APPENDIX 3C: GENERAL SPECIFICATION

S12 HOT AND COLD WATER

GENERAL

110 MAINS COLD WATER SUPPLY

120 STORAGE COLD WATER SUPPLY

130 INSTANTANEOUS HOT WATER SUPPLY

140 DIRECT HOT WATER STORAGE SUPPLY

150 INDIRECT HOT WATER STORAGE SUPPLY

PERFORMANCE

210 DESIGN AND DETAILING
- Design: Complete the design and detailing of the hot and cold water supply.
- Standard: To BS 6700.
- Drawings: Submit drawings showing equipment positions and pipeline routes.

230 CENTRALIZED HOT WATER STORAGE
- System design: Design the system to meet the following requirements:
  - Storage capacity:
  - Primary heat source: Capable of raising temperature of water from 10°C to 60°C within one hour.

235 PIPELINE SIZES
- Sizing: Calculate sizes to meet simultaneous demand for the building in accordance with BS 6700 Appendix D. Submit proposals.
- Performance:
  - Water velocity (maximum): 1.3 m/s for hot water and 2.0 m/s for cold water.

240 DRAW OFF REQUIREMENTS
- WC cisterns (to fill in 2 minutes):
- Discharge rate (design): 0.13 L/s.
- WC pressure flushing valves:
- Discharge rate (design): 1.5 L/s.
- WC flushing troughs:
  - Discharge rate (design): 0.15 L/s.
- Urinal cisterns (each position served):
  - Discharge rate (design): 0.004 L/s.
- Urinal flushing valve:
  - Discharge rate (design): 0.3 L/s.
- Washbasins (pillar or mixer taps):
  - Discharge rate (design): 0.15 L/s.
- Handbasins (pillar or mixer taps):
  - Discharge rate (design): 0.1 L/s.
- Handbasin (spray or spray mixer taps):
  - Discharge rate (minimum): 0.05 L/s.

- Bidets:
  - Discharge rate (design): 0.2 L/s.
- Baths (G¾):
  - Discharge rate (design): 0.3 L/s.
- Baths (G1):
  - Discharge rate (design): 0.6 L/s.
- Shower heads:
  - Discharge rate (minimum): 0.2 L/s.
- Kitchen sinks (G½):
  - Discharge rate (design): 0.2 L/s.
- Kitchen sinks (G¾):
  - Discharge rate (design): 0.3 L/s.
- Kitchen sinks (G1):
  - Discharge rate (design): 0.6 L/s.
- Washing machines:
  - Discharge rate (design): 0.2 L/s.
- Dish-washing machines:
  - Discharge rate (design): 0.15 L/s.

PRODUCTS

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

320 GAS FIRED HOT WATER BOILERS/ CIRCULATORS
- Standard: To BS 6332-1 or BS EN 297.

330 GAS FIRED INSTANTANEOUS WATER HEATERS
- Standard: To BS EN 26.

340 ELECTRIC INSTANTANEOUS WATER HEATERS
- Standard: To BS EN 60335-2-35, BEAB approved.

350 ELECTRIC INSTANTANEOUS SHOWER UNITS
- Standard: To BS EN 60335-2-35, BEAB approved.

360 GAS FIRED STORAGE WATER HEATERS
- Standard: To BS EN 89.

370 ELECTRIC STORAGE WATER HEATERS
- Standard: To BS EN 60335-2-21, BEAB approved.

380 METAL FLUE PIPES
- Standard: To BS 715.

390 CISTERNS FOR NON-POTABLE WATER
- Standard:
  - Moulded plastics: To BS 4213.
  - GRP: To BS EN 13280.
  - Valves: Float operated diaphragm type to BS 1212-2 or -3 with plastics float to BS 2456, size to suit water pressure.

395 CISTERNS FOR POTABLE WATER
- Standards: To BS 4213 and BS 7181.
- Material: Moulded plastics.

- Valves: Float operated diaphragm type to BS 1212-2 or -3 with plastics float to BS 2456, size to suit water pressure.

