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SECTION 1
NOTE TO CONTRACTORS

Whilst some references in these specifications refer to US standards all specifications standards are to be based on current BS and or DIN standards.

SCOPE OF SPECIFICATIONS

The Specifications Manual of Contract Documents for Highway Works (MCDHW) Volume 1 Specification for Highway Works will define the general standards of workmanship and quality of materials relating to Civil Engineering Construction to be carried out for City University London and are to be used in conjunction with the Project Specification prepared for tender purposes.

In the event of any conflict with the Project Specification the latter is to be taken as correct.
CIVIL ENGINEERING

1.0 General

1.1 Site Preparation: Set out building to approved site plan, remove all loose rubbish, etc., grub up shrubs and roots, remove all vegetation and soil to a depth of 225 mm or as necessary, stockpile good topsoil for future use, cart away remainder and leave site ready for excavation under guidance from Operations Department.

1.2 Existing Obstructions: Break up, remove and cart away any existing obstruction, concrete path, base or foundations which affect excavation for the new work.

1.3 Existing Drainage: Stop off manholes, drains etc. where route affects new work, divert or make temporary arrangements as necessary for duration of new work.

1.4 Before new works are started which involves demolition of existing structures or excavating, adequate provision must be made to ensure the stability and protection of existing nearby structures. Markers will be fixed, levels taken and agreed with the City University representative.

1.5 City University London: For Projects involving demolition or modification to existing buildings, certain material and equipment may be required for re-use by City University London. Items of this nature are to be removed taking care to avoid damage and are to be set aside under cover for inspection and disposal by City University London.

1.6 Weatherproofing Existing Structures: For projects involving existing structures full provision is to be made for weather protection of any exposed sections.

1.7 Liaison: The City University London Project Manager appointed in charge of the work is to be kept informed of any instance which calls for variation from the work specified or in any contingency and instructions are to be accepted only from him/her.

2.0 Excavation and Earthworks

2.1 Excavation: Excavate to reduce levels over the area of the new works as required by the drawing and Project Specification. Carry out all necessary support measures to retain sides of excavation as required under Risk Assessment. Stockpile good topsoil for future use and cart away to tip as directed by the Environment Agency, after soil sampling excess spoil and material unsuitable for use as fill. Keep excavations free of standing water. Level and ram bottom of excavation. Refer to Series 600 Earthworks.

2.2 Filling: Suitable excavated material or imported material to be used in accordance with the specification. Refer to Series 600 Earthworks.
3.0 Piling

3.1 Site Investigation: Where necessary City University London will obtain a Site Investigation Report from a specialist firm in order to determine piling and foundation requirements. The choice of piles driven or CFA will be dependent on vibration issues, ground conditions and settlement. A guideline on settlement should be obtained with respect to using piles as several site structures have suffered due to being ground bearing. Refer to Series 1600 Piling and Embedded Retaining Walls.

3.2 Sub-Contractor: Piling will be carried out by a specialist piling sub-contractor after approval of system and company by City University London.

3.3 Records: Full records of all stages of the piling operation are to be handed to City University London for retention. Refer to Series 1600 Piling and Embedded Retaining Walls.

4.0 Concrete

4.1 Cement: Cement shall be ordinary Portland Cement in accordance with B.S.12, unless otherwise specified. Refer to Series 1700 Structural Concrete.

4.2 Aggregates: Aggregates shall be used in accordance with B.S.882. Refer to Series 1700 Structural Concrete.

4.3 Water: Refer to Series 1700 Structural Concrete.

4.4 Batching: Refer to Series 1700 Structural Concrete.

4.5 Mix: The required strength of concrete will be designed in accordance with the specification. Refer to Series 1700 Structural Concrete.

4.6 Mixing: Refer to Series 1700 Structural Concrete.

4.7 Placing: Concrete shall be placed and compacted within a maximum period of 30 minutes from mixing. Concrete in walls and deep sections shall be placed in formwork in 300mm thick layers full length and vibrated, successive layers must be placed and vibrated continuously until the formwork is filled. No voids are to be left and the reinforcement is not to be displaced.

4.8 Curing: The concrete shall be protected from excessive sunshine, rain, high winds and cold by adequate covering of Hessian or other approved material, for a maximum period of seven days, during which it is to be kept damp.

4.9 Cold Weather Concreting: When the ambient temperature is below 3°C (38°F) no concreting shall be carried out. Placed concrete shall be maintained above 3°C (38°F) until it has cured.

4.10 Ready Mixed Concrete: Ready mixed concrete will be used and supplied in accordance with B.S.5328. 1981, to the required strength, from an approved supplier, and each batch provided with a certificate showing details of mix including water content.
4.11 Test Cubes: Test cubes shall be allowed for, made, cured and tested for all structural concrete in accordance with parts 1 to 6 of B.S.1881. Records will be kept of all relevant data with copies provided to the City University Engineer or Representative. Refer to Series 1700 Structural Concrete.

4.12 Floor Slab: On the prepared formation or fill material, lay one layer of 1000g polythene, lapped 150mm at the joints. The surface of the floor slab shall be suitable to receive the specified finish. Where this is steel trowelled or power floated it shall be carried out as soon as access is possible to the surface. For monolithic granolithic finish, while the slab is still green the top 15mm will be formed by a specialist sub-contractor using Portland Cement, aggregate according to B.S.882 finishing with trowelling to a smooth surface. The surface shall be covered with polythene or similar approved covering for at least seven days before allowing access.

4.13 Soundness of Concrete: Finished concrete shall be sound, free from hollows and as specified. Any concrete considered by City University London to be defective for any reason shall be cut out and replaced with sound concrete at no additional cost to City University London.

4.14 Expansion Joints: All concrete work shall be formed allowing adequate expansion and construction joints in accordance with current codes of practice. Refer to Series 1700 Structural Concrete.

5.0 Reinforcement

Material:

5.1 All mild steel reinforcement shall be in accordance with B.S.4461:1969.

5.2 Hot rolled high tensile deformed bars with a guaranteed minimum yield stress of 414 MN/m² with elongation according to and otherwise according to B.S.4449;1978.

5.3 Cold worked twisted bars according to B.S.4461:1969.

5.4 Fabric reinforcement according to B.S.4483;1969 or B.S.4461:1969 and to be delivered in flat sheets.

5.5 Condition and Storage: All reinforcement shall be free from mill scale, pitting, loose rust, grease, oil, paint or other contamination and shall be stored to ensure cleanliness and freedom from damage.

