CIVIL ENGINEERING & BUILDING CONSTRUCTION

CUE9
Contents

SECTION 1

SCOPE OF SPECIFICATIONS

CIVIL ENGINEERING
General
Excavation and Earthworks
Piling
Concrete
Reinforcement
Material
Formwork
Drainage
Roads and Pavings

STRUCTURAL

STEELWORK
Design
Material
Workmanship
Welding
Erection

BUILDING
Brickwork and Blockwork
Carpentry and Joinery
Asphalting
Roofing and Cladding
Plasterwork/Screeding/Wall Tiling
Glazing
Floor Finishes
Painting and Decorating
Plumbing and Sanitary Installations
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 PfizerCity University Limited 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.
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.

CIVIL ENGINEERING

General

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 Operational Services.

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

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

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 PfizerCity University representative Engineer.

PfizerCity University Limited London Property: For Projects involving demolition or modification to existing buildings, certain material and equipment may be required for re-use by PfizerCity University LimitedLondon. 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 PfizerCity University LimitedLondon.

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

Liaison: The PfizerCity University Limited London Project Engineer 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.

Excavation and Earthworks

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

Site Investigation: Where necessary PfizerCity University Limited 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 dependant 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.

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

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

Concrete

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

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

Water: Refer to Series 1700 Structural Concrete.

Batching: Refer to Series 1700 Structural Concrete.

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

Mixing: Refer to Series 1700 Structural Concrete.

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.

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.

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.

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.
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 keep of all relevant data with copies provided to the Pfizer City University Engineer or Representative. Refer to Series 1700 Structural Concrete.

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.

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

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.

**Reinforcement**

**Material:**

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

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.

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

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

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.

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.

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.
Formwork

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.

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.

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

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

Drainage

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.

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

Specific site standard should be adhered to for Trade Effluent Construction

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

- C.P. 301 Building Drainage
- C.P. 303 Surface Water and Sub-Soil Drainage.

Inspection: Drainage shall be inspected, subjected to standard tests and approved by the appropriate local authority and PfizerCity University Engineer before being backfilled. Refer to Series 500 Drainage and Service Ducts.
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 PfizerCity University Limited London they must be completely surrounded by concrete with minimum of 150mm cover above the pipe. Refer to Series 500 Drainage and Service Ducts.

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 PfizerCity University Engineer.

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 ductileiron 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.

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

**Roads and Pavings**

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

- B.S.7263 Specification for precast concrete kerbs, channels, edgings and quadrants.
- B.S.7263 Precast concrete flags.
- B.S.802 Tarmacadam with crushed rock or slag aggregate.
- B.S.1446:1973 Tarmacadam and tar carpets
- B.S. 4987 Cold asphalt

Base: As specified by the designer in accordance with the specification.

Bituminous Surfaces: As specified by the designers to B.S.1621 laid to surface and falls required. Refer to Series 900 Road, Pavements – Bituminous Bound.

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.

Pavements: As specified by the designer. Refer to Series 1100 Kerbs, Footways and Paved Areas.
NOTE TO CONTRACTORS

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STRUCTURAL STEELWORK

Design

Structural steel shall be designed in accordance with current good practice and the following:

- B.S.449 The use of structural steel in building
- C.P.117 Composite Construction in Structural Steel and Concrete.

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

Material

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

Structural steel shall be in accordance with B.S.4360 unless otherwise stated. The steel shall be free from pitting, loose rust scale, grease, oil and other contaminants.

High yield stress steel shall be in accordance with B.S.4360. Hot rolled and hollow section shall be in accordance with B.S.4 and B.S.4848.

Cold rolled sections shall be in accordance with B.S.2994. Black bolts, nuts and washers shall be in accordance with B.S.916.

High tensile bolts, nuts and washers shall be in accordance with B.S.4360.

High strength friction bolts shall be in accordance with B.S.3139.

Workmanship

Workmanship shall be in accordance with B.S.449 and with current good practice. Refer to Series 1800 Structural Steelwork.
Welding

Welding shall be in accordance with the following:-

B.S.449 The use of structural steel in buildings.

B.S.5135 General requirements for metal arc welding of structural steel tubes to B.S.1775.

B.S.5135 General requirements for the metal arc welding of mild steel.