410 DIRECT HOT WATER STORAGE CYLINDERS
- Standard: To BS 1566-1, Kitemark certified.

411 DOUBLE FEED INDIRECT HOT WATER STORAGE CYLINDERS
- Standard: To BS 1566-1, Kitemark certified.

412 SINGLE FEED INDIRECT HOT WATER STORAGE CYLINDERS
- Standard: To BS 1566-2, Kitemark certified.

420 DIRECT INSULATED COMBINATION UNITS
- Standard: To BS 3198, Kitemark certified.

421 DOUBLE FEED INDIRECT INSULATED COMBINATION UNITS
- Standard: To BS 3198, Kitemark certified.

422 SINGLE FEED INDIRECT INSULATED COMBINATION UNITS
- Standard: To BS 3198, Kitemark certified.

430 UNVENTED HOT WATER STORAGE
- Standard: To BS 7206.

440 IMMERSION HEATERS
- Standard: To BS EN 60335-2-73, BEAB approved.

510 COPPER PIPELINES FOR GENERAL USE
- Standard: To BS EN 1057, Kitemark certified.
- Temper, general use: Half hard R250.
- Wall thickness (nominal), general use:
  - Nominal OD 6, 8, 10 and 12 mm: 0.6 mm.
  - Nominal OD 15 mm: 0.7 mm.
  - Nominal OD 22 and 28 mm: 0.9 mm.
  - Nominal OD 35 and 42 mm: 1.2 mm.
- Jointing generally: Integral lead free solder ring capillary fittings to BS EN 1254-1, Kitemark certified.
- Connections to appliances and equipment: Select from:
  - Compression fittings: To BS EN 1254-2, Kitemark certified.
  - Fittings with threaded ends: To BS EN 1254-4.

515 COPPER PIPELINES FOR UNDERGROUND USE
- Standard: To BS EN 1057, Kitemark certified.
- Temper, underground use: Soft coil R220 or half hard R250.
- Finish: Seamless polyethylene to BS 3412.

- Wall thickness (nominal), underground use:
  - Nominal OD 6, 8, 10 and 12 mm: 0.8 mm.
  - Nominal OD 15 mm: 1.0 mm.
  - Nominal OD 22 and 28 mm: 1.2 mm.
  - Nominal OD 35 and 42 mm: 1.5 mm.

- Jointing generally: Integral lead free solder ring capillary fittings to BS EN 1254-1, Kitemark certified.

- Connections to appliances and equipment: Select from
  - Compression fittings: To BS EN 1254-2, Kitemark certified.
  - Fittings with threaded ends: To BS EN 1254-4.

520 CHROMIUM PLATED COPPER PIPELINES
- Standard: To BS EN 1057, Kitemark certified.
  - Finish: To BS EN 12540, service condition 2.
- Temper: Half hard R250.
- Wall thicknesses (nominal):
  - Nominal OD 6, 8, 10 and 12 mm: 0.6 mm.
  - Nominal OD 15 mm, 0.9 mm for 22 and 28 mm: 0.7 mm.
  - Nominal OD 35 and 42 mm: 1.2 mm.
- Jointing: Type A compression fittings to BS EN 1254-2.
  - Finish: Chromium plate to BS EN 12540, service condition 3.

530 STAINLESS STEEL PIPELINES
- Standard: To BS EN 10312.

545 POLYETHYLENE PIPELINES FOR USE BELOW GROUND
- Standard: To BS 6572, Kitemark certified.
- Jointing: Compression fittings.
- Colour: Blue.

550 GAS PIPELINES
- Standard: To BS 6891.

560 WARNING/ OVERFLOW PIPES TO CISTERNS
- Minimum OD: Greater than inlet pipe OD and at least 22 mm.

570 INSULATION TO PIPELINES
- Material: Preformed flexible closed cell or mineral fibre split tube.
- Thermal conductivity (maximum): 0.04 W/m·K.
- Thickness:
  - Hot water pipelines: Equal to the outside diameter of the pipe up to a maximum of 40 mm.
  - Internal cold water pipelines: 25 mm.
  - Roof space cold water pipelines: 32 mm.
  - External cold water pipelines: 38 mm.
  - Fire performance: Class 1 spread of flame when tested to BS 476-7.

