SECTION 5A - Subsection 10: Building Works

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10 Building Works

10.1 Architectural works

10.1.1 Scope

This sub-section covers the requirements for the construction of buildings and includes all building works, except earth and concrete works. The work required under this sub-section shall include all labour, materials, equipment, remedy of deficiencies, site clearance and all other appurtenant works required to complete all building works specified herein.

10.1.2 Standards

The Contractor shall carry out the works described building works in accordance with the appropriate Turkish (TS) and European (EN) standards or equivalent standards. The main standards are, but are not limited by, the following:

- TS-500: Building code for reinforced concrete structures
- TS-698: Building code for steel structures
- TS EN 206: Concrete
- TS 3821: Aggregates for concrete
- TS EN 197-1: Cements
- TS EN 777 Specifications for masonry units
- TS EN 998-1: Specification for mortar for masonry
- TS 213-1 EN 13748 Terrazzo tiles
- TS EN ISO 10545 Ceramic tiles
- TS EN 13227: Solid lamparquet products
- TS 605, TS EN 111 and TS EN 31: Wash hand basin;
- TS EN 34 and TS EN 38: Water closets
- TS 544: Stainless steel sinks
- TS 825: Thermal insulation in buildings
- TS 1262: Internal plastering

- TS EN 13227: Plastic and acrylic paint.

10.1.3 Works to be measured

The Contractor shall, unless otherwise specified herein, supply all materials, equipment, and temporary works and labour necessary to perform, maintain and complete the building works.

10.1.4 Approval of materials and workmanship

The supply of all materials and items shall be subject to the approval of the Engineer. The Contractor shall provide such samples as the Engineer may require in advance for the approval and, when approved, the quality of materials and workmanship shall be at least equal to the approved samples.

10.1.5 Bricks

Bricks shall be clay facing bricks manufactured locally. The quality shall be in accordance with TS EN 777. Bricks shall be hard, sound, square and clean with sharp, well defined arises.

The Contractor shall submit samples of each type of bricks used in the works and obtain the Engineer's approval before placing orders with suppliers. Strength test certificates performed on the basis of appropriate Turkish standards shall also be submitted on request of the Engineer.

10.1.6 Mortar

Materials used for mortar shall be measured in gauge boxes. All concrete surfaces shall be adequately prepared and keyed to receive screeds. The screeds to be carried out have to be placed within buildings and shall be dense aggregate cement screeds.

10.1.7 Floor screeds

Floor screeds in operation buildings shall be laid monolithically to a thickness of minimum 2.5 cm and be laid separately.

The preparation of base concrete shall include the removal of laitance from the concrete surface to receive screed and the removal of all loose concrete, dust and dirt by thorough washing with water.

The screed mix shall thoroughly and efficiently be mixed dry by mechanical means until a uniform distribution is obtained prior to adding the water. The water content shall be kept as low as it is necessary to allow for sufficient workability for laying and compacting. Where only small quantities are required, mixing might be carried out by hand on clean watertight surface with the approval of the Engineer.

The screed mix shall be placed between forms, rigidly fixed on a firm foundation and set true to level within +/- 3 mm, and shall be fully compacted by means of a screed board providing laitance is not brought to the surface. The screed wearing course shall be tamped with a wood float and trowelled with a steel trowel to produce a smooth finish.

The screed mix shall be placed between the forms (and or other bays) worked around the penetrations, duct covers, manhole covers, gutters, balustrade standards, pipes, etc., and shall be fully compacted by means of a screed board, or other suitable compacting equipment, providing laitance is not brought to the surface.

10.1.8 Terrazzo paving

All floor finishes shall be slip-resistant without any abrasive projections or sharp edges in wet and dry conditions.

Flooring tiles shall be Terrazzo tiles of approved co-ordinated dimensions and of the best quality available in Turkey and shall generally comply with the requirements of TS 213-1 EN 13748-1. The quality and colour shall be approved by the Engineer. Therefore the Contractor shall submit some samples to the Engineer before ordering the tiles.

