constant temperature/variable volume.
- **Outlet control strategies:** 75-75-50/231 Heating secondary circuits control strategy.
- **Equipment:** 90-65-50/340 Control panels.
- **Sensors:** 90-65-50/380 Air temperature sensors;
  90-65-50/420 Pressure sensors;
  and 90-65-50/430 Water temperature sensors.
- **Rewireable installations:** Required.
- **Concealed installations:** Required.
- **Control equipment power supply:** Mains supply.
- **System completion:** 75-75-50/810 Inspection and testing;
  75-75-50/820 Start up and commissioning;
  75-75-50/830 Commissioning of automatic control systems;
  75-75-50/860 Documentation;
  and 75-75-50/870 Servicing and maintenance.

System performance

75-75-50/201 Design

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

75-75-50/205 Hand off auto switch

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

75-75-50/207 Low temperature interlock signals for plant protection

- **Low outside air temperature condition:**
  - **Operation:** 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
    •Normal plant operation
- **Low primary heating return water temperature condition:**
  - **Operation:** When activated, start heat source and primary and secondary heating pumps if not already enabled.
  - **Activation set point:** Below 8°C.

75-75-50/210 Optimum start and stop heating

- **Start:**
  - **Optimum start time:** Following learning period, achieve temperature set point within +/- 15 minutes of start of occupancy and Operate plant at maximum output.
  - **Zone heating set point:** 21°C
  - **Maximum preheat time:** 4 h
- **Stop:**
  - **Optimum stop time:** Disable normal plant operation signal.
  - **Minimum acceptable temperature during occupied period:** 18°C
  - **Maximum period between stop and end of occupied period:** 2 h

75-75-50/212 Time control

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

75-75-50/226 Single boiler control strategy

- **Type of boiler:** Air Source Heat Pump
- **Boiler flow water temperature:** Shut down boiler when temperature reaches 58°C.
- **Power failure:** When power is restored and if there is a demand for heating, run primary and secondary pumps, reinstate fuel valves and operate boiler start-up procedure provided safety circuits are satisfactory.

75-75-50/229 Sealed expansion vessel pressurization unit control strategy

- **Pressure sensor:**
  - **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:** 700 kPa
- **High pressure switch:**
  - **Operation:** Allow primary and secondary pumps to continue for run-on period.
- **Low pressure switch:**
  - **Operation:** disable primary and secondary pumps. Raise a low pressure alarm. Hard wire interlocks.
  - **Reset:** Manual.
- **Water level:**
  - **Operation:** If water level falls below a predetermined level, disable the ASHP. Raise alarm. Hard wire interlocks.
  - **Reset:** Manual

75-75-50/231 Heating secondary circuits control strategy

- **Circuit:** UFH Specialist Design

Products

90-65-25/380 Time switches

- **Standards:** To BS EN 60730-1 and BS EN 60730-2-7.

- **Third party certification:** British Electrotechnical Approvals Board Control Mark (BEAB).
- **Equipment interconnectivity:** Wired.
- **Format:** Manufacturer's standard.
- **Number of switching channels:** Manufacturer's standard.
- **Override facility:** Remote manual.
- **GMT/BST daylight saving:** Automatic.
- **Integral thermostat:** To BS EN 60730-2-9
- **Enclosure:**
  - **Mounting type:** Surface.
  - **Mounting method:** Contractor's choice.
- **Execution:** 90-65-25/620 Installing time switches.

90-65-50/340 Control panels

- **Manufacturer:** Contractor's choice.
- **Gland plate gaskets:** Match the assembly's degree of ingress protection.
- **Internal cable zones:** Sufficient to allow cabling to be neatly routed and terminated.
- **Interconnecting cable:** Single core PVC insulated cables to BS 6231.
- **Terminals:**
  - **Mounting:** Suitable for mounting to 35 mm DIN rail.
  - **Identification:**

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

    Cable terminations: Label with circuit reference, with push-on plastics markers.
- **Trunking:**
  - **Standard:** To BS EN 50085-2-3.
  - **Material:** PVC-U.
- **Execution:** 90-65-50/630 Installing control panels.

