



SPECIFICATION

Project: Chippenham Town Hall

Subject: Electrical Specification

Document Ref: 4887 ESP01 T01

Date: 14th Nov 25

Client: Chippenham Town Council

Architect: N/A

Queen Square House
18-21 Queen Square
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0117 238 0909

Revision	Date	Details
P01	16th Apr 25	Preliminary Issue
P02	30 th Oct 25	Draft Tender Issue
T01	14 th Nov 25	Tender Issue

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Date:	16 th Apr 25

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E1 OVERVIEW

E1.1 INTRODUCTION

This specification covers the electrical services materials and workmanship requirements for the project, together with specific system requirements as required for the contract.

The document should be read in conjunction with the following specifications:

- The general specification, which describes preliminary and other general clauses.
- The mechanical specification.
- All associated drawings and details as produced by the Consulting Engineer.
- All other tender and contract issue drawings, including but not limited to drawings produced by the Architect, Structural Engineers, and other consultants forming part of the design team.

E1.2 THE SITE AND BUILDINGS

The works are across two building areas, the Town Hall and the Neeld.

The Town Hall is a Grade II listed building on the High Street in Chippenham. It was completed in 1834 and built in Ashlar stone. The Council Hall is at first floor level and is a double height space overlooking the high street. No works are proposed to other areas of the Town Hall building with the exception of the roof, loft, bar and kitchen.

The Neeld is a masonry building constructed to the rear of the Town Hall between 1848 and 1850 and is also Grade II listed. The main hall is a double height space with a pitched roof and it is surrounded by several adjoined structures housing supporting spaces and toilets. The Neeld is used as a multipurpose community venue and has a stage and retractable bleacher seating. No works are proposed to other areas of the Neeld building with the exception of toilets, corridor, kitchen and the Cheese Hall.

E1.3 SCOPE OF WORKS

The scope of works described in this specification is for the decarbonisation project at Chippenham Town Hall. Primarily, the works involve omitting mains gas services, replacing them with all electric systems, in the form of air-to-water heat pumps and DX split systems.

The electrical services work includes the following:

- Provision of technical submissions for all materials and equipment.
- Production of design and installation drawings.
- Mechanical plant power and controls wiring (liaison with Mechanical Sub-Contractor is required to ensure that all cabling and containment costs are included).
- Tray/trunking/conduit systems.
- Supply and installation of accessories.
- Provision of lighting to Town Hall loft void.
- Earthing and bonding.
- Testing and commissioning of the complete installation.

- O&M manuals and record drawings.
- Client demonstration and training.

E1.4 ELECTRICAL STRIP-OUT WORKS

This section of the specification describes the electrical works required for the strip out of the existing systems, in preparation for the future works.

Services to the rest of the building areas are to be maintained throughout the strip out process. No interruption to their supplies is to be allowed during the works, unless with the agreement with the client asked for in good time.

The document should be read in conjunction with the following documentation:

- All associated drawings and details produced by the Consulting Engineer.
- All other tender and contract issue drawings, including but not limited to drawings produced by any other consultants forming part of the design team.

In brief, the Contractors works comprise:

- Make safe and isolate incoming services, including agreement with any meter or supply providers.
- Strip out of the selected parts of existing electrical services installation from both buildings including the power supplies to several pieces of equipment as described in more detail below.
- Certification of all recycled material or material that has been sent to waste.
- Produce record drawings detailing the works done, the precise location of terminations and the operational state of the systems.
- Remove all redundant materials from site.

E1.4.1 Town Hall

The existing air handling unit (AHU) and four rooftop condensing unit power supplies are to be fully decommissioned, isolated and removed. This includes the disconnection and removal of all associated electrical cabling. Additionally, any remaining related equipment located within the loft space, along with control components within the main Town Hall, Town Hall bar and Town Hall kitchen that are no longer required by the Client, shall also be removed.

E1.4.2 Neeld Hall

The existing boilers and water heater power supplies, located on the second floor boiler room, are to be disconnected and removed from site, including all associated cabling and the old controls.

E2 STANDARD ELECTRICAL SERVICES REQUIREMENTS

E2.1 GENERAL

This Section describes the procedure and/or the methods of installation of equipment, materials, accessories, etc., to the standard requirements of the Consulting Engineer, and is to apply to this Contract, where appropriate, in extension and amplification of the general intent and meaning of the basic descriptions given elsewhere in this Specification.

E2.2 CONDUIT

Conduit is to be heavy gauge Class 4 hot dipped galvanized welded and screwed steel to BS EN 61386.

The maximum practical lengths of conduit are to be used to minimise the number of joints and bends are to be formed by machine with burrs removed from cut ends. Bends and/or junction boxes are to be used at changes of direction. Solid elbows and tee pieces and inspection elbows and inspection tees will not be permitted.

Conduit is to be mechanically and electrically continuous throughout the installation. All joints are to be tightly screwed to ensure electrical continuity, with no thread showing. Expansion couplings are to be used where conduit crosses movement joints in the structure. Conduit boxes are to be securely fixed independently of conduit.

Conduit is to be concealed in walls, floors, ceilings and ceiling voids wherever possible, or fixed on the surface with galvanized space saddles in all areas where concealment is not practicable and, in all areas, where damp conditions or condensation is likely to be encountered, either during construction or in the completed building.

Conduit systems are to be installed so that they permit rewire from directly accessible conduit outlet boxes. No conduit boxes or other like accessories are to be installed buried in the building structure or otherwise inaccessibly located within the building fabric.

Conduit in walls to be securely fixed by crampets or other approved method so as not to damage the plaster when drawing in cable.

Conduits buried in floor screeds are to be fixed by means of single hole fixing saddles with raw plugs and screws. Where two conduits cross, the structural concrete is to be chased to allow one to pass under the other.

All conduits laid in "in situ" concrete slabs are to be laid immediately over the structural reinforcement before concrete is poured. The Electrical Sub-Contractor is to provide attendance during pouring operations to ensure that conduits are not displaced. Conduit boxes are to be fixed to shuttering to prevent such displacement and suitably packed to prevent the ingress of concrete or moisture. The Electrical Sub-Contractor is to be responsible for the accuracy of conduit outlets for lighting points etc.

In all plaster finished walls, plastered or suspended ceilings and in all floors, the conduit is to be concealed in the screed, ceiling spaces etc., and all outlet boxes for lighting and power points are to finish flush with the finished wall or ceiling, allowing ample plaster covering for the conduit. Extension boxes are permitted where necessary to comply with this requirement.