B.S.5135 General requirements for the metal arc welding of medium tensile weldable structural steel to B.S.968 type A.

Erection

Erection shall be accurately carried out in accordance with current good practice and statutory safety codes.
NOTE TO CONTRACTORS

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BUILDING

Brickwork and Blockwork

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

Materials: Materials shall be in accordance with the following:

- B.S. 12 Portland Cement
- B.S.187 Sandlime Bricks
- B.S.405 Reinforcement
- B.S.493 Air Bricks
- B.S.743 Damp Proof Courses
- B.S.890 Limes
- CP111 Reinforced Brickwork
- B.S.6073 Concrete Bricks
- B.S.1200 Sand
- B.S.1243 Wall Ties
- B.S.6073 Aerated Concrete Blocks
- B.S.6073 Precast Concrete Blocks
- B.S.3921 Bricks and Blocks of Fired Clay, etc.

Workmanship: Workmanship shall be in accordance with the following:

- CP101 Foundations and Substructures
- CP111 Structural Recommendations for Load Bearing Walls
- CP121 Brickwork
- CP122 Block Walling
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.
Cement: Cement shall be Ordinary Portland Cement as 2.4.1.

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

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

Water: Water shall be clean fresh mains water.

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.

Damp Proof Courses: These shall be asbestos based bituminous lapped at least 150mm, laid full width on a level bed of mortar and pointed.

Wall Ties: These shall be to B.S.1243.

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.

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.

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.

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

Protection: All recognized means must be used for protecting brickwork during the work. Any stains which occur must be removed to PfizerCity University Limited London satisfaction.

Carpentry and Joinery

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.
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.

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.

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.

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.

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

- B.S. Code of Practice 112 - The Structural Use of Timber in Building
- B.S.1186 Part II Quality of Workmanship in Joinery.

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.

Asphalting

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.

Roofing: Asphalt for roofing shall comply with B.S.988 Mastic Asphalt for roofing (limestone aggregate) or B.S.1162 Mastic Asphalt for roofing (natural rock asphalt aggregate), and shall be machine mixed on site. A black sheathing felt underlay shall be laid on the roofing surface to act as an isolating membrane.

Flooring: Asphalt for flooring shall comply with B.S.988 Mastic Asphalt for flooring (limestone aggregate) or B.S.1162 Mastic Asphalt for flooring (natural rock aggregate) or B.S.988 Coloured Mastic Asphalt flooring (limestone aggregate) and shall be machine mixed on site. A black sheathing felt underlay shall be laid on the sub floor surface to act as an isolating membrane.

Tanking and Damp Proof Coursing: Asphalt for this shall comply with:-

- B.S.988 Mastic Asphalt for tanking and damp proof courses (limestone aggregate)

OR

- B.S.1162 Mastic Asphalt for tanking and damp proof courses (natural rock asphalt aggregate)
Pavings: Asphalt for pavings shall comply with:

- B.S.1446 Asphalt (natural rock asphalt) for roads and footways

OR

- B.S.1447 Mastic Asphalt (limestone aggregate) for roads and footways.

**Roofing and Cladding**

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

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

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

- B.S. 690 Asbestos cement sheets and slates
- B.S. 747 Roofing Felt
- B.S. 849 Plain sheet zinc roofing
- B.S.1142 Fibre building boards
- B.S.1178 Milled lead sheet and strip for building purposes
- B.S.1470 Wrought aluminum and aluminum alloys
- B.S.1494 Fixing accessories for building purposes. PTI fixings or sheet roof and wall coverings.
- B.S.1569 Copper sheet and strip for roofing and other purposes
- B.S.4868 Corrugated aluminum sheets for general purposes
- B.S.3083 Hot dipped galvanised corrugated steel sheets for general purposes
- B.S.4868 Troughed aluminum building sheets
- B.S.3536 Asbestos insulating boards
- B.S.3717 Asbestos cement decking
B.S.3837 Expended polystyrene board for thermal insulation purposes.