5.6 Bending: Mild Steel shall be bent cold all in accordance with B.S.1478. High yield point steel shall be bent in accordance with manufacturer’s specifications. No flame cutting or welding of reinforcement steel is permitted.

5.7 Fixing: Reinforcement shall be accurately positioned by skilled fixers and securely fixed by tying with 16 SWG soft iron wire, ensuring the specified cover is maintained and a rigid cage formed. Refer to Series 1700 Structural Concrete.
6.0 Formwork

6.1 General: Formwork shall be accurately constructed and positioned, sufficiently tight to prevent leakage of fines and properly braced and connected so as to remain in position and provide adequate support to the concrete. Refer to Series 1700 Structural Concrete.

6.2 Surface: Surfaces of formwork shall be clean and oil treated, suitable in all respects for the final finish required to the concrete. Refer to Series 1700 Structural Concrete.

6.3 Holes: Holes required for services, etc., must be formed by formwork. No cutting of finished concrete is allowed without the permission of City University London.

6.4 Striking: Formwork shall be struck without damaging the concrete and according to good practice.

7.0 Drainage

7.1 Materials: Materials used in drainage work will be in accordance with the following British Standards:-

B.S.65 Glazed vitrified drains and sewer pipes

B.S.437 Cast iron spigot and socket drain pipes

B.S.497 C.I. gulley gratings and frames

B.S.539 Dimensions of drain fittings

B.S.5911 Concrete pipes

B.S.437 Schedule of cast iron drain fittings

B.S.1211 Centrifugally cast (spun) iron pipes for water, gas and sewage.

Refer to Series 500 Drainage and Service Ducts.

7.2 Additionally certain drainage systems may be required in stainless steel or polypropylene which will be detailed in the job specification.

7.3 Specific site standard should be adhered to for Trade Effluent Construction

7.4 Workmanship: Workmanship will be in accordance with the following British Standard Codes of Practice:


BS EN 1123-3:2004. Pipes and fittings of longitudinally welded hot-dip galvanized steel pipes with spigot and socket for waste water systems. Dimensions and special requirements for vacuum drainage systems and for drainage systems in ship-building
7.5 Inspection: Drainage shall be inspected, subjected to standard tests and approved by the appropriate local authority and City University Engineer before being backfilled. Refer to Series 500 Drainage and Service Ducts.

7.6 Haunching: Glazed or concrete pipes will be bedded or surrounded in the specified material and will not normally be used under a building structure, cast iron pipes being standard. If for any reason glazed or concrete pipes are allowed by City University London they must be completely surrounded by concrete with minimum of 150mm cover above the pipe. Refer to Series 500 Drainage and Service Ducts.

7.7 Obstruction: On completion of all work the drains shall be checked for obstruction by rodding and all debris removed and to the satisfaction of the City University Engineer.

7.8 Manholes: Manholes shall be constructed in engineering bricks class ‘B’ on a 150mm insitu base. Brickwork to be 225mm in thickness with joints neatly pointed in cement mortar or PCC rings as specified. Manhole covers and frames to be ductile iron unless otherwise specified. The channel is to be benched in concrete sloped to walls and steel trowelled to a smooth finish. Where the system is specified to be run in stainless steel or Polypropylene details of inspection chamber will be provided. Refer to Series 500 Drainage and Service Ducts.

7.9 Road Gullies: Gullies shall be accurately positioned on a concrete bed and surrounded with 150mm thick concrete.

8.0 Roads and Pavings

8.1 General: Specific Site Standard should be adhered to for roads and pavings as detailed in the job specification. It is to include road Construction, Footpath Construction, Banded Areas c/n, Joint Requirement, Drainage channels. Roads and pavings will be in accordance with the following British Standards:-

BS7263 Specification for precast concrete kerbs, channels, edgings and quadrants.

BS7263 Precast concrete flags.

BS 802 Tarmacadam with crushed rock or slag aggregate.

BS 4461:1978. Specification for cold worked steel bars for the reinforcement of concrete

BS 1446:1973. Specification for mastic asphalt (natural rock asphalt fine aggregate) for roads and footways

BS 4987-1:2005. Coated macadam (asphalt concrete) for roads and other paved areas. Specification for constituent materials and for mixtures

8.2 Bituminous Surfaces: As specified by the designers laid to surface and falls required. Refer to Series 900 Road, Pavements – Bituminous Bound.
8.3 Concrete Surfaces: As specified by the Materials designer reinforced with mesh as specified laid to falls and with tamped finish. Refer to Series 1000 Road Pavements – Concrete and Cement Bound Materials.

8.4 Pavements: As specified by the designer. Refer to Series 1100 Kerbs, Footways and Paved Areas.
STRUCTURAL STEELWORK

9.0 Design

9.1 Structural steel shall be designed in accordance with current good practice and the following:- BS 7668:2004. Weldable structural steels. Hot finished structural hollow sections in weather resistant steels. Specification

9.2 When designing, the site standard for cat ladders, skips, ladders, guarding and plates should be adhered to.

10.0 Material

10.1 Specific site standard should be adhered to for steelwork finishes as detailed in the job specification for painting and galvanizing.

10.2 Structural steel shall be in accordance with BS 4360:1990. Specification for weldable structural steels unless otherwise stated. The steel shall be free from pitting, loose rust scale, grease, oil and other contaminants.


10.4 Cold rolled sections shall be in accordance with BS 2994:1976. Specification for cold rolled steel sections.

10.5 High tensile bolts, nuts and washers shall be in accordance with BS 4360:1990. Specification for weldable structural steels.

11.0 Workmanship

11.1 Workmanship shall be in accordance with BS 8000-0:2014. Workmanship on construction sites. Introduction and general principles and with current good practice. Refer to Series 1800 Structural Steelwork.
12.0 Welding

12.1 Welding shall be in accordance with the following:-

Manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding and beam welding of steels

13.0 Erection

Erection shall be accurately carried out in accordance with current good practice and statutory safety codes.
14.0 Brickwork and Blockwork

14.1 Specific site standard to be adhered to for brickwork and blockwork paying attending to pointing in areas of driving rain.

14.2 Materials: Materials shall be in accordance with the following:

- BS EN 845-1:2013. Specification for ancillary components for masonry. Wall ties, tension straps, hangers and brackets
- B.S.3921 Bricks and Blocks of Fired Clay, etc.