Conduit runs are to be so arranged that it is impossible for the lodgement of water to occur at any point in the tube. U-forming loops of conduit will not be permitted unless adequately drained.

Straight junctions are only to be made with fixed length couplers.

Where conduits are required to change from an embedded to surface installation along their route, or vice versa (as for switch drops on thin partition walls etc.), this is to be effected by means of a standard conduit box terminating the concealed conduit run to which is then fixed an extension conduit box and the surface installed conduit.

Where the surface conduit turns to pass through a wall, or ceiling, a back outlet box is to be provided.

All conduits after erection and before the pulling in of cables are to be cleaned free from dirt by drawing through of swabs until completely clean and dry.

Conduit connections to equipment, panels and accessories will be by washers and flanged couplers.

Conduit ends are not to be threaded for a greater length than is necessary for the purpose of attachment and any exposed threads are to be cleared free from oil and, immediately upon erection, painted with galvanised paint. Such applications to be in addition to the general painting of conduits as elsewhere described.

The conduits and fittings are to be screwed up tight into sockets, couplers, etc., with any vice marks and damaged parts of enamel etc., filed out and all threads, running threads, joints, etc., painted as described in the preceding paragraph. Attention is drawn to the necessity for preventing rust on any threads exposed for any length of time during erection of the building.

The inner radii of conduit bends are not to be less than three times the outside diameter of the conduit nor less than four times the diameter of the largest cable within the conduit. All bends and sets are to be made cold without alteration to the section.

All surface conduit installations are to be complementary to the architectural features of the buildings, due allowance being made for accessibility, inspection and maintenance, and attention is to be given to the alignment of accessories. Where practicable these are to be on the same horizontal or vertical centre lines. All corners and angles are to be neatly negotiated and vertical and horizontal runs are to be kept straight. No diagonal runs will be permitted and all branches are to be taken off at right angles.

Surface conduit on walls etc. is to be secured by distance saddles giving a minimum clearance of 5mm at even distances of not more than 1200mm apart and so arranged that a distance of not more than 200mm exists between a saddle and a joint or bend. Spacer bar saddles are not to be used. Expanding soft metal plugs and sherardized screws are to be used for all conduit fixings in brick or concrete in all damp situations and exterior installations. Rawlplug fixings or other approved equivalents are to be used on all interior installations.

Standard pattern circular conduit boxes are to be used for all surface work, with cast metal switch and accessory boxes. Looping-in circular conduit boxes are to be used for concealed conduit work, where the building construction permits their use. Pressed steel switch and accessory boxes are permitted in conjunction with buried conduit systems only (unless otherwise specified) and are to be fitted with male brass bushes and couplings connecting to the conduit system.

Unless by agreement with the Consulting Engineer all conduit runs are to be kept clear of gas, hot water and steam pipes by a minimum distance of 450mm and are not to be run behind or less than 900mm above heating radiators or convectors. In such instances where adequate segregation of metal pipes, gas and electric services are not possible, effective bonding between these at all points of contact or near contact are to be completed.

Generally, not more than two bends or offsets or one coupling will be permitted without a suitable inspection accessory.

Where metallic conduit is buried within the fabric of the building the Contractor is to employ a paint and corrosion specialist to specify an appropriate corrosion protection package, and to include the application of

Denso tape and Petrolatum products as a minimum level of protection. All corrosion protection to be fully continuous and applied to all metallic surfaces.

Plastic conduit is to be heavy gauge, high impact, smooth inside and outside, free from imperfections and of minimum diameter of 20mm. Plastic conduit is to be suitable for jointing by means of adhesive solution or screwing with standard electrical threads.

Plastic conduit generally is to be installed to the requirements described above for steel conduit. Bends and sets are to be formed with the aid of a helical spring fitted internally with the conduit warmed sufficiently for it to move without deformation of the bore, and with minimum wall thinning on the outside of the bends.

Plastic fittings, boxes, bends and sets, etc., are to be used in conjunction with the plastic conduit. A separate protective conductor is to be run with each circuit and is to be sized in accordance with the BS 7671: Requirements for Electrical Installations. Expansion couplers are to be fitted on long straight runs in accordance with the manufacturer's recommendations.

NOTE: Plastic conduit is not to be used without the agreement of the Consulting Engineer.

Flexible conduit connections are to comprise a length of not more than 450mm of PVC flexible conduit with internal reinforced spiral complete with additional circuit protective conductor.

E2.3 TRUNKING

Trunking is to be heavy duty galvanised to BS EN 50085. All accessories and fixings are to be the manufacturer's proprietary items.

Trunking is to be sized to be adequate for the known cabling plus 25% for future cabling.

Proprietary bends, tees and connectors are to be used to form junctions and changes of direction. Site manufacture of bends will not be acceptable. All fastenings and fixings are to be mechanical. Grommets, bushes or liners are to be fitted to holes through which cables pass.

Where trunking or ducting passes through fire resisting floors, ceilings, cavity barriers, etc., it is to be sealed internally with packed Rockwool. The lids are to be solidly fixed and to project 50mm on either side of walls and 150mm on either side of floors or ceilings.

Trunking is to be of minimum lengths of 2400mm and free from all sharp edges or distortions. Lids are to be of the same materials and fixed to the body by turnbuckle fixings at regular intervals not exceeding 750mm. Short lengths of lid are to be fixed by a turnbuckle fixing located centrally along the length of the lid. Burrs are to be removed from site cut trunking ends.

Floor tray type trunking is not to be less than 2.5mm pressed steel, single or multi-way, to sections as indicated on working drawings and will normally be fitted within floor screeds and with tray type lids containing lino or other floor finish as required by the situation. The lids are to be free from distortions and be fitted to give a reasonably watertight finish and be firmly fixed by brass flush fitting screws in brass pads at regular intervals not exceeding 600mm apart on each side of the lid, except where varying specifications are shown on working drawings.

Metal surface type trunking is to be run on the surface of walls and/or ceilings in such a manner that condensed moisture is drained off. It is to be kept 450mm clear of and below steam or hot water pipes and other services. Where such distances are not practicable, and with the approval of the Architect, the trunking is to be bonded to pipework in the manner described in the previous clause. Trunking is to be supported at intervals as specified by approved type metal clips. Drilling of structural steelwork for this purpose will not be permitted without written approval. Where trunking is required to be self-supporting over gaps of more than 1.8 metres but not more than 6 metres, long sleeve couplings are to be used.

Where trunking is run vertically over a distance exceeding 3 metres, proprietary pin racks are to be used to support the weight of the cables contained therein.