Workmanship: Workmanship shall be of the highest standards and comply with the relevant B.S. Code of Practice as follows:

- C.P.143 Sheet roof and wall coverings
- C.P.143 Part 1 Aluminum corrugated and troughed sheet
- C.P.143 Part 2 Galvanised corrugated steel
- C.P.143 Part 3 Lead
- C.P.143 Part 4 Copper
- C.P.143 Part 5 Zinc
- C.P.143 Part 6 Corrugated asbestos cement
- C.P.143 Part 7 Aluminum
- C.P.144: 101 Bitumen felt roof coverings
- C.P.145: 101 Patent Glazing

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.

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

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.

**Plasterwork/Screeding/Wall Tiling**

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

- B.S. 12 Portland Cement
- B.S. 405 Expanded Metal (Steel)
- B.S. 890 Building Limes
- B.S.1191 Gypsum Building Plasters
- B.S.1198 1200 Building Sands from natural sources
B.S. 882 Aggregates for granolithic concrete floor finishes

B.S.1230 Gypsum plasterboard

B.S.1281 Glazed ceramic tiles for internal walls, etc.

B.S.1369 Metal Lathing (Steel) for plastering

Workmanship: The workmanship shall comply with the British Standards Codes of Practice as follows:-

C.P.211 Internal Plastering

C.P.221 External Rendered Finishes

C.P.212 Wall Tiling

Water: Water shall be clean mains water.

Storage: Materials shall be stored under cover and protected from spoilage, contamination, damage, etc.

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.

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.

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

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

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.

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.

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.
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 40mm (1½") unless laid monolithically. A final screed of "Ardit" shall be applied when tiles are to be laid.

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.

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.

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.

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, as detailed in Para 4.7.11.

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.

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

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

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.
**Glazing**

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, but shall in any event conform to the Code of Practice C.P. 152.

Putty: Putty for glazing to wood shall be linseed oil putty to B.S. 544 and 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.

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.

Wired Glass: Where glass is used in general access doors, corridors, etc., Georgian Wired Cast (where transparency is not required) and Georgian Wired Polished Plate (where transparency is required) shall be used. In all cases the wire shall extend to the glass edge and be free from rust and the wires shall run parallel to the edges.


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

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.

F Rated glass for general access doors, corridors etc.

**Floor Finishes**

Materials: Materials shall conform to the appropriate British Standards as follows:-

- B.S. 810 Sheet linoleum and cork carpet
- B.S. 988, 1087, 1076 1451 Mastic Asphalt for Building
- B.S.1162, 1418, 1410 Mastic Asphalt for Building, Natural Rock
- B.S.1187 Wood blocks for floors
- B.S.1197 Concrete flooring tiles and fittings dimensions and workmanship
- B.S.1286 Clay tiles for flooring
- B.S.1297 The grading and sizing of softwood flooring
- B.S.5902 Black pitch mastic flooring
- B.S.1711 Solid rubber flooring
B.S.2592 Thermoplastic flooring tiles
B.S.3187 Electrically conducting rubber flooring
B.S.3260 P.V.C. (vinyl) asbestos floor tiles
B.S.3261 Flexible P.V.C. flooring
B.S.5902 Coloured pitch mastic flooring
B.S.3717 Asbestos cement paviors

Workmanship: Workmanship shall conform to the following British Standard Codes of Practice:

C.P.202 Tile flooring and slab flooring
C.P.203 Sheet and tile floorings
C.P.204 In-situ floor finishes

Cement and Sand Screeds: See Section 4.5.12.

Granolithic Screeds: See Section 4.5.13.

Asphalt Flooring: See Section 4.3.3.

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.

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.

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.

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

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.

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.

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

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

**Painting and Decorating**

Materials: Materials shall be suitable in all aspects for the particular application and conform to the appropriate British Standards.

Workmanship: Workmanship shall be carried out according to the British Standard Code of Practice C.P.231 and the manufacturer's instructions.

Manufacturers: The materials used shall be manufactured by the following approved firms, unless otherwise specified:

- Oil and emulsion paint - I.C.I. Ltd. (Paint Division) Dulux Ltd (Trade)
- Oil and emulsion paints - W. & J. Leigh Ltd
- Cement Stone paint ("Arpax") - W. & J. Leigh Ltd
- Sprayed plastic paint ("Portaflek") - Sissons Bros. & Co. Ltd.
- Sprayed plastic paint ("Gayflek") - Pinchin Johnson & Assoc. Ltd.