590 PIPEDUCTS
- Pipeduct sealant: A nonhardening, noncracking, water resistant compound.

610 TIMERS
- Standards: To BS EN 60730 and BS EN 61058. BEAB approved.

620 THERMOSTATS
- Standards: To BS EN 60730 and BS EN 61058, strap-on type.

630 VALVES GENERALLY
- Types: Approved for the purpose by local water supply undertaker and of appropriate pressure/ temperature ratings.
- Control of valves: Fit with handwheels for isolation and lockshields for isolation and regulation of circuits or equipment.

640 ABOVE GROUND STOP VALVES AND DRAW-OFF TAPS

- Standard: To BS 1010-2, Kitemark certified.
- Material: Copper alloy.

641 BELOW GROUND STOP VALVES
- Standard: To BS 5433.
- Material: DZR copper alloy CZ 132.

650 GATE VALVES
- Standard: To BS 5154, series B, Kitemark certified.
- Material: Copper alloy.

655 DOUBLE CHECK VALVE ASSEMBLIES
- Standard: Check valves to BS 6282-1 with intervening test cock to BS 2879.
- Material: Copper alloy.

660 FLOW REDUCING/ SERVICING VALVES
- Type: Screw operated ball type.

665 DRAINING TAPS
- Standard: To BS 2879, type 1, hose connection pattern, Kitemark certified.
- Material: Copper alloy.

690 GAS PLUG COCKS
- Standard: To BS 1552.

691 GAS BALL VALVES
- Standard: To BS EN 331.

695 SECONDARY GAS METERS
- Standard: To BS EN 1359.

EXECUTION

710 INSTALLATION GENERALLY
- Installation: To BS 6700.
- 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, use corrosion resistant fittings/ fixings and avoid contact between dissimilar metals by use of suitable washers, gaskets, etc.

740 INSTALLATION OF CISTERNS
- Outlet positions: Connect lowest outlets at least 30 mm above bottom of cistern.
- Access: Fix cistern with a minimum clear space of 350 mm above, or 225 mm if the cistern does not exceed 450 mm in any dimension.

745 INSTALLATION OF WARNING/ OVERFLOW PIPES TO CISTERNS
- Difference (minimum) between normal water level and overflow level:
  - Cold water storage cisterns: The greater of 32 mm or the bore of warning pipe.
  - Feed and expansion cisterns: Sufficient to allow 20% increase in the volume of water in the tank, plus 25 mm.
- Vertical distance (minimum) of water supply inlet above overflow level: Bore of warning pipe.

- Fall (minimum): 1 in 10.
- Installation: Support to prevent sagging. Terminate pipes separately in prominent positions with turned down ends. Turn down within the cistern. Terminate 50 mm below normal water level.
- Insulation: Insulate within the building where the pipe is in an uninsulated space and subject to freezing.

747 INSTALLATION OF VENT PIPES OVER CISTERNS
- Route: Install with no restrictions or valves and rising continuously from system connection to discharge over cistern.
- Internal diameter (minimum): 20 mm.

750 UNVENTED HOT WATER STORAGE DISCHARGE PIPES
- Fall (minimum): 1 in 80.
- Discharge: Via an air break and tundish.

760 INSTALLATION OF WATER SOFTENERS
- Supply continuity: Fit bypass pipe and stop valves for continuity of water supply if softener becomes inoperable or is removed.
- Drains: Connect overflow/ drain lines to trap and waste.
- Back siphonage: Provide for prevention of back siphonage of brine during regeneration process.