Trunking is to be fitted with a copper link at each joint to ensure electrical continuity.

Trunking is to be filleted to cater for segregated services where these are required in compliance with Clause "Final Circuit Cables" in this Section.

When more than two circuits are run in one trunking, the cables in each circuit are to be laced together with adhesive tape or cord.

With the exception of trunking designed and installed specifically for the support of lighting fittings, no trunking is to be installed with the cover on the underside.

Cables must be laid carefully in trunking, and carefully drawn through sections of trunking at walls, etc., to avoid damage to insulation. Particular attention is to be given to corners at tees and bends and to the fitting of screws to avoid possible damage to cables.

Data cable matting is to be manufactured from LSOH materials and be Class 0 fire rated. The matting is to be non-compressible or a minimum thickness of 5mm in its compressed condition.

E2.4 CABLE BASKET

Wire mesh cable basket is to be hot dipped galvanised. Where cable basket is run vertically over a distance exceeding 3 metres, cable supports are to be used to support the weight of the cables contained therein.

The cable basket is to be mechanically and electrically continuous throughout its entire length. Electrical continuity is to be assured using copper links firmly attached so that every length of basket, or fitting, is bonded to the main earth system. All accessories and fixings are to be the manufacturer's proprietary items.

Particular attention is to be given to corners at tees and bends and to the fitting of screws to avoid possible damage to cables.

Cables must be laid carefully in cable basket, and carefully drawn through sections of walls, etc., so as to avoid damage to insulation.

Cable matting is to be provided as indicated on the drawings. It is to be constructed of LSZH materials and be Class 0 fire rated. The matting is to be non-compressible, or a minimum thickness of 5mm in its compressed condition and installed in accordance with the manufacturer's instructions.

E2.5 CABLE TRAY

Perforated cable tray is to be in accordance with BS EN 61537 and BS EN 10346, pre-galvanised, medium duty return flange type. Bends and angles are to be formed from the same gauge. After erection the tray is to be thoroughly cleaned and painted, as described for conduit.

Perforated cable tray for use outside buildings or in corrosive atmosphere is to be heavy duty return flange type.

Perforated cable trays are to be sized to be adequate for the known cabling plus 25% for future cabling. All accessories and fixings are to be the manufacturer's proprietary items.

All cable trays are to be bonded to the earthing system.

Perforated cable trays are to be carried on Unistrut brackets or distance pieces at 1200mm intervals. Supports are to be finished self-coloured (if corrosion resistant) or galvanised, as appropriate, and securely fastened to the structural walls or floor slabs. The tray is to be spaced off the structure to which it is

secured. Brackets or distance pieces are to be designed, or supported, to prevent lateral movement of the cable tray.

All galvanised cable trays when cut is to be painted in the area of the cut end with red lead paint, or equal, to prevent corrosion at the cut surface. Fixing screws, brackets etc., are to be of corrosion resisting materials or alloys.

E2.6 ARMoured CABLES

Armoured cables are to be BASEC certified with XLPE insulated copper conductors and steel wire armour as follows:

- PVC sheathed to BS 5467 for underground applications.
- LSF sheathed to BS 6724 for outdoor and indoor applications.

All cables are to be terminated with cable glands to BS EN 50262.

Cables are to be handled and installed carefully to prevent damage to sheath and armouring. They are not to be installed if the cable and ambient temperature are, or have been for the last 24 hours, below 0oC, and internal cabling is not to be commenced until the building is enclosed and weatherproof.

Cables are to be installed without joints other than at equipment and terminal fittings. The armour is to be bonded to the equipment earth and the main earthing system.

Cables are to be routed and installed in a neat and as unobtrusive a manner as possible, protected against accidental damage, adverse environmental conditions, mechanical stress and deleterious substances and are not to conflict with the various routes selected for heating pipes or other services or where they will be surrounded or covered by insulation. In this respect the Electrical Sub-Contractor is to confer with the various other Sub-Contractors concerned in order to arrange for the installation of their respective plant and equipment to an orderly and approved plan.

The exact routes of all cables are to be agreed on site with the Consulting Engineer and no cables are to be placed on order until the precise route has been determined. No allowance will be made for expressed ignorance on this point; neither will straight through joints be permitted other than those necessary by manufacturer's limitations on length per cable drum, for ease of handling.

The Electrical Sub-Contractor is to provide all cable jacks, fair leads, cable stockings, hauling tackle and the like and is to be responsible for ensuring that these are always maintained in a safe and serviceable condition.

Where cables are to be buried in the open ground these are to be laid in a 75mm deep bed of sand and covered by an equal depth of sand bedding over the cable. The Electrical Sub-Contractor is to then supply and install interlocking cable protection tiles separately over each cable and the cable trench is to be of sufficient depth so that the apex of these tiles is not less than 450mm below ground level for all medium or low voltage cables and 900mm below ground for all high voltage cables.

Cables installed underground are to be marked at the end of every straight run or deviation by pre-cast concrete marker posts inscribed "Electric Cable" and projecting not less than 200mm above the finished ground level, or by similarly inscribed marker slabs, not less than 450mm x 300mm x 75mm. All buried cable joints are to be similarly identified.

Where cables are required to crossroads or pathways these are to be drawn through uPVC ducts provided for this purpose. The ends of all ducts are to be sealed after the cables have been drawn in.

Cables run in service ducts and other selected routes above ground level are to be supported by approved 'J' type cable hangers, single or multi-way perforated cable tray and saddles; or claw type cable cleats, racked for multi-way use, as required.

All cables routed vertically or horizontally are to be supported, at the spacing specified by the manufacturer of the cable, by means of claw type cleats, or approved pattern cast saddles, or cable tray and cable ties only. Cable ties are to be Low Smoke Zero Halogen (LSZH) type. Where cables are not supported directly by steel cable containment they are to be adequately supported against premature collapse by steel or copper clips, saddles or stainless-steel ties.

The internal radius of all bends made in cables is not to be less than the manufacturer's recommendations.

In all instances where there is insufficient physical space to allow for at least 400mm of straight cable run into cable boxes an angular offset pattern cable box is to be used to permit this length of straight run before making any cable bend.

Cables are to be secured at approved regular intervals by means of cast distance saddles fixed firmly to the building fabric, along concealed or inconspicuous routes or installed in the ground in the manner previously described.

Unless otherwise specifically permitted by the Consulting Engineer, all cable routes are to be arranged so that they are kept at a minimum distance of 450mm from cables supplying telephone services.