The tiles shall be bedded and pointed in 1: 3 Portland cement-sand mortar. Broken or scratched tiles shall not be used.

A tile skirting, with the same kind of tiles, shall be provided for all areas where the floor is tiled.

Flooring tiles shall be laid evenly with joints of 3 mm. Where gullies and/or drainage facilities are provided, the tiles shall be laid with a slight slope towards these outlets to ensure good run-off of surface water.

All joints shall be completely filled with mortar.

Tile work on foundation blocks, supports, etc., for the mechanical and electrical equipment shall be carried out after installation of the equipment.

10.1.9 Parquet floors

Wood floors shall be massive laminated parquet of abrasion class 32 (AC3) and shall comply with TS EN 13227.

10.1.10 Computer flooring

Computer flooring, where applicable, shall be a proprietary modular flooring system in which square floor panels are fitted into a gridded support overlying a cavity containing power and telemetry cables. The removable panels shall not be less than 500 mm or more than 700 mm square form, and shall be non-conducting and carpeted with anti-static material.

The grid system and its supports shall be of approved materials, and shall be designed such that the deflection of the floor under personnel loading does not exceed 1 mm at any point.

10.1.11 Preparation for flooring

The surfaces must be cleaned prior to flooring. The base for covering to be placed without underlay shall be smoothed with filler compound. In the case of major unevenness a suitable levelling compound shall be used.

Any filler or levelling compound shall be applied so that it will bond firmly and durably to the base, will not crack and will adequately withstand pressure. Any screeds such as magnesia and anhydride screed to which the filler or levelling compound will not sufficiently bond, shall receive a priming coat.

All finished surfaces shall be properly protected until completion of the contract. Terrazzo tile and in-situ flooring shall be protected with a layer of clean sawdust. PVC tile floors and carpets shall be protected with polythene sheeting.

10.1.12 Tiling

Tiling shall comprise all required labour, equipment and the supply of the appurtenant materials and structural components including off-loading and storage at the site.

All tiles and flags for which there are several grades available shall be of the best standard commercial grade, unless grade is stipulated in the Particular Specification.

Before starting the work, the Contractor shall ascertain the Employer's selection of patterns and colours and the Contractor shall furnish the Engineer with duplicate samples of the patterns and colours of the materials selected by the Employer.

Tiling shall be free of any defects and any work that shows signs of bond failures, hollow patches, misalignment, cracking or any other defect. Defected work will not be accepted and shall be removed and replaced by acceptable work.

In general, tiles shall meet the quality requirements of TS EN ISO 10545. Where tiles and flags are not standardised, the quality features shall satisfy the standard commercial requirements (top surface, parallelism of edges, colour, and water absorption). All floor and wall tiles shall be from the same batch.

Glazed ceramic tiles for walls shall be in the colour selected by the Employer, true to shape, flat, free from flaws, cracks and crazing, uniform in colour, keyed on the back. The tiles shall be of a suitable type, size, colour and acid resistance.

Ceramic tiles at laboratories and chemical storage rooms shall be oil and acid resistant, true to shape, flat, free from flaws, cracks and crazing, uniform in colour and of an approved type, make and colour.

10.1.13 Plastering

Sand

Sand shall be clean and sharp course grit, fresh water river or pit sand and shall be re-washed on site if the silt, loam or clay content exceeds the limits prescribed in TS 3821. The sand shall be obtained from a source approved by the Engineer.

Cement

Cement shall be Portland cement as specified in TS EN 197. The source of cement is subject to the approval of the Engineer and shall not be changed without his prior approval.

Water

For the mixing of mortar and plaster the Contractor shall provide tap water, if not otherwise directed or approved by the Engineer.

Mixing of plaster

Plaster shall be mixed with proportions according to TS EN 998-1. The constituents shall be measured by volume and water added in an amount compatible with workability.