770 PIPELINE INSTALLATION
- Appearance: Install pipes straight, and parallel or perpendicular to walls, floors, ceilings, and other building elements.
- Pipeline finish: Smooth, consistent bore, clean, free from defects, e.g. external scratching, toolmarks, distortion, wrinkling, and cracks.
- Concealment: Generally conceal pipelines within floor, ceiling and/ or roof voids.
- Access: Locate runs to facilitate installation of equipment, accessories and insulation and allow access for maintenance.
- Arrangement of hot and cold pipelines: Run hot pipelines above cold where routed together horizontally. Do not run cold water pipelines near to heating pipelines or through heated spaces.
- Electrical equipment: Install pipelines clear of electrical equipment. Do not run pipelines through electrical enclosures or above switch gear distribution boards or the like.
- Insulation allowance: Provide space around pipelines to fit insulation without compression.

780 PIPELINE FIXING
- Fixing: Secure and neat.
- Joints, bends and offsets: Minimise.
- Pipeline support: Prevent strain, e.g. from the operation of taps or valves.
- Drains and vents: Fix pipelines to falls. Fit draining taps at low points and vents at high points.
- Thermal expansion and contraction: Allow for thermal movement of pipelines. Isolate from structure. Prevent noise or abrasion of pipelines caused by movement. Sleeve pipelines passing through walls, floors or other building elements.
- Dirt, insects or rodents: Prevent ingress.

790 SUPPORTS FOR COPPER/ STAINLESS STEEL PIPELINES
- Spacing: Fix securely and true to line at the following maximum centres:
  - 15 and 22 mm pipe OD:
    1200 mm horizontal.
    1800 mm vertical.
  - 28 and 35 mm pipe OD:
    1800 mm horizontal.

2400 mm vertical.
- 42 and 54 mm pipe OD:
  2400 mm horizontal.
  3000 mm vertical.
- Additional supports: Locate within 150 mm of connections, junctions and changes of direction.

795 SUPPORTS FOR EXPOSED THERMOPLASTICS PIPELINES
- Spacing: Fix securely and true to line at the following maximum centres:
  - Up to 16 mm pipe OD:
    300 mm horizontal.
    500 mm vertical.
  - 17-25 mm pipe OD:
    500 mm horizontal.
    800 mm vertical.
  - 26-32 mm pipe OD:
    800 mm horizontal.
    1000 mm vertical.
- Additional supports: Locate within 150 mm of connections, junctions and changes of direction.

810 BENDS IN THERMOPLASTICS PIPELINES
- Bends: Do not use 90° elbow fittings instead of 90° bends.
- Large radius bends: Support at maximum centres.
- 90° bends: Fix pipe clips either side of bend.
- Small radius bends: Fully support 90° bends with cold form bend fixtures.

820 PIPELINE SPACING
- Clearance (minimum) to face of wall-fixed pipes or pipe insulation:
  - From floor: 150 mm.
  - From ceiling: 50 mm.
  - From wall: 15 mm.
  - Between pipes: 25 mm.
  - From electrical conduit, cables, etc: 150 mm.

830 JOINTS IN COPPER/ STAINLESS STEEL PIPELINES
- Preparation: Cut pipes square. Remove burrs.
- Joints: Neat, clean and fully sealed. Install pipe ends into joint fittings to full depth.
- Bends: Do not use formed bends on exposed pipework, except for small offsets. Form changes of direction with radius fittings.
- Adaptors for connecting dissimilar materials: Purpose designed.
- Substrate and plastics pipes and fittings: Do not damage, e.g. by heat when forming soldered joints.
- Flux residue: Clean off.

831 CAPILLARY JOINTS IN PLASTICS COATED PIPELINES
- Plastics coating: Do not damage, e.g. by direct or indirect heat. Wrap completed joint (when cool) with PVC tape of matching colour, half lapped.

835 JOINTS IN THERMOPLASTICS PIPELINES
- Fittings and accessories for joints: Purpose designed.
- Preparation: Cut pipes square. Remove burrs.
- Joints: Neat, clean and fully sealed. Install pipe ends into joint fittings to full depth.
- Compression fittings: Do not overtighten.

840 PIPELINES ENTERING BUILDINGS
- Depth: Lay pipes at least 750 mm below finished ground level.

- Pipelines rising into building within 750 mm of the external face of the external wall or passing through a ventilated void below floor level: Insulate from finished floor level to 600 mm beyond external face of building.
- Ends of pipeducts: Seal both ends to a depth of at least 150 mm.