E2.7 FINAL CIRCUIT CABLES

Final circuit cables are to be BASEC certified as follows:

- 6491LSZH - thermosetting insulated non-sheathed single core LSZH to BS 7211;
- 6242LSZH - thermosetting insulated flat twin LSZH with CPC to BS 7211;

Internal cabling is not to be commenced until the building is enclosed and weatherproof. Cables are to be installed without joints other than at equipment and terminal fittings and junction boxes are not to be used without approval.

The minimum size of cable is to be 1.5mm² copper for lighting circuits and 2.5mm² for power circuits.

No final circuit cable will be permitted in conduits carrying main or sub-main cables.

All cables routed vertically or horizontally are to be supported, at the spacing specified by the manufacturer of the cable, by means of cable tray and cable ties only. Cable ties are to be Low Smoke Zero Halogen (LSZH) type. Where cables are not supported directly by steel cable containment they are to be adequately supported against premature collapse by steel or copper clips or stainless-steel ties.

E2.8 FLEXIBLE CORDS

Flexible cords are to be as follows:

- Sheathed 300/500V 90°C to BS 6500;
- PCP insulated 450/750V to BS 7919;
- Glass fibre insulated 450/750V to BS 7919

E2.9 FIRE RESISTING CABLES

Fire resisting cables are to be as follows:

- LSF sheathed MICC to BS 60702;
- LSF sheathed soft skin type to BS 7629;
- LSF armoured to BS 7846.

All accessories are to be of approved design and as recommended by the manufacturers.

Single screw fixing clips will be permitted along concealed routes but two screw fixing saddles or centre-screw spring fixing clips only are to be used for all surface wiring. Corrosion resistant round-headed screws not less than 20mm x 8mm are to be used. Wiring is to be secured by the above described methods at intervals not exceeding the manufacturer's recommendations with fire resisting LSF covered cable ties.

No cables are to be installed with a bend which has a radius less than six times the overall diameter of the cable and no such bend is to be put in any cable either before or during erection. All bends are to be neat and of uniform radius. There is to be 50m of straight cable between the gland and the nearest bend of the off-set to enable the gland to be removed.

When more than one cable follows a route, they are to be installed on steel cable tray.

Cables installed either on the surface of or buried behind walls or ceilings are to be routed in straight vertical or horizontal routes, to an approved neat and orderly pattern. Cable runs are to be installed parallel or perpendicular to associated walls and ceilings and must not be installed diagonally across these areas.

The ends of all lengths of cable are to be terminated in the manner prescribed by the manufacturers.

LSF sheathing is to be colour coded according to the particular service they supply. The colours to be used to identify each specific service are as described elsewhere in this Specification or indicated on the associated drawings or will be given to the Electrical Sub-Contractor on site by the Architect. Control circuits and similar duty cables are to be fixed with numbered ferrules for the purpose of identification.

Insulation tests are to be made on each length of cable before and after sealing. If low readings are obtained before sealing, then the cable ends be heated to drive out the moisture. Low readings obtained after sealing will necessitate resealing.

Straight through joints will not normally be permitted on the cable, but if essential owing to excessive length of runs, then the cable manufacturer's recommended straight through joint are to be used. The resistance across the joint shall equal that of a solid conductor.

E2.10 SWITCHES, SWITCH-SOCKETS, ETC.

The Electrical Sub-Contractor is to verify the position and swinging of doors with the Main Contractors working drawings to enable them to fix the position of switches on the correct side of the door.

All local lighting circuit switches (except where ELV switching is used) are to be rated at 20 Amp and their mounting height is to be as specified in this Specification or as detailed on the drawings.

Switches for luminaires or equipment for special purposes may be ganged with switches for normal service but must indicate their distinction by means of coloured dolly switch or label.

Unless otherwise stated all switch sockets are to be 13A rectangular pin general purpose pattern, for either flush or surface mounting as applicable, single or twin gang units, and wired in 'ring-main' circuits. All switch sockets supplying fixed or specific items of equipment are to be of the neon lamp indicating pattern.

The finish of all switches and switch sockets and similar accessory front plates is to be as stated elsewhere in the Specification.

"External" pattern local lighting switches and general purpose switch socket outlets are to be used in all plantrooms, service ducts and similar situations, in addition to all external applications.

All fused connection units are to have cartridge fuses rated in accordance with the equipment supplied and are to be wired up as described above for socket outlets. These units are to be rated as socket outlets for the purpose of wiring and number per circuit, and generally mounted 450mm above floor level.

Cooker control units are to be 45A to BS 4177: Specification for cooker control units, having a neon indicating light. Where flush units are specified the cable connection to the cooker is to be made with 6mm² single core cables enclosed in conduit and terminated in a flush connector unit mounted in a metal box with moulded cover plate 450mm above floor level. The connection from the connector unit to the cooker is to be in 6.0mm² heavy circular braided workshop flexible cable, unless otherwise stated elsewhere in this Specification.

The Electrical Sub-Contractor is to be responsible for identifying of the location of fixed apparatus or furniture together with details of their exact dimensions etc., from the Architect's detailed drawings and is to modify where necessary the position of any outlet, switch or switch sockets, etc., where these positions conflict. The Electrical Sub-Contractor must give the Consulting Engineer prior notification of intention to make such modification and obtain approval before commencement.

The Contractor is to provide acoustic rated back-boxes or back-box inserts as necessary not to reduce the acoustic rating of any partitions.

The Contractor is to avoid mounting sockets back-to-back in acoustically rated partitions. If the Architect's setting out shows back-to-back sockets the Contractor is to raise the issue via a RFI before proceeding on site.

E2.11 FIXINGS

Generally, fixing centres for work described in this and other sections are to be as follows:

Type of installation	Horizontal runs on horizontal surfaces	on	Horizontal runs on vertical surfaces	on	Vertical runs
	mm		mm		mm
Conduit	1500		1200		1200
Cable Trunking (surface type)	1500		1200		1800
LSOH Cables	600		450		600
LSF/SWA	900		900		1200
Cable Tray	1200		1200		1200
Earth bars for other copper-work for static bonding etc.	600		450		600

The above figures are for guidance only; actual fixing centres may need to be decreased from the distances stated as necessary to suit the building details and/or the manufacturer's recommendations.

All lightweight fixings to brick or concrete are to be made with sherardized steel greased wood screws and appropriate size of Rawlplug fibrous wood, or milled plastic, or white bronze screw anchor fixing plugs, as appropriate.

All heavyweight fixings to brick or concrete are to be made by means of M.S. bolts of appropriate size of the grouted bolt type or one of the various types of expanding Rawlbolts.