14.3 Workmanship: Workmanship shall be in accordance with the following:

Workmanship shall be in accordance with BS 8000-0:2014. Workmanship on construction sites. Introduction and general principles and with current good practice.

14.4 Bricks: Common bricks generally Flettons or equivalent. Facing bricks will be selected or specified in the Project Specification. Bricks are to have square and sharp arises, chipped bricks are not to be used.

14.5 All bricks used shall meet at least one of the following criteria:

- Are reclaimed
- If new, are manufactured with at least 30% recycled content and 100% recyclable content;
- Are unfired clay blocks
• If new are sourced from a certified manufacturer with a BES 6001 “Very Good” performance rating for the product and the corresponding quarry; or
• Are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.
Any recycled and recyclable content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions.

14.6 Cement: Cement shall be Ordinary Portland Cement as 2.4.1.

14.7 Sand: Sand shall be naturally occurring sand or sand prepared by crushing natural stone.

14.8 Lime: Lime shall be hydrated lime stored in sealed bags in dry conditions.

14.9 Water: Water shall be clean fresh mains water.

14.10 Mortar: Gauged mortar for brickwork is to be 1 part cement, 1 part hydrated lime and six parts sand by volume. Gauged mortar for lightweight blockwork is to be 1 part cement, 2 parts hydrated lime and 9 parts sand by volume. Gauged mortars shall be used within two hours of cement being added. Cement mortar is to be 1 part cement to 3 parts sand by volume and shall be used within one hour of mixing. No partially set mortar may be used.

14.11 Damp Proof Courses: These shall be to BS 743:1970. Specification for materials for damp-proof courses lapped at least 150mm, laid full width on a level bed of mortar and pointed.


14.13 Construction: Brickwork shall be built in straight, even courses, rising four courses per 300mm. Bricks shall be well wetted before laying, with joints well buttered and flushed up as work proceeds. Walls shall be carried up evenly ensuring no part rises more than 900mm above adjoining parts. All jambs and quoins shall be vertical and perpendiculars to be strictly kept and all properly bonded. No bricks shall be laid during frosty weather and any green work is to be protected from damage in frosty weather. Any work damaged by frost is to be removed and made good. Fair face work shall be pointed up as the work proceeds.

14.14 Cavity Walls: Cavities are to be continuous, the two leaves tied with wall ties 900mm (3’0”) apart horizontally in rows 450mm (1’6”) apart vertically and staggered. The cavity is to be kept clear of mortar droppings, etc. D.P.C. shall be inserted vertically at each jamb and horizontally over all lintels sloping towards the external leaf. Air bricks in cavities shall be surrounded by slate slips across the cavity with a slight fall towards the external leaf.

14.15 Bonding: Half brick walls shall be built in stretcher bond and solid brickwork in English Bond. All partition or cross walls are to be firmly attached to main walls by bonding or tying.

14.16 Scaffolding: Scaffolding suitable for the job will be used in accordance with B.S.1139 and all safety regulations are to be observed.

14.17 Protection: All recognized means must be used for protecting brickwork during the work. Any stains which occur must be removed to City University London satisfaction.
15.0 Carpentry, Joinery and Doors

15.1 Materials: All materials used in carpentry and joinery shall be of good quality, well cut, sound, square edged and well-seasoned, free from warp, sap, rot, shakes, loose or dead knots, beetle infestation or other imperfection, suitable for the purpose in all respects and complying to the relevant British Standards. Timber and joinery delivered to site shall be stored under cover protected from dampness. External softwood joinery shall be primed before delivery to site. A maximum of 3mm (1/8") shall be allowed for all wrought faces.

15.2 Softwoods: Softwoods shall be of Western Hemlock, Canadian Spruce, European Redwood, Douglas Fir, European Whitewood and European Larch. Softwood used for joinery shall be of suitable quality complying to B.S.1186.

15.3 Hardwoods: Hardwoods generally will be as specified for a particular project or application and shall be of good quality for carcassing and selected quality for joinery. Where hardwood has to match an existing installation this matching shall be in terms of type, colour, texture and grain. All hardwood shall be kept clean for clear polishing.

15.4 Plywoods: These shall comply with B.S.1455 with M.R. (moisture resistant) bonding for internal use and W.B.R. (water and boil resistant) bonding for external use.

15.5 Preservatives: When required these will be specified in the project specification. Brush applied preservatives shall be "Protin" or similar applied in accordance with the manufacturer's instructions. Pressure impregnated preservatives shall be of "Tanolith" manufacture or similar applied in accordance with the manufacturer's instructions.

15.6 Workmanship: The workmanship shall comply with the following British Standards:


15.7 Ironmongery: Ironmongery shall be as specified for the project and will be protected before and after fitting as necessary. It shall be correctly fitted with screws to match the required finish.

15.8 Toilet cubicle door locks shall be as Access hardware T201 brushed stainless steel finish for solid cubicle doors and C4028 for system cubicle doors.

15.9 Hardwoods - 100% of hardwood meets at least one of the following criteria:
• is reclaimed;
• where new hardwood is used, is supplied with a Chain of Custody (CoC) from one of the following forest certification schemes only:
  – Forest Stewardship Council (FSC);
  – Programme for the Endorsement of Forest Certification (PEFC);
  – Sustainable Forestry Initiative (SFI); or
  – Canadian Standards Association (CSA); or
• Project FSC certification is accredited to the project through the contractor to include the supply of all timber on the project.

15.10 Timber - 100% of timber used is from at least one of the following sources:
• is reclaimed;
• is recycled; or
where new timber is used, is supplied with a Chain of Custody (CoC) from one of the following forest certification schemes only:
– Forest Stewardship Council (FSC);
– Programme for the Endorsement of Forest Certification (PEFC);
– Sustainable Forestry Initiative (SFI);
– Canadian Standards Association (CSA).
Or FSC Project Certification is accredited to the contractor and includes the supply of all timber on the project.

15.11 Joinery - 100% of materials used in the joinery for the fit-out:
• is reclaimed; or
• it is new timber and meets the criteria of good practice measure

15.12 Where joinery items are completed off site, paint finishes should meet the criteria of Section 21.1. Paints and polishes & varnishes should meet the criteria of 21.2 Polishes and varnishes.