850 EXTERNAL SUPPLY PIPELINES
- Pipelines exposed to air and less than 750 mm below finished ground level: Insulate.

860 INSTALLATION OF INSULATION TO PIPELINES
- Cold water pipelines: Insulate in unheated spaces and to potable cold water pipelines.
- Hot water pipelines: Insulate, except for short lengths in prominent positions next to appliances.
- Appearance: Fix securely and neatly. Make continuous over fittings and at supports. Leave no gaps. Locate split on ‘blind’ side of pipeline.
- Timing: Fit insulation after testing.

865 INSTALLATION OF INSULATION TO CISTERNS
- General: Fix securely to sides and top of cisterns. Leave no gaps.
- Access cover: Allow removal of cover with minimum disturbance to insulation.
- Underside of cistern: Insulate where exposed in unheated spaces.

870 INSTALLATION OF VALVES
- Isolation and regulation valves: Provide on equipment and subcircuits.
- Access: Locate where valves can be readily operated and maintained and next to equipment which is to be isolated.
- Connection to pipework: Fit with joints to suit the pipe material.

880 INSTALLATION OF GAS PIPELINES
- Standard: To BS 6891.

885 INSTALLATION OF GAS METERS
- Standard: To BS 6400-1.

COMPLETION

910 TESTING
- Testing: To BS 6700.
  - Notice (minimum): 3 days.
- Preparation: Secure and clean pipework and equipment. Fit cistern/ tank covers.
- Flushing and filling: To BS 6700.
- Leak testing: Start boiler and run the system until all parts are at normal operating temperatures and then allow to cool to cold condition for a period of 3 h.
- Pressure testing: At both hot and cold conditions joints, fittings and components must be free from leaks and signs of physical distress when tested for at least 1 h as follows:
  - Systems fed directly from the mains and systems downstream of a booster pump: Apply a test pressure equal to 1.5 times the maximum pressure to which the installation or relevant part is designed to be subjected in operation.
  - Systems fed from storage: Apply a test pressure equal to the pressure produced when the storage cistern is filled to its normal maximum operating level.
  - Inaccessible or buried pipelines: Carry out hydraulic pressure test to twice the working pressure.

920 SYSTEM DISINFECTION
- Disinfection: To BS 6700.

930 SETTING TO WORK
- Commissioning: To BS 6700.
- Equipment: Check and adjust operation of equipment, controls and safety devices.
- Outlets: Check operation of outlets for satisfactory rate of flow and temperature.

940 TESTING SERVICE PIPELINES
- Test method: Disconnect from the mains, fill with potable water, exclude air, and apply at least twice the working pressure for 1h.
- Test criterion: No leakage.

950 TESTING GAS PIPELINES
- Testing and purging: To BS 6891.

960 DOCUMENTATION
- Manufacturers' operating and maintenance instructions: Submit for equipment and controls.
- System operating and maintenance instructions: Submit for the system as a whole giving optimum settings for controls.
- Record drawings: Submit drawings showing the location of circuits and operating controls.

970 OPERATING TOOLS
- Tools: Supply tools for operation, maintenance and cleaning purposes.
- Valve keys: Supply keys for valves and vents.

980 LABELS
- Valve labels: Provide labels on isolating and regulating valves on primary circuits, stating their function.

P31 HOLES/ CHASES/ COVERS/ SUPPORTS FOR SERVICES

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

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

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

230 NOTCHES AND HOLES IN STRUCTURAL TIMBER
- General: Avoid if possible.
- Sizes: Minimum needed to accommodate services.
- Position: Do not locate near knots or other defects.
- Notches and holes in same joist: Minimum 100 mm apart horizontally.
- Notches in joists: Locate at top. Form by sawing down to a drilled hole.
  - Depth (maximum): 0.125 x joist depth.
  - Distance from supports: Between 0.07 and 0.25 x span.
- Holes in joists: Locate on neutral axis.
  - Diameter (maximum): 0.25 x joist depth.
  - Centres (minimum): 3 x diameter of largest hole.
  - Distance from supports: Between 0.25 and 0.4 of span.
- Notches in roof rafters, struts and truss members: Not permitted.
- Holes in struts and columns: Locate on neutral axis.
  - Diameter (maximum): 0.25 x minimum width of member.
  - Centres (minimum): 3 x diameter of largest hole.
  - Distance from ends: Between 0.25 and 0.4 of span.