Plaster shall be mixed in a mechanically operated plaster mixer for at least long enough to make a thorough, complete intimate mix of the materials. The mixing of plaster by hand shall not be permitted, unless otherwise directed.

The mixer, bunker, gauge boxes and all tools shall be kept clean, and care shall be taken to ensure that fresh plaster is not contaminated with set plaster.

Waterproof plaster

Waterproof plaster shall consist of waterproofing compound, cement and sand mixed in strict accordance with the manufacturer's specification. The water proofing compound shall be a mass product of a repudiated manufacturer and shall be approved by the Engineer.

Workmanship

Plaster shall be of 2 or 3 coats. If plaster is to be applied to smooth surfaces, a dash coat shall be applied as a bonding surface. The dash coat shall be of mush consistency, composed of 1 part Portland cement and 1.5 parts of sand.
The plaster coats shall be applied according to the thicknesses given below, whereby additional thickness, which will be required due to unevenness in the masonry surface, is not included:

Location:	Ceiling	Interior wall	Finish
Thickness of first coat:	15mm	10 mm	10 mm
Thickness of intermediate coat:	--	6 mm	9 mm
Thickness of finish coat:	10 mm	4 mm	6 mm
Total thickness:	25 mm	20 mm	25 mm

Tolerances

All surfaces shall be true to line, level, plumb and all junctions, angles and arises truly scare. On two or three coat work, the plaster surface shall not show any deviation greater than -+5mm.

10.1.14 Rendering

Rendering with plain finish

Plain finished rendering shall be carried out with 1:5 cement-sand in two or three coats. Three coat work shall be carried out on metal latching and on other backgrounds which the Engineer determines by inspection to be too uneven to permit two coat work.

Rendering applied to external walls shall contain a waterproofing agent to the approval of the Engineer. Undercoats shall not exceed an average thickness of 10 mm and finishing coats shall have a thickness of 8 mm to 10 mm. Three coat rendering shall have a total thickness of 35 mm.

Where rendering is to be applied to surface of concrete or block work, such surfaces shall be treated by a means approved by the Engineer to provide a mechanical key for the rendering.

Where dissimilar wall backgrounds meet to form a continuous surface, a 150 mm wide strip of expanded metal shall be fixed over the joint between the dissimilar surfaces before the first undercoat is applied.

Surfaces shall be cleaned of all residual mould, oil, dust, loose particles and other deleterious material before rendering work begins.

Each undercoat shall be combed or scratched to provide a key for subsequent coats as soon as undercoat has set firm.

Particular care shall be taken to cure newly applied rendering as specified herein for concrete.

Each coat shall be allowed to dry completely before the next coat is applied.

The finishing coat shall have a wood float finish to true planes and regular curves and to an even surface. Arises shall be rounded and in true alignment and a hollow fillet shall be run at internal angles.

Rendering with Tyrolean finish

Cement mortar rendering with a Tyrolean finish coat for use on external surfaces shall be carried out as three coat work and shall be applied in accordance with the manufacturer’s recommendations subject to the approval of the Engineer.

Render shall contain a waterproofing agent to the approval of the Engineer.

The Tyrolean finish coat shall be of materials and colour to the approval of the Engineer and shall be applied by machine.

Surfaces to be rendered shall be prepared and cleaned as specified in the clause herein entitled "Rendering with Plain Finish". Tyrolean finish shall also include plastering and painting work and on other payment shall be done.

Particular care shall be taken to cure undercoats as specified herein for concrete.

The application of tyrolean finish coats shall be carried out on surfaces shaded from direct sunlight.

10.1.15 Timber Works

Before commencing work, the Contractor shall submit samples of all types of timber to be used in the works for the approval of the Engineer. Timber, or carpentry and joinery units of which the material on delivery to the site does not conform to the standard of approved samples will be rejected and replaced by the Contractor at his own expense.

10.1.16 Doors and windows

Glass

External windows and doors shall generally be double glazed in (4+4) mm thick bronze solar control thermal glass.