90-65-50/380 Air temperature sensors

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN IEC 60730-2-9.
- **Equipment interconnectivity:**
  - **Wired:** Required.
- **Execution:** 90-65-50/675 Installing temperature sensors.

90-65-50/420 Pressure sensors

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS EN 60730-1 and BS EN 60730-2-6.
- **Equipment interconnectivity:**
  - **Wired:** Required.
- **Execution:** 90-65-50/670 Installing pressure sensors.

90-65-50/430 Water temperature sensors

- **Manufacturer:** Contractor's choice.
- **Standards:** To BS EN 60730-1 and BS EN IEC 60730-2-9.
- **Equipment interconnectivity:**
  - **Wired:** Required.
- **Execution:** 90-65-50/675 Installing temperature sensors.

Execution

90-65-25/620 Installing time switches

- **Position:** Adjacent to low voltage switchgear in a dedicated enclosure.

90-65-50/630 Installing control panels

- **Clearance (minimum):** Contractor's choice.
- **Fixing equipment:** Fix independently of wiring installation with zinc electroplated fasteners.
- **Orientation:** Accurate and square to vertical and horizontal axes. Align adjacent items of switchgear on the same horizontal axis.
- **Identification:**
  - **Neutral and earth bar terminals:** Label with the outgoing circuit reference.
  - **Cable terminations:** Label with circuit reference, with push-on plastics markers.

90-65-50/650 Installing sensors generally

Shared by: 90-65-50/670 Installing pressure sensors; and 90-65-50/675 Installing temperature sensors.

- **Standard:** In accordance with BCIAGuide: 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:** Contractor's choice.

90-65-50/670 Installing pressure sensors

- **General requirements:** 90-65-50/650 Installing sensors generally.
- **Tapping points:** Do not locate in turbulent flow. Locate an adequate distance from bends or fittings.
- **Vibration:** Install on vibration free surface.

90-65-50/675 Installing temperature sensors

Shared by: 90-65-50/380 Air temperature sensors; and 90-65-50/430 Water temperature sensors.

- **General requirements:** 90-65-50/650 Installing sensors generally.
- **Room sensors:**

- **Height:** 1.5 m above floor.
- **Position:** Away from corners and doors;
  Away from heat sources and draughts;
  Away from direct solar radiation;
  Not on external walls;
  and In the area controlled.

- **Pipe mounted immersion sensors:** Immerse full length of sensor in water and 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 and Do not locate next to extract points, above windows or under eaves.
- **Frost protection sensors:** Locate downstream of the first coil.
- **Interconnection:** To valve actuator and To central control panel.

System completion

75-75-50/810 Inspection and testing

- **Standard:** In accordance with BS 7671.
- **Notice before commencing tests (minimum):** 24 h
- **Certificates:** Submit one.
- **Test equipment identity:** Record on test certificates.
- **Certificates of calibration:** Submit for each test instrument.
- **Control panel test certificates:** Submit one.

75-75-50/820 Start up and commissioning

- **Standard:** In accordance with BCIA Start up and commissioning guide.

75-75-50/830 Commissioning of automatic control systems

- **Pre-commissioning:** In accordance with Commissioning Code C.
- **Commissioning:** In accordance with Commissioning Code C.
- **Notice (minimum):** 48 h.

75-75-50/860 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Paper copy.
  - **Number of copies:** Two.
- **Record drawings:**

- **Content:** For all controls cabling, the cable origin, circuit designation, route, conductor material and insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder and Location of control panels, equipment and repeater panels.
- **Format:** A1 paper print and Electronic.
- **Number of copies:** Two.

- **Submittal date:** At handover.

75-75-50/870 Servicing and maintenance

- **Requirement:** Undertake until 12 months after completion.

Ω End of system

75-85-45/110 Lightning protection system

System outline

75-85-45/110 Lightning protection system

- **Description:** A fully operational and functional lightning protection system will be installed for the Community Centre - provision subject to a lightning risk assessment.

  Note: Where present existgin lightning protection systems shall be decommissioned and replaced wiht new

  The lightning protection system will be designed and installed in accordance with the reuqirements BS EN 62305:2006 Protection against Lightning, BS 7671 and BS 7430.