15.13 All adhesives used in the assembly of each joinery item must have been tested to EN 13999 or ISO16000 standards and show that carcinogenic and volatile organic compounds are absent; or the adhesive is to have been awarded one of the following labels:
• Eurofins Indoor Air Comfort Gold standard
• Blue Angel RAL-UZ 113
• M1 Emissions Classification for construction products

15.14 All materials other than those stated above, such as glass or composite panel products, must contain a minimum of 10% recycled and 100% recyclable content. Recycled content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions.

15.15 All assemblies must be designed for deconstruction with components that can be recycled.

15.16 Doors - All doors, including frames, meet at least one of the following criteria:
• are re-used;
  • if new, are manufactured in a factory that has achieved and maintains an Environmental Management System in accordance with BS EN ISO 14001 with either (or a combination of both):
    – composite materials that have at least 80% recycled content; or
    – metal components that follow WRAP’s Choosing construction products guide (see guidance) and contain an average of:
      • steel section 15%
      • stainless steel 75%
      • copper sheet 60%
      • aluminium extrusion 44%
      • aluminium sheet 73%; or
    • are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.
And:
• if containing timber components, the timber meets the criteria of good practice measure 15.8 and 15.9.
16.0 **Asphalting**

16.1 Asphalting General: Asphalting shall be carried out by an approved specialist sub-contractor using materials and workmanship complying with all relevant British Standards and Codes of Practice.


17.0 **Roofing and Cladding**

17.1 Specific site standards are to be incorporated into the design and specified with respect to as follows:

- Slopes of cladding roof to be min 6º
  - Approved site colours to be goosewing grey, merlin grey and wedgewood blue.
  - New roofs to have edge protection.
  - All rooflights should be "safe" lights.

17.2 Materials: All materials used shall comply with the relevant British Standards as follows:-

- BS EN 316:2009. Wood fibre boards. Definition, classification and symbols
- BS EN 12588:2006. Lead and lead alloys. Rolled lead sheet for building purposes
17.3 Built Up Mineral Felt Roofing: This shall be carried out by a specialist sub-contractor using materials complying with the relevant British Standard and shall be a three layer system suitable in all respects for the particular project.

17.4 Where plant or other access is required on felt roofing paviors are to be embedded in hot bitumen as walkways.

17.5 Proprietary Membrane Roofing: These may be single or double layer systems but shall be suitable in all respects and installed strictly in accordance with the manufacturer's detailed specifications.

17.6 Suspended Ceilings - All suspended ceiling systems, including tiles meet at least one of the following criteria:

• are reused;
• if new, are manufactured with at least 90% recycled content (measured by mass) and 100% recyclable content (designed for deconstruction with components that can be recycled);
• if new, have a Cradle to CradleCM Silver – Platinum certificate; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards;

And:
• if containing timber components, the timber meets the criteria of good practice measure Section 15.

18.0 Plasterwork/Screeding/Wall Tiling/Wall Coverings

18.1 Materials: All materials used for plastering, screeding and wall tiling shall comply with the relevant British Standards as follows:-


BS EN 459-1:2010. Building lime. Definitions, specifications and conformity criteria


18.2 Water: Water shall be clean mains water.
18.3 Storage: Materials shall be stored under cover and protected from spoilage, contamination, damage, etc.

18.4 Surface Preparation: The surfaces shall be brushed and all dust, loose particles, etc., removed, oil on surfaces shall be removed, smooth concrete or brickwork shall be roughened to form a key or a bonding agent may be used to form a key, all steps shall be taken to ensure that the surface to be plastered is suitably prepared.

18.5 Metal Lathing: Expanded metal for general lathing shall be 9/10mm (3/8") mesh, (for light-weight plasters 7mm (1/4") mesh) coated with bituminous paint, fixed with galvanised staples 100mm (4") apart, lapped 50mm (2") and wired with 18 SWG soft galvanised wire.

18.6 Metal Angle Beads: Protected metal angle beads shall be used at all external angles for interior work.

18.7 Plasterboards: Gypsum plasterboard shall be used according to the manufacturer's recommendation with joints staggered, sealed and reinforced before plastering.

18.8 Plastering: Plastering generally shall be carried out in two coats (on metal lathing three coats), finished thickness 12mm (½"). On brickwork or blockwork the undercoat shall be one part browning to three parts sand. On concrete the undercoat shall be one part browning to two parts sand. The undercoat shall be even and keyed properly to accept the finishing coat applied 3mm (1/8") thick and trowelled to a true and even surface. Lightweight plasters shall be used strictly in accordance with the manufacturer's instructions.

18.9 Skim Coat: A 3mm (1/8") to 5mm (3/16") thick in undercoat to an even surface well keyed and dried out to accept the finishing coat of 6mm (1/4") thickness which shall be trowelled to a true and even surface.

18.10 Cement Rendering: Cement rendering shall comprise one part cement to three parts sand applied 9mm (3/8") thick in undercoat to an even surface well keyed and dried out to accept the finishing coat of 6mm (1/4") thickness which shall be trowelled to a true and even surface.

18.11 All screeds used, e.g. for floor repairs, replacement, build-up or levelling, meet at least one of the following criteria:
• if new, are manufactured with at least 50% recycled content and are 100% recyclable;
• if new, are sourced from a certified manufacturer with a BES 6001 ‘Good’ or better performance rating; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.

18.12 Any recycled and recyclable content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions.
Floor Screeds: Before laying screeds, concrete floors shall be well brushed and soaked overnight. Surplus water shall be removed next day and a neat cement grout brushed on, followed by the screed before the grout sets. Screeds shall consist of one part Portland cement to three parts of fine aggregate with sufficient water added for workability. Screeds shall be laid in alternate bays not exceeding 11m² (120 ft²) in area and shall be covered with polythene sheeting to prevent rapid drying. Minimum screed thickness
18.13 Granolithic Screeds: These shall consist of one part Portland cement, one part clean sand, three parts clean granite chippings to pass a 6mm (1/4") ring, with sufficient water for workability only. The screed, minimum 40mm (1½") thick, shall be laid in alternate bays using a float and trowelled to a level surface. This shall be further compacted and finished up till the time the mix has cured sufficiently to form a hard surface with laitence coming to the surface. The surface shall be kept damp for seven days and not exposed to fast traffic. Unless otherwise specified a proprietary surface hardener shall be used strictly in accordance with the manufacturer's instruction. For monolithic granolithic finish see section 2.4.12.