Obscure panels to window frames shall be formed in 6 mm thick toughened opaque float glass in approved colours.

Internal screens, doors, inspection panels and aluminium framed glass doors shall be in 6 mm thick Georgian wired plate glass, or approved equivalent.

All glass shall be cleaned at the completion of construction and any broken glass replaced. The glazing shall be maintained in a clean condition until the date of handing over the works.

Metal Windows and Doors

Metal windows and doors shall be of good quality and robust and shall be to the approval of the Engineer. Metal windows and doors shall be handled with care and until fixed shall be stacked on edge on clean surf aces.

In brick openings, frames shall be fitted with fixing lugs in adequate number, and bedded in mortar. In concrete openings, frames shall be plugged to the walls using zinc-coated screws.

To avoid corrosion of Aluminium alloy frames, screws and other metal fixing in contact with them shall be of Aluminium, zinc or cadmium plated. In no circumstances shall copper fixings be used.

Frames shall not be used as centring for brickwork or to support a lintel. Frames shall be carefully pointed in 1: 3 cement mortar and, after raking out the gap, shall be pointed with mastic.

The main elements of aluminium solid section outer frame shall be not less than 2.0 mm thick. The thickness of all other structural elements of the sections shall be not less than 1.2 mm except for weather-stripping retaining flanges and glazing beads which may be thinner.

All aluminium alloy parts shall be finished satin matt and anodised conforming to Turkish Standards.

Weather-stripping shall

- be made from materials known to be compatible with aluminium
- not shrink or warp nor adhere to sliding surfaces or closing surfaces
- not promote corrosion when in contact with the aluminium alloy used
- be resistant to deterioration by weathering

Joints in frames shall be made neatly and accurately either by welding or by mechanical means (e.g. cleating and screwing) and may have flush stepped or lapped surfaces. Welded joints shall be cleaned off smooth on the surfaces which are exposed when the window or door is in closed position or where they come into contact with glazing.

Hinges and pivots shall be either of suitable corrosion resistant materials or, if not compatible with aluminium, shall be separated from the aluminium by material that is compatible with it. Hardware including its fixings shall be of suitable corrosion resistant materials. Materials or finishes which are not compatible with aluminium shall not be used unless they are satisfactorily separate from the aluminium by materials that are compatible with it. Screws (self tapping and wood), nuts, bolts, washers and other fastenings shall be of stainless steel or aluminium.

Glazing beads gaskets glass adapters and glazing compounds shall be materials compatible with aluminium and finished thereon.

Windows and doors shall be such that glazing or re-glazing on site is possible without the need to remove the outer frame from the structure of the building.

All opening windows and shall be fitted with suitable insect screens.

The Contractor shall submit details of manufacture including sections of the frame members and no orders shall be placed until such details have been approved by the Engineer.

Folding Shutter Doors

Folding shutter doors shall be bi-parting, and shutter constructed of galvanised mild steel having two coats of paint and zinc chromate primary coated. The leading two pairs of shutter leaves shall bunch independently of each set to provide a personnel passage. Leaves shall generally be about 305 mm wide, shall bunch against columns at jambs and shall be reinforced with a lattice frame of approved design. The top rolling track shall be supported by brackets, which are bolted to the underside of the supporting reinforced concrete beam. A channel guide set into the floor slab shall finish flush with the internal floor finish and shall be of heavy duty rolled steel sections set apart with bolted or welded distance plates or of other suitable design capable of trafficking by heavy trucks. Dirt boxes with access covers shall be provided at each hanging (bunching) jamb. Channels shall carry surface water drainage into dirt boxes, which are to be provided with outlets discharging into sleeves to the exterior of the building. Where required a 14 gauge end panel shall be fitted to close off each jamb and fit to one slamming stile a hook lock and a mortise box to the other with lock of the five lever or pin tum-

bler pattern to the Engineer's approval. The key shall be operable from the outside and the inside of the building. Rubber draught/dust excluding seals shall be provided at the top and bottom edges.