The size of bolts or screws used is to be the largest permitted by the diameter of the hole in the apparatus to be fixed and is to be of an adequate length.

All fixings are to be made either directly, or by means of saddles, brackets, hangers, etc., supplied and fixed by the Electrical Sub-Contractor, to the structural fabric of the building. No fixings are to be made to suspended ceiling systems or to apparatus or equipment supplied by other Sub-Contractors unless prior approval for this is given by the Consulting Engineer.

E2.12 LABELS & IDENTIFICATION

The Electrical Sub-Contractor is to obtain approval prior to manufacture of all notices. In order to do this a sample of all labels is to be provided for approval.

Labels for switchgear, distribution boards, motor starters or appliance isolators etc., are to be fitted on the outside front face of the equipment and are to be of Black 2.5mm laminated Traffolyte with bevelled edges having White block characters 3mm high. Labels for major equipment items are to have characters 10mm high. Labels are to indicate the description and/or the duty of the item so labelled, the equipment or area served, any identity reference letters and/or numbers, phase connections, cable sizes, etc., as appropriate and as later more specially directed by the Consulting Engineer.

Labels are to be secured either by BA brass round head screws fixed in tapped holes or fixed washers and nuts, to facilitate their removal and replacement.

Armoured cables are to be fitted with embossed plastic labels fixed at each end of the cable, and either side of wall and floor penetrations, using Critchley K-type cable markers. The labels are to indicate the cable reference number, description, size, type of cable and origin of the supply. Labels are to be provided at the origin and at the final termination if the item of plant or equipment being supplied is not obvious, or if a number of cables are glanded onto the same item of plant or equipment.

Any items of equipment supplied by more than one phase to bear the label "WARNING 400 VOLTS" marked clearly on the outside of the case by means of Black letters on White Traffolyte plate, or by means of a separate internal plate for ganged switched units having circuits supplied off separate phases.

Distribution boards are to be provided with a renewable circuit chart in a transparent plastic envelope permanently fitted inside the distribution board cover to clearly indicate, in typed script, the circuit identification number, cable size, fuse or circuit breaker rating and a description of item supplied and area supplied by circuit.

All switches, fused connection units and isolators are to be labelled to indicate the distribution board reference and the circuit and, where relevant, the device controlled. Labels are to be durable and permanent using Dymo D1 Permanent Polyester tape. Labels are to have black text on a clear or white background to suit the accessory finish.

Labels of Black/White/Black Traffolyte with engraved wording are to be provided to adequately identify each electric motor, switch, item of switchgear, main and sub-main cable, instrument, pump, fan, filter, heater and any other item of equipment which, in the opinion of the Architect or Consulting Engineer, requires identification. Labels are to be secured by a minimum of two chromium plated brass screws. Fans, pumps, chillers, boilers, compressors, etc., are additionally to carry a manufacturer's plate which gives the manufacturer's name, service number and all relevant details of operation and capacity.

Labels on electrical items are to indicate the description and/or the duty of the item so labelled, the equipment or area served, any identity reference letters and/or numbers, phase connections, cable sizes, etc., as appropriate and as later more specially directed by the Client.

Sundry control switches, indicator lights, etc., whose function is not immediately apparent are likewise to be labelled to describe their duty.

All main or sub-main feeder cables are to be fitted at each end of their length with embossed plastic labels fixed about the cable sheath. These labels are to bear the cable reference and description as given in the Cables Schedule, prepared by the Contractor.

All distribution boards are to be provided with a panel on the inside of the board cases for numbering and describing of the various local outgoing circuits. This is to be completed using typed labels, or alternatively a typed schedule may be provided in a pocket that is permanently fixed to the casing, with the information all visible.

All conductors are to be colour coded, where possible. Conductors which are not colour coded shall be identified by identification ferrules in accordance with the I.E.E. Regulations.

As-built schematic drawings for each system are to be provided, on the wall in a suitable location in the plantroom. A suitable clear plastic folder is to be provided to contain the diagrams. The contractor is to ensure that all item references align between drawings and physical labels.

E2.13 PROTECTIVE PAINTING

All iron and steel materials which show signs of rust are to be wire brushed bright metal clean, painted with one coat of rust remover and neutraliser, one coat of approved grey colour chemical scaler and two coats of red oxide paint, one before erection and one after.

All junctions and joints in conduit work and all areas of conduit where there is evidence of enamelling or galvanising being damaged are also to have one application of red oxide paint (or, in the floor screeds only, bitumastic paint), directly after installation.

E2.14 EARTHING

The arrangements for earthing are to comply strictly with the recommendations contained in BS 7671: Requirements for Electrical Installations, BS 7430: Earthing, Electricity Supply Regulations, and Local Electricity Supply Authority requirements.

Where satisfactory readings result and with appropriate prior approval, the sheath and armour of main or sub-main cables may be used to attain these requirements. This option is in no way to relieve the Electrical Sub-Contractor of any additional provisions for earthing which may prove to be necessary in order to obtain values specified in the above referred Code of Practice and the BS 7671: Requirements for Electrical Installations. Such additional provisions are to take the form of earth rods, single or multiple arrangements as required, driven into the ground at a position conveniently adjacent to the particular building served by the supply system.

All cable armouring and sheaths and all conduits (unless specifically exempted) are to be mechanically and electrically continuous throughout the installation and to satisfy the earth resistance test specified in the BS 7671: Requirements for Electrical Installations.

All exposed conducting parts are to be bonded together with joints of negligible impedance.

E2.15 TESTING

The Electrical Sub-Contractor is to comply with BS 7671: Requirements for Electrical Installations and provide completion certificates for the installations.

The Electrical Sub-Contractor is to check the correct operation of devices, confirm interlocks and sequences operate correctly.

The Electrical Sub-Contractor must give at least fourteen days' notice to the Consulting Engineer for the proposed day for carrying out these tests.

These test reports are to be signed by the Electrical Sub-Contractor's Site Representative and copies forwarded monthly to the Consulting Engineer for record.

The Electrical Sub-Contractor is to provide test equipment and consumables to complete tests and retest any failed installations following corrective measures and complete the prescribed "Completion Certificate" and "Inspection Certificate" which is to be forwarded in triplicate to the Consulting Engineer, together with equal number of copies of the test results upon which the certificate information is based.

The Electrical Sub-Contractor is to include for any out-of-normal working hours' time that may be necessary for the testing of various services due to phased takeover of the building projects.