18.14 Wall Tiling: Ceramic wall tiles shall be as specified in the project specification and shall be laid on a prepared cement and sand screed (1:3) and be bedded with an approved adhesive compound. When tiles are set they shall be neatly grouted with tile cement to match tiling and thoroughly cleaned down.

18.15 Non-Conductive Wall Finishes: These may be used in areas regularly washed or sponged down with water. They must not be used in de-humidified areas or areas with controlled dry environments where the humidity is generally controlled 50%Rh or below. Special attention should be given to dusty areas to prevent free air borne dust clinging to wall finishes. Plastic materials must have additives to reduce their maximum resistance, measured from the longest path to OHMS or less.

18.16 Tiled Walls, Using Ceramic Tiles: Tile surface area must not exceed 30,000mm². Tile grout must be resistant to products used in the environments in which it is located, it must be conductive with a maximum resistance to earth, measured on the longest path, not exceeding 100 OHMS and be connected to the main earth using earth wire and boxes.

18.17 The static earth system will be identified by permanent labels at strategic points, these will include all major termination points, earth points for portable equipment and junction boxes. Labels will read "STATIC EARTH POINT". Labels will be trafficlyte or similar, black letters on a white background.

18.18 Each pipe run, trunking, structure etc., will be tested after completion.

18.19 All walls and floors will be tested in identifiable areas (i.e. each room or production floor).

18.20 A test certificate will be issued recording details of date, location, specific item, or area, and test results, and must be signed by the person carrying out the test and the Company he represents.

18.21 Wall Coverings – All wall coverings meet at least one of the following criteria:
- if new, are manufactured with at least 40% recycled content;
- if new, have a Cradle to CradleCM Silver – Platinum certificate; or
- are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.
And:
- where paper-based wallpaper is specified, meet the criteria of D20 Timber. Recycled content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions.

18.22 Hard Wall Coverings - All wall coverings meet at least one of the following criteria:
• are reused;
• if new, are manufactured with at least 70% recycled content (measured by mass) and 100% recyclable content (excluding wall tiles);
• if a new wall tile (ceramic, glass, clay, stone, porcelain), are manufactured with at least 50% recycled content and recyclable content, measured by mass;
• if new, have a Cradle to Cradle CM Silver certification or above;
• if new, have an EU Ecolabel; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards;
And:
• if timber, meet the criteria of good practice measure Section 15;
And:
All adhesives used to fix the material to the wall must have been tested to EN 13999 standards and can show that carcinogenic and volatile organic compounds are absent, or that the adhesive is to have been awarded one of the following labels:
• Eurofins Indoor Air Comfort GOLD standard
• Blue Angel RAL-UZ 113
• M1 Emissions Class for Construction Products
• EMICODE EC2 or better
• Émissions dans l’Air Intérieur rated A+
Recycled content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions.

19.0 Glazing, Window treatments, Glare Control

19.1 Glass: All glass shall conform to B.S.952 and be suitable in all respects for the particular application. Unless otherwise specified sheet glass shall be 4mm (32 oz) ordinary quality.

19.2 Putty: Putty for glazing to wood shall be linseed oil putty to BS 8000-7:1990. Workmanship on building sites. Code of practice for glazing. For glazing to metal shall be an approved proprietary putty suitable in all respects for the application. The glass shall be secured with sprigs, puttied to full rebate and neatly trimmed all round.

19.3 Bead Glazing: Glass and beads shall be bedded and back puttied and the putty neatly trimmed off flush. Beads to be screwed with cups and screws.

19.4 Glazed partitions - All glazed partitions meet at least one of the following criteria:
• are reused;
• are re-locatable (see guidance for definition), and are manufactured in a factory that has achieved and maintains an environmental management system in accordance with BS EN ISO 14001; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.

19.5 Curtain Walling: Curtain walling shall be carried out by an approved specialist subcontractor in accordance with the manufacturer's recommendations.

19.6 Double Glazing: Where specified this shall be suitable in all respects for the application, i.e. sound or thermal insulation, and shall be properly sealed to prevent ingress of moisture, subsequent condensation and failure.

19.7 Window Treatments - All window treatments meet at least one of the following criteria:
• are reused;
• if new, are manufactured with at least 80% recycled content (measured by mass) and 100% recyclable content (designed for deconstruction with components that can be recycled);
• if new, have a Cradle to CradleCM Silver or higher certificate;
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards; or
• are supplied with environmental product declarations for the materials used.
And:
• if timber or containing timber components, the timber meets the criteria of good practice measure Section 15.

19.8 Daylight Glare Control - For office spaces all of the following criteria must be met:
• occupant-controlled window coverings (typically blinds or screens) are fitted to the external windows and atria that receive sunlight directly or indirectly;
• coverings are designed to provide optimum glare control and allow the best possible retention of views out with the coverings drawn closed; and
• fabric screens, where specified, have a visual light transmittance (VLT) of less than 10%.

20.0 Floor Finishes

20.1 Soft Flooring – All soft floor coverings, including underlay where applicable, meet at least one of the following criteria:
• are reused;
• if new, are manufactured with at least 50% recycled content (measured by mass) and 100% recyclable content (designed for deconstruction with components that can be recycled);
• have an A or A+ rating in BRE’s The Green Guide to Specification for the offices scheme;
• have an A or A+ rating in BRE’s Green Book Live database for the offices scheme;
• are manufactured from 50% renewable and natural products, e.g. wool, natural rubber, hessian;
  if new, have a Cradle to CradleCM Silver or higher certificate; or
• are supplied with an environmental product declaration (other than that written for the Green Book Live), written in accordance with ISO 14025 standards.
Recycled content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions

20.2 Hard Flooring - All hard floor coverings meet at least one of the following criteria:
• are reused;
• if new, are manufactured with at least 25% recycled content (measured by mass) and 100% recyclable content (designed for deconstruction with components that can be recycled);
• have been awarded the EU Ecolabel;
• have an A or A+ rating in BRE’s The Green Guide to Specification for the offices scheme;
• have an A or A+ rating in BRE’s Green Book Live database for the offices scheme;
• if new, have a Cradle to CradleCM Silver or higher certificate; or
• are supplied with an environmental product declaration (other than that written for the Green Book Live), written in accordance with ISO 14025 standards.
And:
20.3 **Materials:** Materials shall conform to the appropriate British Standards as follows:

- **BS EN 16511:2014.** Loose-laid panels. Semi-rigid multilayer modular floor covering (MMF) panels with wear resistant top layer


- **BS EN ISO 10581:2013.** Resilient floor coverings. Homogeneous poly(vinyl chloride) floor covering. Specifications

- **BS EN 650:2012.** Resilient floor coverings. Polyvinyl chloride floor coverings on jute backing or on polyester felt backing or on a polyester felt with a polyvinyl chloride backing. Specification

- **BS ISO 10575:2012.** Resilient floor coverings. Specification for rubber sheet floor coverings with backing

- **BS ISO 10577:2012.** Resilient floor coverings. Specification for rubber sheet floor coverings without back

- **BS EN ISO 24011:2012.** Resilient floor coverings. Specification for plain and decorative linoleum

- **BS EN ISO 10874:2012.** Resilient, textile and laminate floor coverings. Classification

- **BS EN 653:2011.** Resilient floor coverings. Expanded (cushioned) polyvinyl chloride floor coverings. Specification

- **BS EN 651:2011.** Resilient floor coverings. Polyvinyl chloride floor coverings with foam layer. Specification


20.4 **Softwood and Hardwood Strip Flooring:** This shall be carried out by an approved specialist sub-contractor and shall be suitable in all respects for the particular application. Plastic Sheet and Tiles: Thermoplastic, vinyl asbestos and vinyl sheet and tile floorings shall be carried out by an approved specialist sub-contractor and shall be suitable in all respects for the particular application.

20.5 **Linoleum Sheet and Tiles:** Linoleum sheet and tiles shall be carried out by an approved specialist sub-contractor and shall be suitable in all respects for the particular application.

20.6 **Wood Block Floors:** Wood blocks shall be as specified and laid with a suitable adhesive to a clean dry substrate allowing an expansion joint of cork around the perimeter of the floor. On completion and after allowing adequate setting time the surface shall be sanded.
and sealed with appropriate sealers strictly in accordance with the manufacturer's recommendations.

20.7 Protection: All floors shall be properly protected and cleaned prior to final hand over of the works.

20.8 Non-Conductive Floor Finishes: Tiles used for floors must not have a surface area greater than 30,000mm². Tile grout must be totally resistant to its environmental product spillage. Grout must be conductive. Finally compiled floor will have a total resistance of 100 OHMS or less, measured on the grout to earth, via the longest path. Floor composition will include a stainless steel wire grid, connected by crimped joint at each cross over point, laid directly on the floor seal or membrane before tile grout is laid. The diagonally opposite ends of this grid will be connected to stainless steel earth wires, not less than 12 gauge, and terminated in 100mm x 100mm boxes, using standard connections. These boxes will be accessible for test purposes. From the boxed terminations, connection will be made to the main earth system, using standard copper earth wire. The grout laid on the floor grid will be electrically conductive. In locations where process materials are, loaded, unloaded, transferred etc., by hand, a stainless steel, or other product resistant, metal plate, of adequate size and location, to ensure the operator must stand on it to perform his duties, will be flushed into the floor. This plate will be connected electrically to the floor grid.

20.9 The static earth system will be identified by permanent labels at strategic points, these will include all major termination points, earth points for portable equipment and junction boxes. Labels will read "STATIC EARTH POINT". Labels will be traffolyte or similar, black letters on a white background.

20.10 Each pipe run, trunking, structure etc., will be tested after completion.

20.11 All walls and floors will be tested in identifiable areas (i.e. each room or production floor).

20.12 A test certificate will be issued recording details of date, location, specific item, or area, and test results, and must be signed by the person carrying out the test and the Company he represents.

21.0 Painting and Decorating

21.1 Paints - All paints meet at least one of the following criteria:
• have been awarded the EU Ecolabel;
• are manufactured with at least 90% recycled content; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.
Recycled content claims must comply with ISO 14021:1999 Type II Self declared Environmental Claims and state knowledge of IAQ emissions.

21.2 Polishes & Varnishes – All polishes and varnishes meet at least one of the following criteria:
• are water based;
• have been awarded the EU Ecolabel; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.
21.3 Materials and workmanship: Materials and workmanship shall be suitable in all aspects for the particular application and conform to the appropriate British Standards.

21.4 Colour to be defined in the project brief. Walls and skirting should be Dulux Diamond Eggshell or approved equivalent.

21.5 Painted joinery should be Dulux gloss, eggshell, satinwood, matt finish or approved equivalent.

21.6 Paint Preparation: All paints shall be stored and prepared according to the manufacturer's recommendations.

21.7 Fillers where required must be flexible, in addition, the following should be observed:

- Building caulk should be used on all interfaces
- Silicon should be avoided, however, where required and approved, colour should be appropriate to finish
- Natural finish products where required should be stopped with the appropriate filler colour.

21.6 Walls. Where required, surfaces should be made good, i.e. filling, sanding, decorators caulk where necessary. Surface should be smooth and even unless exposed block or concrete formed walls or columns (project dependent). All existing nails, screws, wall plugs etc. should be removed and made good.

21.7 All signage, notice boards, whiteboards, and fixings should be removed and protected and re-fixed on completion unless otherwise stated.

21.8 All switches, sockets etc. must be released from the surface and not cut in.

21.9 Where possible radiators should be removed to allow walls to be painted. Where this is not possible, walls should be painted as far as possible.

21.10 Undercoat should be applied where necessary followed by a mist coat and two top coats. All snots must be rubbed down and a top coat reapplied.

21.11 Internal joinery. Preparation. Joinery should be rubbed down to a sufficient standard.

21.12 Finish to internal joinery shall be:

- One undercoat must be applied prior to applying two top coats.
- Any runs must be rubbed down and top coat reapplied.
- Doors can be either brush or roller finished but must be consistent throughout.

21.13 M08 Re-locatable Partitions - All partitions meet at least one of the following criteria:

- are reused;
- are re-locatable (see guidance for definition) and are manufactured in a factory that has achieved and maintains an environmental management system in accordance with BS EN ISO 14001;
- if new, are manufactured with at least 90% recycled content (measured by mass) and 100% recyclable content (designed for deconstruction with components that can be recycled); or
- are supplied with an environmental product declaration (other than that written for the Green Book Live), written in accordance with ISO 14025 standards;
And:
• if timber or containing timber elements, the timber meets the criteria of good practice measure Section 15.