Each slamming stile shall be fitted with a pair of heavy duty "D" pull handles securely bolted through the door and located above or below the lock without obstructing it.

The Contractor shall provide for approval details of folding doors and full information location and fixing details, allowing for all boxing out and drillings which will be required. The Contractor shall ensure that reinforcement details, building details and the like on all affected structural and general arrangement drawings are compatible with the door and these shall be submitted to the Engineer for approval at the same time as the door details above are provided.

Internal Doors and Frames

Internal doors and frames shall be hardwood timber. All internal doors shall be painted to a colour as agreed with the Engineer.

Internal doors shall be designed such that they swing to the closed position unless deliberately held open.

External Doors and Frames

External doors and frames shall be thermal blistered and finished externally in anodised aluminium with a bronze tone that matches the windows.

External doors shall be designed such that they swing to the closed position unless deliberately held open. The doors and frames shall be fitted with efficient draught excluders.

Glazing to external doors shall be toughened glass. Samples of toughened glass shall be submitted to the Engineer for his approval. The colour of all external glass shall be to the approval of the Engineer.

Large gates may be designed as folder doors.

External Windows

All windows shall be from one manufacturer only and be manufactured from extruded aluminium. Windows shall be of the thermal blistered double insulated type and shall be glazed in a coloured glass to the approval of the Engineer. Windows of toilets and showers shall be frosted.

All hardware shall be supplied and fixed by the manufacturer and shall match the finish of the surfaces of the units and shall be replaceable without removing the outer frame from the structure. Fasteners shall be designed so that they cannot be released from the outside by the insertion of a thin blade or other simple tool.

All aluminium surfaces in contact with block work, concrete render or other alkaline materials shall be coated with two coats of black bitumen solution or similar approved protective coating. All unit surfaces, which will be visible when the window is fixed in position, shall be protected after manu-

facture by low tack tape or other suitable means capable of being removed after installation of the window to leave clean undamaged anodised surfaces.

All windows in this section of the Employer's Requirements shall equal or exceed the following performance requirements:

Opening parts of windows shall be equipped with fly mesh.

All the windows shall be provided by 3 mm thick marble skirting.

Emergency Doors

Emergency doors shall be fitted with approved panic bolts to the inside of the doors and the doors shall be designed to open outwards.

Fixed Louvers

Windows of the pumping stations shall be fitted with fixed louvers attached securely to the window frames. The louvers shall be of dimensions spacing and pitch to the Engineer's approval, and shall be in anodised aluminium finished in bronze. The material Employer's Requirements and finish colour matching those for the windows.

10.1.17 Signs

All buildings, water structures, rooms and fire exits shall be designated by signs or name plates made from engraved plastic laminate, screw fixed in required positions.

All signs shall be in both Turkish and English lettering to the approval of the Engineer.

10.1.18 Finish hardware

The Contractor shall furnish and install all finish hardware to complete the work as specified.

The Contractor shall submit samples of all hardware to the Engineer for approval.

All hardware shall have the required screws, bolts and fastenings necessary for proper installation, wrapped in paper and packed in the same package as the hardware. Each package shall be legibly labelled, indicating that portion of the work for which it is intended.

All hardware shall be of the best grade, entirely free from imperfections in manufacture and finish.

Quantities, weight and sizes specified herein are the minimum that will be acceptable.

Finish of all hardware shall be dull stainless steel unless otherwise noted.