310 PIPE SLEEVES
- Sleeves: Extend through full thickness of wall or floor. Position accurately.
  - Clearance around service (maximum): 20 mm or diameter of service, whichever is the lesser.
  - Installation: Bed solid.
- Space between service and sleeve to be sealed
- Where exposed to view: Finish bedding and sealing neatly.

320 INTUMESCENT COLLARS
- Fixings must not incorporate plastics materials.
- Fire resistance to match that of the structure it pentrates

- Integrity: Fit tightly and accurately to structure and pipe to maintain fire resistance. Fill gaps between collar and structure and/ or pipe with intumescent material.

V90 ELECTRICAL INSTALLATION

PERFORMANCE

210 GENERAL DESIGN
- Standards: To BS 7671 and the requirements of the electricity distributor.
- Design: Complete the design and detailing of the electrical installation.
- Design information: Submit calculations, manufacturer's literature and drawings showing equipment positions and routes.
- Installation: Provide a safe, well insulated, earth protected system capable of serving the building.

220 INCOMING ELECTRICAL SUPPLY DESIGN
- Capacity: Determine the anticipated maximum demand of the installation.
- Establishing the supply: Manage and liase with the electricity distributor to establish an incoming electricity supply.
- Electricity supplier: EDF .
- Incoming earthing arrangement: Establish with the electricity distributor.
- Location: Coordinate the location of the incoming supply and establish the spatial requirements for the electricity distributor's equipment and metering.

230 LV DISTRIBUTION DESIGN
- Design: To cater for the complete working building.
- Equipment: Provide electrical supplies to equipment requiring power.

235 ARRANGEMENT OF PARTICULAR CIRCUITS
- Separation: Divide installation into separately controlled circuits.
- Further subdivision: As required.

280 EARTHING AND BONDING DESIGN
- Earthing, main bonding, supplementary bonding and protective conductors: In accordance with BS 7430.

PRODUCTS

310 PRODUCTS GENERALLY
- Standard: To BS 7671.
- CE Marking: Required.
- Proposals: Submit drawings, technical information and manufacturer's literature.

320 DISTRIBUTION BOARDS AND CONSUMER UNITS
- Standards: To BS 5486-12, -13 and BS EN 60439-3. ASTA certified.
- Rating: To suit maximum demand.
- Number of ways: Determine.
  - Spare capacity: 25% of max demand
- Circuit protection: Miniature circuit-breakers.
  - Standard: To BS EN 60898.
- Additional circuit protection:
  - Standard: To BS EN 61008-1 or BS EN 61009-1.
- Enclosure:
  - Ingress protection to BS EN 60529: _____ .

340 CONDUIT, TRUNKING AND DUCTING
- Standard: To BS 50086-1.
- Type: Suitable for location and use.

342 STEEL CONDUIT AND FITTINGS _____
- Standards: To BS 4568-1 and BS EN 50086.

343 PVC CONDUIT AND FITTINGS _____
- Standards: To BS EN 50086 and BS 4607-5.

350 STEEL SURFACE TRUNKING SYSTEMS
- Standard: To BS 4678-1.

355 PVC SURFACE TRUNKING SYSTEMS _____
- Standard: To BS 4678-4.
- Accessories and fittings: Factory made of the same material type, finish and thickness as cable trunking.