21.14 Recycled content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions.

21.15 Glazed partitions - All glazed partitions meet at least one of the following criteria:
• are reused;
• are re-locatable (see guidance for definition), and are manufactured in a factory that has achieved and maintains an environmental management system in accordance with BS EN ISO 14001; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.

22.0 Plumbing and Sanitary Installations

22.1 All works shall comply with the current Building Regulations Part H and appropriate BSI Codes of Practice which include BS EN 12056-1 to 5 inclusive and BS 8000 – 13: 1989. Reference may also be made to the current Edition of the I.O.P Guide. All works carried out shall also comply with any local water authorities requirements. The University shall also be fully informed of all works by issuing the appropriate method statements.

22.2 Prior to commencing work the Installer shall satisfy himself that he is fully conversant with the requirements of the University and that the works can be installed properly making provision for all maintenance works that may be required such as access to rodding eyes and that the correct falls of drainage pipework can be accommodated. Gradient of $2\frac{1}{2}^\circ$ shall be as the standard unless otherwise stated. Alternative materials such as heavyweight (HW) cast iron, lightweight (LW) cast iron, MuPVC may be used as detailed in this document subject to the application and requirements of the University.

22.3 Pipework Installation. This section describes the minimum standards and workmanship expected from the Installer by the University.

22.4 Joints. Shall be assembled to comply with the manufacturer’s site work instructions, if required, using a lubricant/solvent as recommended by the Manufacturer. No other type shall be used. Solvent welded fittings shall be kept to a minimum and suitable Boss pipes with pre-formed upstands and Boss socket adapters shall be used for waste pipe take-offs and where possible, assembled by the Manufacturer. Solvent patch or strap-on Boss pieces shall not be used. Only proprietary Boss branches shall be accepted.

22.5 Where the vertical stacks meet the ground drain, the pipe shall be entered into the drain socket and jointed with an agreed coupling.

22.6 Supports. All pipes shall be fixed using the recommended type of bracket and where necessary, purpose made brackets shall be manufactured from mild steel flat bar or angle iron of an appropriate weight and girth. An insert piece of suitable material shall be placed between bracket and pipe and the bracket shall be secured to the structure with the recommended type of fixing.
22.7 Drop rods shall be made of screwed mild steel bar of an appropriate diameter and shall be fixed to the structure with an agreed type of fixing. Vertical pipes shall be supported where they pass through floors with the recommended type of weight support bracket, intermediate brackets to give lateral support shall be provided. All sanitation pipework shall be supported at intervals not less than those stated in Table NF1 of BS EN 12056.

22.8 All brackets/fixings shall be secured to the building structure and not onto the face of plastered walls.

22.9 The Installer must not cut, drill or weld to any structural member without the written agreement of the Structural Engineer and the University.

22.10 Horizontal pipes shall be supported with the recommended type of bracket so as to provide for weight support, and lateral stress, these shall be spaced at no more than 2m centres.

22.11 Expansion. Expansion joints shall be provided as required to relieve thermal movement. Any point where a pipe is made good or fire stopped when passing through a wall or floor must be treated as a fixed point when arranging the position of expansion joints but should not be relied on to anchor the pipe.

22.12 Sleeves. Where pipes pass through walls or floors, sleeves of plastic, sheet metal or mild steel, depending on the service, shall be provided, and shall be designed so as to leave an annular space which shall be suitably fire stopped with mineral/fibre quilt type rope so as to satisfy Fire Regulations and provide proof against vermin.

22.13 Where PVC pipework 50mm and above pass through a fire compartmented area an intumescent sleeve or collar shall be provided to maintain the compartments integrity.

22.14 Sleeves shall not be used as supports for the pipes and pipes shall be fixed clear of sleeves at all points.

22.15 Sleeves shall be of sufficient length to be clear of the building structure, except for floor or ground sleeves which shall have a 100mm (4”) upstand, where fitted in rooms likely to be hosed down.

22.16 Access. Access pipes and large radius bends shall be provided at the foot of all vertical stacks and at points as indicated on the drawings so as to facilitate easy access for cleaning and testing. Access shall be provided on each floor level positioned above the spill-over level of the lowest appliances connected to that stack.

22.17 Waste pipe runs serving more than one fitment shall be provided with means of clearance at their extreme end.

22.18 Access shall also be provided at floor level for each unventilated branch run from the main ground drain where vent stacks rising from ground drainage reduce such reduction shall be after the access pipe.

22.19 Access shall be deemed to be provided where on the lowest floor in each area the drain reducing to 32 > 50 PVC, etc. serving unventilated units has:

The reducing fitting at floor level.
The small diameter waste piping demountable.
Ready means of removing and reinstating the reducing piece therefore giving direct full size access to the below floor drain run.

22.20 Wall, Floor and Ceiling Masking Plates. Masking plates shall be provided in all exposed penetrations of walls, floors and ceilings. Type Chromium plated copper alloy. Split on the diameter, close fitting to the outside of the pipe. Fixing shall be with chrome raised head fixing screws.

22.21 Vent Pipe Terminations. Ventilation pipes to terminate through roof with copper wire balloons or suitable vent cowls. Where appropriate a weathering slate shall be incorporated.

22.22 Open Ends. All open ends shall be suitably sealed during the course of the works against the ingress of foreign building matter.

22.23 Sanitary Ware. The Installer where required shall accept as free issue from the client (the University) or client representations any sanitary ware and install the appliances in strict accordance with the selected manufacturers’ requirements and any prevailing local regulations.

22.24 The Installer may also be requested to purchase sanitary ware on behalf of the University as specified.

22.25 The sanitary ware shall be suitably protected at all times. Basins, toilet pans and the like shall also be covered so as to avoid the ingress of any site building materials during the construction works.

22.26 Pipework And Fittings. The Installer shall be competent in the supply and installation of the following materials as applied to conventional above ground waste and ventilation pipework. However, there may be specialist applications where drainage from chemical sources (fume cupboards, laboratory sinks etc) may be required which may require guidance from the University.

22.27 Lightweight (LW) Cast Iron Pipework and Fittings. Soil, waste and ventilating pipes and fittings shall be of the lightweight cast iron to BS EN 877 and ISO 6594 ‘above ground’. Couplings will be fitted with electrical continuity clips within each joint.

22.28 PVCu Pipework and Fittings. Soil, waste and ventilating pipes and fittings shall be manufactured of PVCu to BS 4514 with either neoprene ring joints or solvent welded.