- Locks: 1. Tabular cylinder locks: stainless finish
  2. Entry, exit and office doors: keyed on side, button opposite side

- Passage doors: knobs both side, no lock

- Storage rooms: single knob with key
- Toilet rooms: stainless outside, chrome inside, pin opening outside for emergency with button inside
- All keyed locks to be master keys for same building
- All locks to have two key each
- Door closers: heavy duty type with stainless cover; top installation for either right or left hands operation
- Stops: floor or wall mounted type, stainless
- Door pull: 10 x 30 cm stainless plate, with 15 cm shaped pull securely fastened to plate; mounted with oval head stainless screws.
- Kick plates: 20 cm stainless plate, width of door less 5 cm
- Coat holder: stainless steel, standard
- Door hinges: 10 x 10 cm stainless steel, three per door
- Flush bolts: 15 cm stainless
- Gravity hinges: set of upper and lower, chrome finish, adjustable to stay slightly ajar
- Cabinet hinges: 6 x 10 cm stainless, three per door
- Friction catch: heavy duty - two parts with rubber grips concealed installation
- Cabinet and drawer pulls: stainless steel, 10 cm grip with concealed bolt fastenings
- Window hardware:

Windows indicated to be pivot type shall be furnished with a pair of window fittings (friction stays), a window pull and one barrel bolt lock. Window fittings shall be galvanised or stainless steel. Window pull shall be 2.5 x 10 cm with 4 screws and barrel bolts 10 cm long, 6 mm bolt.

Unless otherwise indicated, all hardware installation and hanging shall be done at the site.
Exteriors doors and doors in air conditioned areas shall be weather-stripped.

Provide one (1) painted wood key case in each structure, size 25 x 50 cm with door and lock. Supply plywood back inside with hooks for spare keys. All keys shall be clearly labelled with metal or hardboard tags size approximately 50 x 20 securely fixed to the keys and handed over to the Engineer.

Upon completion of the hardware installation, all items shall be inspected for proper operation. All work shall be protected and any damage or incorrectness shall be repaired.

Hardware shall not be fitted until the latest time in the Contract.

10.1.19 Roofing

General

The work shall consist of supplying, laying and finishing complete insulation and roof coverings and shall include the provision of all necessary skirtings, copings, flashings etc. On completion, all roofs shall be left sound and watertight and in neat and clean condition. All roof finishes shall be carefully worked or fitted around pipes and openings.

Roofing systems shall be in general the “inverted roof“ or “protected membrane roof system“ where the waterproof membrane is laid directly onto the structural slab and the insulating layer is then laid on the membrane and protected by a layer of files.

If heavy snowfall is expected at the project area, roofs shall be designed as timber or steel roofs and covered with aluminium trapezoidal sheet cladding or aluminium sandwich panel.

Any special working details prepared by the Contractor must be submitted to the Engineer for approval.

Waterproofing and Insulation

The structural slab or surface screed on it shall be primed before application of the membrane in accordance to the manufacturer’s instructions. The insulation layer shall have a minimum density of 35 kg/m².

The waterproofing system shall be of approved type and manufacture.

The waterproofing system shall be suitable for prevailing climatic conditions and shall be capable to withstand local weather conditions especially as regards to high temperature difference between day and night, high humidity and heavy rains. The waterproof membrane must have a mineral fibre surface.

Filter Geotextile

The material shall have resistance to Ultraviolet light, chemical attack and experience no significant change to its physical, chemical or engineering properties under the influence of sulphates, chlorides, acids and alkalis in the forms and concentrations in which they are present in soils and ground-water to be found in-place. The material shall have proven resistance against bacterial or other microbiological attack and shall perform according to its specifications at working temperatures between 5 and 45°C. Temporary exposure during construction to temperatures up to 60°C shall not permanently impair the material.

Filter fabric shall be supplied in rolls of at least 2m wide and shall unless specified otherwise be lapped in both directions at 0.3m wide. Roll lengths of the fabric shall be such as to lay complete in one operation without jointing, each of the various sloping and horizontal lengths.

The water permeability of the fabric shall be greater than that of the soil it is protecting while the mesh size shall be smaller than the sieve size passed by less than 10% of the soil particles. The weight of the fabric shall be at least 240g/m².

Water insulation membrane

On inverted roof, water insulation shall be made by two layer of water insulation membranes. First layer shall be 3mm thick fibreglass retrofitted and second layer 3.3mm polyester rockwool retrofitted, one side mineral glazed.