  The system will provide protection of the entire building, any exposed metalwork, contents and occupants from the effects of a lightning strike by discharging strikes to the general mass of earth.

  The contractor will liaise with a specialist contractor for the complete design and installation of a lightning protection system throughout the Community Centre.

  The lightning protection system will comprise of the air termination network, down conductors and an earth termination network.

  All lighting protection equipment which is accessible such as test points and earth rod inspection pits will be tamper proof.

  Steel reinforcing in columns will not be used as part of the lightning protection system as the continuity and condition of the steel work cannot be assured.

  The materials for the component parts of the lightning protective system will be those detailed in BS EN 62305.

  The installer will take full account of the environmental conditions at the site and the materials used in the building construction to supply a lightning protection system that will provide trouble free life of at least 25 years.

  All bonding connections will be covered in grease to prevent corrosion. Upon completion of the installation, the system will be tested in accordance with BS EN 62305.

  Surge protective device requirments will be co-ordinated with the lightning specialist prior to completion.

  The lightning protection system will also be connected to the main earthing system of the building.
- **System performance:** 75-85-45/210 Design of lightning protection systems.

- **System manufacturer:** A member of the Association of Technical Lightning and Access Specialists.
- **Air-termination system:** Contractor's design.
- **Down-conductor system:** Contractor's design.
- **Earth-termination system:** Contractor's design.
- **Accessories:** Contractor's design.
- **Electrical identification:** Contractor's design.
- **Execution:** 75-85-45/630 Installing lightning protection systems.
- **System completion:** 75-85-45/810 Inspection and testing of lightning protection systems and 75-85-45/820 Documentation.

System performance

75-85-45/210 Design of lightning protection systems

- **Design:** Complete the design of the lightning protection system.
- **System designer:** Contractor's choice.
- **Standards:** To BS EN 62305-1, BS EN 62305-2, BS EN 62305-3 and BS EN 62305-4.
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Execution

75-85-45/630 Installing lightning protection systems

- **Standards:** To BS EN 62305-3 and BS EN 62305-4.
- **Position:**
- **Results:** Submit.

System completion

75-85-45/810 Inspection and testing of lightning protection systems

- **Standards:** To BS EN 62305-3 and BS EN 62305-4.
- **Results:** Include within inspection guide.

75-85-45/820 Documentation

- **Standards:** To BS EN 62305-3 and BS EN 62305-4.
- **Inspection guide:**
  - **Submit including the following information:** The general status of the LPS including conditions of air termination components, down-conductors and earth system components;
    Earth resistance measurements of the earth-termination system;
    and Any deviation from the technical documentation.

- **Submittal date:** At handover.

Ω End of system

Financial Summary

Financial Summary	£
50-10-05/120 Above ground wastewater drainage system with internal stacks	
55-40-40/120 Cold water supply system	
55-40-40/140 Instantaneous hot water supply system	
60-45-40/110 Low temperature hot water heating system	
60-45-90/110 Low temperature hot water underfloor heating	
65-70-45/110 Room air conditioning system	
65-10-95/130 Mechanical supply ventilation system	
65-10-95/140 Mechanical extract ventilation system	
65-10-95/150 Toilet extract ventilation system	
65-10-95/160 Kitchen extract ventilation system	
70-50-45/110 Incoming low voltage electricity supply	
70-70-25/110 Earthing and bonding system	
70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation	
70-70-40/130 Inspection and testing of existing electrical installations	
70-70-45/110 Low voltage distribution system	
70-70-75/110 Hard wired low voltage small power system	
70-80-25/120 Amenity lighting system	
70-80-35/110 Hard wired general lighting system	
75-45-20/110 Data distribution system type A	
75-45-20/110 Data distribution system type B	
75-45-40/110 Audio-frequency-induction-loop system	
75-45-85/110 Telecommunications system	
75-60-05/110 Electronic access control system	
75-60-10/110 CCTV system	
75-60-40/110 Intrusion and hold-up alarm system	
75-65-30/110 Fire detection and alarm systems in non-domestic premises	
75-75-50/120 Heating systems control	
75-85-45/110 Lightning protection system	
Total £	

Signed _____

For and on behalf of _____

Date _____