E2.16 IDENTIFICATION OF CONDUCTORS

All conductors are to be colour coded, where possible. Conductors which are not colour coded are to be identified by identification ferrules in accordance with the BS 7671: Requirements for Electrical Installations.

All final circuit conductors are to be identified at the point of connection to the MCB, neutral bar or earth bar inside each distribution board and at the final outlet position. For example, Circuit Ref. DB1-1/3L2 is to be identified as "3L2". At the final outlet points only the phase conductor needs to be identified.

Identification ferrules are to be of the Critchley or Viskring type.

E2.17 ADAPTABLE BOXES

Adaptable boxes used external to buildings, or in crawlways, ducts, lift motor rooms, tank rooms, lavatories, plantrooms, basements, kitchens, subways, boiler houses, etc., are to be of malleable cast iron, complete with ground faced lids.

Boxes used elsewhere inside buildings may be of galvanised mild steel:

- For 20mm conduit - 40mm deep
- For 25mm conduit - 50mm deep
- For 32mm conduit - 60mm deep

Boxes used externally are to be robust plastic IP67 rated with grey or black colour finish.

No adaptable box smaller than 75 x 75 x 40mm is to be used. The lid is to be secured by means of at least four M5 round head brass screws.

E2.18 ELECTRO-MAGNETIC COMPATABILITY

The recommended cable separations/equipment standards and installation practice recommended in the Electrical Sub-Contractors' Association Document "Recommended Cable Separations to Achieve Electromagnetic Compatibility (EMC) in Building" are to be provided by the Contractor.

The equipment provided is to comply with the Electromagnetic Compatibility (EMC) Directives 2014/30/EU, 2014/35/EU and 2014/53/EU.

E2.19 SLEEVING OF PENETRATIONS

Where cables are required to pass through fire barriers, the hole is to be effectively sealed against the spread of fire, smoke or water, as described in the General Specification. The M&E Contractor is to cooperate in full with the Specialist Subcontractor carrying out firestopping and provide sleeves as required by the Specialist.

E2.20 EXTERNAL DUCTS

Ducts are to be the twin wall type and runs are to be as straight as possible and any deviations are to be made by carefully bending the ducts. Ducts are to be laid generally in accordance with NJUG recommendations and there is to be no more than one pre-formed 90o bend in any duct run.

On completion of the network, and prior to the cables being pulled in, the ducts are to be tested by drawing through a mandrel, 7mm diameter smaller than the nominal duct bore and 250mm long. Once proved the duct runs are to be cleaned by drawing through a wire brush 12mm diameter larger than the nominal duct bore. A corrosion resistant draw wire with a minimum breaking capacity of 550N is to be installed in each duct and secured at both ends. Any unused ducts are to be sealed with a proprietary plug.

Ducts for electrical cables are to be black HDPE to ESI12/24 with an internal diameter of 125mm.

Ducts for communication cables are to be grey HDPE with an internal diameter of 90mm and the final bend into the building is to be with a pre-formed 90o bend.

Where ducts are stacked vertically, they are to be maintained in position using proprietary duct spacers.

Manufacturer and range: Genuit Group – Ridgiduct or Ridgicoil

E2.21 DRAW CHAMBERS

Draw chambers are to be provided by the Contractor at the positions as indicated on the drawings.

Draw chambers are to be constructed as follows:

- 150mm GEN1 (BS8500) concrete base to be clean and level.
- Ducts to enter with bottom of duct 50mm above the base.
- Walls constructed with B3921 engineering bricks, keyed at the corners and pointed.
- Covers in soft dig and pedestrian areas are to be skid resistant high strength composite type, 750 x 750 clear opening, fitted level and in accordance with the manufacturer's instructions.
- Covers in traffic areas are to be solid top, anti-slip ductile iron type, 750 x 750 clear opening, fitted level and in accordance with the manufacturer's instructions.

Cover load ratings are to be in accordance with BS EN 124 classifications.

Manufacturer and range: Gatic
www.gatic.com

Note: clauses for ducts and draw chambers below should be shared with the QS for inclusion in any BoQ so that the Main Contractor provides the correct material.

E3 INCOMING ELECTRICAL SUPPLIES

E3.1 MAIN INCOMING SUPPLY

Both buildings have independent incoming utility services.

E3.1.1 Town Hall

The existing 3-phase 100A incoming electrical supply cut-out and meter (MPAN number 2000006880150) to the Town Hall is located in a cupboard at ground floor level.

A new electrical connection is not required for the Town Hall building, as the existing air handling unit will be removed and replaced with a new unit of equivalent electrical load.

E3.1.2 Neeld Hall

The existing 3-phase incoming electrical supply cut-out and meter (MPAN number 2000050277648) to the Neeld Hall is located in a cupboard at ground floor level.

The additional air source heat pump electrical load, along with the existing maximum demand, exceeds the agreed supply capacity of 50kVA and therefore an upgrade to the existing supply is required.

Scottish & Southern Electricity Networks (SSEN) has been notified of the planned connection of the new ASHPs to the system alongside the supply upgrade to 70kVA.

E4 LOW VOLTAGE SWITCHGEAR AND CABLES

E4.1 GENERAL

The Electrical Sub-Contractor is to design, supply, install, connect and test & commission the proposed electrical installation for both the Town Hall and Neeld Hall buildings.

E4.2 MAIN PANELBOARD/SWITCHBOARD

There is no provision to install new panel board/switchboard equipment on either Town Hall or Neeld Hall buildings.

E4.3 DISTRIBUTION BOARDS

There is no provision to install new distribution boards on either Town Hall or Neeld Hall buildings.

E5 FINAL CIRCUITS AND GENERAL EQUIPMENT

E5.1 GENERAL

The Electrical Sub-Contractor is to supply, install, connect and test & commission the electrical installation as shown on E3 drawings. Local fused connection units are to be provided for fixed equipment. Final circuits will be of the ring or radial type.

For finishes generally see the Architects drawings and finishes schedules. The Electrical Sub-Contractor is to make do allowance in their Tender for the installation to suit the proposed finishes in all areas, without any additional cost.

Where cables, trunking, and conduit are visible, being surface fixed or suspended from soffits in areas with no suspended ceiling, all routes and arrangements will be subject to agreement with the Architect prior to installation.

The term 'point' in this Specification applies to any electrical outlet, termination, accessory, control device, or equipment. All points must be fixed in locations described or indicated on the Architects drawings. The right is reserved; however, to make such local adjustment or alterations as may be found expedient during the progress of the works, without incurring any additional cost, provided the Electrical Sub-Contractor is not committed by such instructions to the dismantling of any work already executed.