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

Softwood Painting: Unless otherwise specified all softwood shall be rubbed down with a glass paper to the appropriate finish and dusted off. All knots shall be treated with genuine shellac knotting and allowed to dry. The surface shall be primed with one coat of wood primer. Before application of the undercoat all cracks, holes, etc., shall be made good with hard stopping. End grain surfaces shall receive two coats of primer. The second and third to be undercoating applied liberally and laid off evenly. The finished coat to be gloss or eggshell as particularly specified, applied liberally and laid off evenly.
Hardwood Painting: Unless otherwise specified all hardwood shall be thoroughly rubbed down with fine glass paper, dusted off, stopped, stained as necessary or desirable to give an even colour and shall receive two coats of matt clear marine quality varnish, rubbed down between coats.

Iron, Steel and Galvanised Surfaces Painting: Unless otherwise specified new iron, steel and galvanised steel surfaces shall be thoroughly cleaned and all traces of scale, rust, grease and dirt removed. The clean surface shall be primed immediately with the appropriate metal primer. The second and third coats to be undercoating applied liberally and laid off evenly. The finishing coat to be gloss or eggshell as particularly specified, applied liberally and laid off evenly.

Plaster, Brickwork, Concrete and Hardboard Painting: These surfaces shall be thoroughly cleaned and prepared as appropriate. The finishes shall be as specified in the project specification.

For emulsion paintwork the first coat shall be thinned by the addition of water in the ratio of 1:10. The second and third coats shall be thinned only as necessary for application and material liberally applied and laid off evenly.

For oil paintwork the surface shall be sealed with the appropriate sealer, the second and third coats shall be undercoating applied liberally and laid off evenly. The finishing coat shall be eggshell or gloss as particularly specified, applied liberally and laid off evenly.

For sprayed plastic paintwork the surface shall be primed and sprayed all to the manufacturer's specification. For cement stone painting of concrete, etc., apply "Arpax" strictly in accordance with the manufacturer's specification.

**Plumbing and Sanitary Installations**

Materials: Materials shall comply with the following relevant British Standards:-

- B.S. 460 Cast iron rainwater goods
- B.S. 569 Asbestos cement rainwater pipes, gutters and fixings
- B.S.1091 Pressed steel gutters, rainwater pipes, fittings and accessories
- B.S.1125 W.C. flushing cisterns
- B.S.1130 Schedule of cast iron drain fittings
- B.S.1188 Ceramic wash basins
- B.S.1206 Fireclay sinks
- B.S.1211 Centrifugally (spun) iron pipes for water, gas and sewage
- B.W.1213 Ceramic wash down W.C. pans
- B.S.1229 Fireclay wash tubs and sink sets
- B.S.1876 Automatic flushing cisterns for urinals
B.S.3402 Quality of vitreous china sanitary appliances.
Asbestos Rainwater Goods: Generally asbestos gutters and down pipes shall be used unless otherwise stated. These shall be fixed to correct gradients together with all necessary angles, stopped ends, nozzle outlets and brackets. The joints shall be made with bituminous mastic compound. Rainwater pipes shall be fixed 25mm (1") clear of walls with all necessary swan necks, offsets, bends, shoes, heads, etc.

Steel Rainwater Goods: Where steel eaves gutters are required these shall be painted two coats bituminous paint prior to positioning, jointed with red lead cement and screwed with gutter bolts.

Cast Iron Rainwater Goods: Where downpipes are necessary inside a building, cast iron pipes and fittings shall be used. Similarly cast iron pipes shall be used for below floor rainwater drainage within the curtilage of the building and manholes shall be constructed at all junctions. All joints in drains and down pipes shall be made with hemp and molten lead or approved compound and caulked to form a watertight connection.

P.V.C. Rainwater Goods: If P.V.C. rainwater goods are specified in the particular project specification these shall be heavy duty grade jointed and fixed in accordance with the manufacturer's recommendations.

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.

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.

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 Pfizer City University Limited London.

Wire Balloons: Galvanised wire balloons shall be fitted to all drain ventilating pipes and gutter outlets.

Testing: All drainage shall be tested to the complete satisfaction of the local authority and City University London Pfizer Limited and prior to handing over shall be thoroughly flushed through and cleaned to ensure perfect functioning.