22.29 Waste Pipes. Small diameter waste pipes and fittings shall be in MuPVC to BS 5255, BS EN 1329, BS EN 1455, BS EN 1519, BS EN 1565, BS EN 1566 as per manufacturers detailed in Appendix 1 or similar agreed. Traps shall be in Polypropylene to BS EN 274, 3” seal tubular type, as per manufacturers detail Appendix 1 with mechanical joint system or other equal.

22.30 Gradients for waste pipework shall be 2½° as standard unless noted otherwise.

22.31 Chemical Drainage. Drainage systems dealing with chemical waste shall be installed as per manufacturers detailed in Appendix 1 who shall provide a detailed product specification.

22.32 The Installer shall ensure that any works carried out are fully agreed by the University in connection with the specific project involved.
22.33 Testing Generally. The complete installation shall be tested to the satisfaction and in the presence of the Environmental Health/Building Control Officer. The test shall be as follows:

Check that all sections of installation are securely fixed and free from obstruction and debris.

Carry out tests as specified. After testing, locate and remedy all defects without delay and retest as instructed. Do not use smoke to trace leaks.

The Installer shall supply Test Certificates to show that equipment and materials and installations have been tested in accordance with the specified requirements. The certificate signed by the Contractor shall indicate: (1) the apparatus/service under test, (2) test pressure. (3) duration. Generalised descriptions of the area tested will be rejected.

The Installer shall be responsible for the complete commissioning of the works to the satisfaction of the Environmental Health/Building Control Officer and the University and shall leave the works in correct working order.

The Installer shall regulate all services installed or connected.

Apply to all internal pipework prior to concealment behind cladding/boxing-in.

Temporarily plug or cap off outlets.

Using a pump with suitable gauge, introduce air to a pressure of 200m bar (2m head of water equivalent).

Allow a period of temperature stabilisation, after which pressure to be maintained, without loss, for not less than five minutes.

22.34 Soil, Waste Pipework Final Test

Temporarily seal open ends of pipework with plugs

Connect a 'U' tube water gauge and air pump to the pipework via a plug or through the trap of an appliance

Pump air into pipework until gauge registers 38mm.

Allow a period for temperature stabilisation, after which the pressure of 38mm is to be maintained without loss for not less than 3 minutes.

22.36 Siphonage and Back Pressure Tests

Test WC pans by flushing and test other appliances by filling to overflow level, then removing the plug

Carry out tests at least three times with traps recharged before each test

Test each appliance individually for self siphonage, then test for induced siphonage and back pressure by discharging appliances simultaneously on each stack.
22.37 Soil, Water and Trade Effluent Drainage: Within the curtilage of a building all drainage shall be carried out in cast iron, stainless steel, or polypropylene with joints made as required to form a watertight connection. Manholes shall be constructed at all junctions and changes of direction.

22.38 Hot and Cold Water Installations: These will normally form part of the Mechanical Service contract up to the point of connection to cisterns, sinks, etc., and including waste connections from sinks to gulleys, etc. Pipework and fittings from urinal cisterns shall be chromium plated.

22.39 W.C. Suites, Urinals, Sinks, etc: These shall normally be specified in the particular project specification. Equipment of this type is to be carefully stored on site prior to installation and protective coverings left on until the facilities are handed over for use at which time all items are to be thoroughly cleaned. Any damaged or defective items shall be replaced immediately at no cost to City University London.

22.40 New Low Flush WCs - WCs have an effective flush volume of 4.5 litres or less and are either on the Water Technology List (WTL) or have an EU Water Efficiency label.

22.41 Existing Low Flush WCs - Existing WCs are retrofitted with flushing devices that provide a 20% reduction in flush volume (see guidance) and meet the Water Technology List (WTL) criteria either by (in order of preference):
- being listed on the WTL;
- having an EU Water Efficiency Label that indicates performance that meets/exceeds the WTL criteria; or
- meeting/exceeding the WTL criteria based on specifications provided by the manufacturer.

22.42 Efficient Taps - Flow rate on taps is limited to 6 litres/minute up to a pressure of 5 bar (+/- 0.2 bar) and the tap fitting or flow controller is either on the Water Technology List (WTL) or has an EU Water Efficiency Label. The taps should be one of the following:
- automatic shut-off taps;
- electronic taps;
- low flow screw-down/lever taps; or
- spray taps.
Where auto-shut off or electronic taps are specified these should be restricted to no more than 20 seconds flow.

22.43 Showers - Flow rate to showers is limited to 9 litres/minute up to a pressure of 5 bar (+/- 0.2 bar) and the flow controller fittings meet the Water Technology List (WTL) criteria either by (in order of preference):
- being listed on the WTL;
- having an EU Water Efficiency Label that indicates performance that meets/exceeds the WTL criteria; or
- meeting/exceeding the WTL criteria based on specifications provided by the manufacturer.
Note: This measure can be achieved by using a shower that meets the requirements or installing a flow controller to control the flow through the shower.

22.44 WC cubicles - All WC cubicles must meet at least one of the following criteria:
- are reused;
• if new, are manufactured with at least 70% recycled content (measured by mass) and 100% recyclable content (designed for deconstruction with components that can be recycled);
• if new, are manufactured with 70% renewable content (straw or hemp) sourced from a UK manufacturing base; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.

And:
• if timber or containing timber components, the timber meets the criteria of good practice measure Section 15.

23.0 Insulation

23.01 Insulation - All insulation materials (thermal and acoustic) meet at least one of the following criteria:
• if new, are manufactured with at least 50% recycled (measured by mass) and 100% recyclable content that is designed for deconstruction with recyclable components;
• are manufactured from at least 50% renewable material, e.g. hemp, flax, newspaper, wool;
• if new, are manufactured with a combination of at least 50% recycled content or 50% renewable material, e.g. hemp, flax, newspaper, wool;
• 80% of the insulation has an A or A+ rating in BRE’s The Green Guide to Specification;
• 80% of the insulation has an A or A+ rating in BRE’s Green Book Live database; or
• are supplied with an environmental product declaration, written in accordance with ISO 14025 standards.

Any recycled and recyclable content claims must comply with ISO 14021:1999 Type II Self-declared Environmental Claims and state knowledge of IAQ emissions.

23.02 Low-GWP insulation - The manufacture and installation of all new insulants only uses products that have a Global Warming Potential (GWP) of less than five.