The Electrical Sub-Contractor must obtain from the Architects latest drawings, and from site, all information available that is likely to affect the installation of any part of their works, including furniture details. Any points installed prior to such consultation become the Electrical Sub-Contractor's responsibility and the cost of any subsequent alteration will then have to be borne by the Electrical Sub-Contractor.

Where a tiled finish is to be provided to walls, floors, or ceilings, all items of electrical equipment and accessories are to be installed in a symmetrical and regular manner with respect to the tile or grid layout. In general, this will require the fixing of fittings and accessories in the centre of a tile or, where this is impractical, symmetrically about the join of two or more tiles. Details are to be agreed with the Architect and Consulting Engineer prior to the installation of any related first fix works.

The Electrical Sub-Contractor is to provide comprehensive information, in drawing form, relating to points and service runs in, on, and above suspended ceilings following co-ordination with other trades. The Electrical Sub-Contractor is to liaise, via the Main Contractor, with all other trades to ensure that electrical services are fully co-ordinated with other services and with the building structure and fabric. The Electrical Sub-Contractor is to produce such drawings as are necessary to demonstrate the results of this co-ordination exercise.

Where equipment is mounted in a horizontal line, the setting out is to be such that a common centre line can be drawn through the centre line of each individual item.

Where two or more items of equipment are mounted at different heights, but in close proximity on a common wall or surface, they are to be arranged such that a common vertical centre line can be drawn through the centre line of each individual item. This requirement is to be particularly observed where outlets/equipment for different service elements are shown on separate drawings for the same area, or where symbols for outlets on drawings have been indicated side by side for clarity.

Any indicative routes and sizes of trunking and conduits indicated on the drawings are for guidance only. It will be the Electrical Sub-Contractor's responsibility to ensure that final routes and sizes meet the requirements of the IET Wiring Regulations (Selection and Erection Guidance Notes, Appendix 'A'), and the manufacturers recommendations. No additional costs will be entertained for final cable tray, trunking, conduit requirements necessary as a result of this exercise.

The Electrical Sub-Contractor is to liaise and co-ordinate fully with all other trades, and in particular the Mechanical Contractor, to ensure that there are no clashes and that all routes are planned and agreed prior to installation. No additional costs will be entertained due to failure to comply with this requirement.

E5.2 SYSTEM REQUIREMENTS

E5.2.1 General

Final circuits will be rewirable with twin & earth in trunking/conduit or XLPE/SWA/LSOH armoured cabling where appropriate externally. Where concealed from view, or enclosed in walls, conduit is to be in plastic, provided that it can be buried 50mm deep within the walls so that mechanical protection is not required for the wiring. Where on view to occupants, in plant areas and installed close to the wall surface, it is to be in galvanised steel.

All 13A socket outlet circuits not exceeding 32A and external power points will have RCD protection to avoid unnecessary tripping due to a fault on another circuit.

RCD protection types will be generally as follows - refer to distribution board schedules for details.

Specifier note – RCD type to be added to distribution board schedules

- Type AC – General purpose use, typically: immersion heaters, oven/hobs with resistive elements, electric showers.
- Type A – Equipment incorporating electronic elements, typically: single-phase with electronic components, typically single-phase inverters, Class 1 IT equipment, washing machines, lighting controls, induction hobs.
- Type F – Frequency controlled equipment/appliances, typically: dishwashers, power tools, air conditioning units
- Type B – Three-phase electronic equipment, typically: invertors for speed control, UPS, industrial machines, electric vehicle charging.

E5.3 SYSTEM DESCRIPTION

E5.3.1 Accessories (General)

Fused Connection Units: 13A switched or unswitched with neon indicator. Final details appropriate to the equipment connected.

Double Pole Switches: 20A or 32A rated and complete with neon indicator.

Manufacturer and range: MK Electrical – Logic Plus
or equal and approved.

E5.3.2 Weatherproof Equipment

Where weatherproof equipment and accessories are required, or where isolators are provided adjacent to mechanical plant and equipment, they are to be of the following types and manufacture:

Switch sockets: 13A rated, double pole, surface fixed units, with IP56 enclosure and complete with 30mA integral RCD.

32 – 125A rated, double and triple pole, surface fixed units, with IP44 and

IP67 enclosure and complete with 30mA integral RCD as required.

Manufacturer: M.K. Electric Ltd. - MasterSeal range

or equal and approved.

Isolators:

Of the rating indicated on the drawings or elsewhere in this Specification and typically for plant supply connections.

IP65 degree of protection

Manufacturer: MEM - RDM

or equal and approved.

E5.3.3 Equipment Mounting Heights

Electrical equipment is generally to be installed to comply with the requirements of the Building Regulations Part M.

For this project, the following equipment mounting heights generally apply, however the Architects setting out drawings should be referred to for confirmation.

Item	Mounting Height
Switches	1200mm to centre line

E6 LIGHTING AND EMERGENCY LIGHTING

E6.1 GENERAL

The Electrical Sub-Contractor is to design, supply, install, connect, test & commission and demonstrate the complete lighting installations.

Lighting points and switches are to be related to the building features (i.e. doorways, blockwork, furniture, steelwork, windows, ceiling tiles, wall tiles, etc.), and therefore correct positioning and alignment are essential and are to be subject to the final approval of the Architect prior to installation.

A technical submission is to be provided to confirm the lighting design and each luminaire type prior to ordering. The technical submission is to take the form of a lighting catalogue, in PDF format, identifying each and every luminaire type against the drawings.

E6.2 SYSTEM REQUIREMENTS

E6.2.1 General

The lighting Installation is to be designed in accordance with the following:

- CIBSE Code for interior lighting.
- Building Regulations Part L, volume 2: Conservation of fuel and power.
- BS 5266-1: Emergency lighting.

Lighting will be generally provided by low maintenance, low energy fluorescent and LED fittings.

E6.2.2 Illumination Levels

The Electrical Sub-Contractor is to provide illumination level calculations for both normal and emergency lighting for all areas. The calculations are to include for the Maintenance Factor (Light Loss Factor) to be calculated using the following parameters:

- RSMF – a normal environment with one half year between cleanings.
- LMF – (internal) a normal environment with one half year between cleanings; (external) a dirty environment with one year between cleanings.
- LLMF – generally an estimated yearly operating time of 1365 hours. Based on the lighting being in use for 10 hours per days, 39 weeks per year.

Where daylighting is being utilised the operating time can be assumed to be 40% less than that noted above.

- LSF – lamps will be replaced as and when they fail, i.e., spot replacement.