410 CABLES
- Standard: BASEC certified.

420 PROTECTIVE CONDUCTORS
- Type: Cable conductors with yellow/ green sheath.

430 ELECTRICAL ACCESSORIES
- Standard: To BS EN 60669-1.

580 EARTHING AND BONDING
- Earth electrodes: In accordance with BS 7430.
- Earth clamps: To BS 951.

585 EARTH BARS
- Separate earth bar: Required.
- Size: Determine.
- Material: Copper.

592 TIME SWITCHES
- Standards: To BS EN 60730-1 and -2-7. BEAB approved.

EXECUTION

610 EXECUTION GENERALLY
- Standard: To BS 7671.

630 CONNECTION TO INCOMING SUPPLY
- Main switchboard/ distribution board: Connect to main incoming metering equipment.

650 SWITCHGEAR INSTALLATION
- Clearance in front of switchgear (minimum): 1 m.
- Labelling: Permanently label each way, identifying circuit function, rating and cable size.

700 CABLES LAID DIRECTLY IN THE GROUND
- Cable bedding: 75 mm of sand.
- Backfilling: 75 mm of sand over cables, then as-dug material.
- Multiple cables in same trench: Set 150 mm apart.
- Cables below roads and hardstandings: Duct, derate if longer than 10 m.

710 CABLES ENTERING BUILDINGS FROM BELOW GROUND
- Pipeducts: Seal at both ends.
- Proposals: Submit drawings.

720 CABLE TRAY INSTALLATION
- Support: Submit proposals.
- Access: Provide space encompassing cable trays to permit access for installing and maintaining cables.
- Supports and fasteners: Avoid contact between dissimilar metals. Use corrosion resistant components in locations where moisture may occur.
- Cutting: Along an unperforated line. Minimize. Make good edges. Treat surface as the tray.

730 CABLE BASKET INSTALLATION
- Support: Submit proposals.
- Access: Provide space encompassing cable basket to permit access for installing and maintaining cables.
- Fittings: Side action bolt croppers.
- Supports and fasteners: Avoid contact between dissimilar metals. Use corrosion resistant components in locations where moisture may occur.

740 CONDUIT AND FITTINGS
- Fixing: Fix securely. Fix boxes independently of conduit.
- Location: Position vertically and horizontally in line with equipment served and parallel with building lines. Locate where accessible.
- Jointing:
  - Number of joints: Minimize.
  - Lengths of conduit: Maximize.
  - Cut ends: Remove burrs and plug during building works.
  - Movement joints in structure: Manufactured expansion coupling.
  - Threaded steel 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/ male brass bush and protective conductor.
- Changes of direction: Site machine-formed bends, junction boxes and proprietary components. Do not use elbows or tees. Alternatively, use conduit boxes.
- Connections to boxes, trunking, equipment and accessories: Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.

745 CONDUIT IN CONCRETE
- Fixing: Fix conduit securely to reinforcement. Fix boxes to formwork to prevent displacement.

748 DRAINAGE OF CONDUIT
- Drainage outlets: Locate at lowest points in conduit installed externally, and where condensation may occur.

750 INSTALLING TRUNKING/ DUCTING/ CABLE MANAGEMENT SYSTEMS
- Positioning: Accurate with respect to equipment served and parallel with other services, and where relevant, floor level and other building lines.
- Access: Provide space encompassing cable trunking to permit access for installing and maintaining cables.
- Jointing:
  - Number of joints: Minimize.
  - Lengths of conduit: Maximize.

    - Steel systems: Mechanical couplings. Do not weld. Fit a copper link at each joint to ensure electrical continuity.
- Movement: Fix securely. Restrain floor mounted systems during screeding.
- Junctions and changes of direction: Proprietary jointing units.
- Cable entries: Fit grommets, bushes or liners.
- Protection: Fit temporary blanking plates. Prevent ingress of screed and other extraneous materials.
- Service outlet units: Fit when cables are installed.

800 CABLE ROUTES
- Cables generally: Conceal wherever possible.
    - Concealed cable runs to wall switches and outlets: Align vertically with the accessory.
- Exposed cable runs: Submit proposals.
    - Orientation: Straight, vertical and/ or horizontal and parallel to walls.
- Distance from other services running parallel: 150 mm minimum.
    - Heating pipes: Position cables below.