Reflectance values will be determined by referring to the Architects finishes.

E6.2.3 Lighting Efficacy

Lighting is to meet the recommended minimum standards for efficacy as follows:

- Average initial efficacy – to be not less than 95 luminaire-lumens per circuit-watt (averaged over the whole area in the building);

The Electrical Sub-Contractor is to provide all calculations to confirm compliance.

E6.3 SYSTEM DESCRIPTION

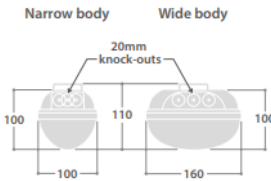
E6.3.1 Luminaires

The lighting installation will consist of the luminaires typically as indicated on the drawings and of the make and pattern as described in the Luminaire Schedule. Luminaires are to be supplied, installed and connected by the Electrical Sub-Contractor, complete with all lamps, fixings, connections and accessories.

Any suspended luminaires are to be supported independently of the ceiling tiles, ceiling or ceiling grid, with, where appropriate, suitable grommets for cables and wires.

Luminaires mounted on or in suspended ceilings, or on wire suspensions are to be finally connected via a plug-in ceiling rose and HR flexible or coiled cable (as appropriate).

Luminaire schedule:

Description	Manufacturer and Type	Lamp Type and Technical Details	Image	Dimensions
Linear LED IP65 non-corrosive luminaire	Thorlux ThoroProof Available with emergency backup. Or equal and approved.	LED -3700lm 4000K 23W Control Gear: Electronic CRI:80 Emergency: Integral self-test		

The Electrical Sub-Contractor is to include in this tender for providing a sample of all luminaires for approval by the Consulting Engineer and Architect prior to ordering.

E6.3.2 Emergency Lighting

The Electrical Sub-Contractor is to design, supply, install, connect and test & commission a complete emergency lighting installation. The system is to comply with the recommendations of BS 5266 and BS EN 60598.2.22.

The emergency lighting is to be switch maintained.

The system is to comprise illuminated signs and general lighting luminaires fitted with emergency conversion packs (either integral to the luminaire or fixed adjacent as appropriate).

Emergency lighting luminaires are to derive their non-switched mains supply in each case from the respective lighting circuit to provide cover for both local MCB failure and full mains supply failure.

Each luminaire is to be complete with its own battery, charger unit, and inverter.

Each luminaire is to incorporate a visible, Green "Charge Healthy" LED indicator that is visible whilst the luminaire is in operation.

A test key switch is to be provided to test the function of all emergency luminaires simultaneously.

Manufacturer: CP Electronics – ELT10 test key switch

The unit is to be located adjacent to the floor distribution board and clearly labelled. The ELT-REL relay units are to be provided as necessary if the circuit loads exceed those recommended by the manufacturer.

E6.4 CONTROL REQUIREMENTS

Lighting controls are to be as simple as possible to ensure that the lighting is not on throughout the day when spaces are unoccupied or when daylight can provide adequate lighting and are to comply with the Building Regulations Part L Vol2.

Switches will be one, two-way, momentary action types as appropriate with the number of gangs to suit the switching arrangement in respective rooms. Where necessary, phase barriers and warning notices are to be provided in switches.

E7 FIRE ALARM SYSTEM

2No smoke detectors within the Town Hall are to be relocated to suit the new design. The Electrical Sub-Contractor is to engage with the incumbent specialist to design, supply, install, connect, test & commission and demonstrate a complete fire alarm system in accordance with BS 5839-1.

Specialist:

JG Fire and Security Limited, info@jgfireandsecurity.co.uk

Prior to installation work commencing the Electrical Sub-Contractor and the specialist are to agree all methods of installing the fire alarm wiring with the Architect and client, and identify the agreed methods of installation and the general wiring routes on a set of installation drawings.

E8 WIRING TO MECHANICAL SERVICES EQUIPMENT AND CONTROLS

E8.1 GENERAL

The Electrical Sub-Contractor is to supply, install, connect and test & commission all power supply wiring associated with equipment and ancillary electrical items forming part of the Mechanical Sub-Contractor's works.

Where local switch disconnectors, fused connection units, etc., are required, they are to be supplied, installed and connected by the Electrical Sub-Contractor in accordance with the requirements of other sections of this specification and are to be complete with any necessary supports and upstands. The Electrical Sub-Contractor is to note that all switch disconnectors in plantrooms and externally are to be the weatherproof rotary handle type capable of being padlocked in the 'off' position. The ratings will be as the protective device rating.

Switch disconnectors are to be positioned directly adjacent to (within 1m), or on, each item of plant in a readily accessible position and the Electrical Sub-Contractor is to allow for providing a Unistrut frame fixed at high and low level, e.g., over low-level pumps, etc., to support the switch disconnector and cables and/or containment as necessary. Final connections to plant and equipment are to be either by flexible Nylon conduit, as Kopex or equal, or rubber flex wiring connections to provide vibration isolation.

The Mechanical Sub-Contractor will supply and install all the controls field wiring, and this is to be laid on a separate cable tray/trunking on the primary services distribution routes. The Electrical Sub-Contractor is to supply and install all primary distribution containment and is to liaise with the Mechanical Sub-Contractor to ensure that all requirements for containment are adequately allowed for.

E8.1.1 Air Source Heat Pump (ASHP)

The Electrical Sub-Contractor is to supply and install an isolator adjacent to the external ASHP and wiring from a local floor distribution board and make the final flexible connection to the air source heat pump. The Electrical Sub-Contractor to supply and install electric meters to the air source heat pump's final circuit.

The Mechanical Sub-Contractor will supply and install all the respective controls field wiring and this is to be laid on a separate cable tray/trunking on the primary services distribution routes.

E8.1.2 Air Handling Units (AHU)

The Electrical Sub-Contractor is to supply and install isolators and wiring from a local floor distribution board and make the final flexible connection to the respective air handling units. The Electrical Sub-Contractor to supply and install electric meter to air handling unit's final circuits.

The Mechanical Sub-Contractor will supply and install all the respective controls field wiring and this is to be laid on a separate cable tray/trunking on the primary services distribution routes.

E8.1.3 Condensing Unit (CU)

The Electrical Sub-Contractor is to supply and install isolator and wiring from a local floor distribution board and make the final flexible connection to the respective condensing units. The Electrical Sub-Contractor to supply and install electric meter to condensing unit's final circuit.

The Mechanical Sub-Contractor will supply and install all the respective controls field wiring and this is to be laid on a separate cable tray/trunking on the primary services distribution routes.