810 INSTALLING CABLES
- General: Install cables neatly and securely. Protect against accidental damage, adverse environmental conditions, mechanical stress and deleterious substances.
- Timing: Do not start internal cabling until building enclosure provides permanently dry conditions.
- Jointing: At equipment and terminal fittings only.
- Cables passing through walls: Sleeve with conduit bushed at both ends.
- Cables surrounded or covered by insulation: Derate.

811 CABLES IN PLASTER
- Protection: Cover with galvanized steel channel nailed to substrate.

812 CABLES IN VERTICAL TRUNKING/ DUCTS
- Support: Pin racks or cleats at each floor level or at 5 m vertical centres, whichever is less.
- Heat barrier centres (maximum): 5 m.
- Heat barriers: Required except where fire resisting barriers are not provided.

813 CABLES IN ACCESSIBLE ROOF SPACES
- Cables running across ceiling joists: Fix to timber battens which are nailed to joists.

820 ARMOURED CABLE
- Temperature: Do not start installation if cable or ambient temperature is below 0°C, or has been below 0°C during the previous 24 h.
- Galvanized steel guards: Fit where cables are vulnerable to mechanical damage.
- Earthing: Bond armour to equipment and main earthing system.
- Connections to apparatus: Moisture proof, sealed glands and PVC shrouds.

825 PVC SHEATHED CABLE
- Temperature: Do not install cables if ambient temperature is below 5°C.

830 MICC CABLE
- Bending: Do not corrugate sheath.
- Connection to equipment and boxes: Fit PVC shrouded glands.
- Testing: Test each length immediately after fixing. Repeat test 24-48 h later.

840 ELECTRICAL ACCESSORIES AND EQUIPMENT
- Location: Coordinate with other wall or ceiling mounted equipment.
- Positioning: Accurately and square to vertical and horizontal axes.
- Alignment: Align adjacent accessories on the same vertical or horizontal axis.

- Mounting heights (finished floor level to underside of equipment/ accessory): _____ .

845 FINAL CONNECTIONS
- Size: Determine.
- Cable: Heat resisting white flex.
- Length: Allow for equipment removal and maintenance.

850 MULTIGANG SWITCHES
- General: Connect switches so that there is a logical relationship with luminaire positions. Fit blanks to unused switch spaces.
- Segregation: Internally segregate each phase with phase barriers and warning plates.

880 INSTALLING EARTH BARS
- Location: At incoming electrical service position.
- Mounting: Wall mounted on insulated supports.

890 LABELLING
- Identification and notices:
  - Standards: To BS 5499-5 and BS 5378-2.
  - Equipment: Label when a voltage exceeding 230 V is present.
- Distribution boards and consumer units: Card circuit chart within a reusable clear plastic cover. Fit to the inside of each unit. Include typed information identifying the outgoing circuit references, their device rating, cable type, size, circuit location and details. Label each outgoing way corresponding to the circuit chart.
- Sub-main cables: Label at both ends with proprietary cable marker sleeves.

895 ENGRAVING
- Metal and plastic accessories: Engrave, indicating their purpose.
- Emergency lighting test key switches: Describe their function.
- Multigang light switches: Describe the luminaire arrangement.

COMPLETION

910 FINAL FIX
- Accessory faceplates, luminaires and other equipment: Fit after completion of building painting.

915 CLEANING
- Electrical equipment: Clean immediately before handover.
- Equipment not supplied but installed and electrically connected: Clean immediately before handover.

920 INSPECTION AND TESTING
- Standard: To BS 7671.
- Notice before commencing tests (minimum): 24 hours.
- Labels and signs: Fix securely before system is tested.
- Inspection and completion certificates: Submit.
  - Number of copies: 1

990 DOCUMENTATION
- Timing: Submit at practical completion.
- Contents:
  - Full technical description of each system installed.
  - Manufacturer’s operating and maintenance instructions for fittings and apparatus.
  - Manufacturer’s guarantees and warranties.

- As-installed drawings showing circuits and their ratings and locations of fittings and apparatus.
- List of normal consumable items.