The membrane shall be continuous and take up abutments and pipes to above the insulation layer. Exposed membrane shall be solar protected. The waterproof membrane shall be dressed and bonded into rainwater outlets and under flashings.

Heat insulation boards

The insulation board for buildings shall be not less than 25 mm thick closed cell extruded polystyrene loose laid in a single layer with tight staggered butt joints in accordance with the manufacturer's instructions. The board shall be trimmed to fit any fillets used under the waterproof membrane.

Lightweight Screed

Lightweight screeds shall be laid in accordance with the manufacturer's instructions and to falls not less than 2.5% with an minimum thickness of 50 mm. The screed shall be laid in two courses and in bays not exceeding 15 m², laid alternatively and finished with a mortar topping of 1:4 cement/sand mortar. Immediately after laying, the screed shall be protected from wind and sunlight and cured for 7 days.

When required, joints shall be formed in the insulating screed. A vapour barrier and ventilation to the bituminous roof sheeting shall also be provided. The Contractor shall submit samples and references to the Engineer for his approval of the materials he intends to use before ordering these materials.

Metal Roof and Wall Sheeting

Trapezoidal type sheeting, including flashings, copings and the like, for roofing and wall cladding shall be a hot dip galvanised steel substrate with zinc coating mass G 350 to EN 10143. It shall be coated on both sides with approved colour similar bonded to the sheeting, as a protection against corrosion and a type and quality approved by the Engineer.

With a span of 1.0m the sheeting shall be able to bear without plastic deformation, assuming a safety coefficient of 1.8:

- a uniformly distributed load of 0.75kN/m²
- a concentrated load of 1.5 kN at midspan.

The deflection of the sheeting with a span of 1.0m and a concentrated load of 1.5kN at midspan shall be less than 10mm. The sheeting and the fixings thereof shall be able to safely withstand uplift forces from wind of 0.75kN/m² with a span of 1.0m.

The sheeting shall not be scratched, stained, distorted or have any other defects. The sheeting shall without any maintenance and under the local conditions not be adversely affected by corrosion.

Flashings and Rainwater Outlets

Flashings shall be sheet aluminium neatly cut to the width and length required. The aluminium shall be carefully bent using a slightly rounded former so as to avoid surface cracking. Where surface fixing is required, the sheet shall be pre-drilled and fixed with stainless steel screws to proprietary fixings or hardwood grounds let into the surface of the base concrete or brick work.

Roof Lights

Roof lights shall be of clear plastic confirming to TS EN 1873. Roof lights shall be permanently fixed, and shall not be able to be readily interfered with by unauthorised persons. The mounting shall be to up stand kerbs cast into the roof slab.

10.1.20 Stairs, handrails and balustrades

Specifications for stairs, handrails and balustrades are given in the Employer's Requirements, Section 7: Mechanical Works.

10.1.21 Suspended ceilings

Suspended ceilings shall be of the lay-in metal suspension system type.

Ceiling tiles shall be mineral fibre pre-painted smooth finish tiles, sized 600 x 600 x 19 mm with square edges and be laid into galvanised steel tee suspension grid. Additional support shall be provided by galvanised pressed steel channel sections at 1200 mm centres set at right angles and clipped to primary tees and suspended from structural ceiling by wire or steel angle suspension members, also at 1200 mm centres.

Edge trim angles shall be fixed to perimeter walls. The exposed faces of suspension tees and edge trim shall be pre-painted.

All necessary couplings and clips shall be provided.

Openings shall be formed in ceilings to accommodate air conditioning grills, where applicable, and recessed light fittings. 600 x 600 mm tile sized galvanised steel hinged access panels and frames shall be provided in ceilings as required for servicing mechanical and electrical equipment in the ceiling void. The panels shall be finished with matching tiles.

Movement joints shall be provided in suspended ceilings where required. The ceiling shall end on either side of the joint at a steel tee. A strip of pre-painted galvanised steel sheet shall be loose laid in the suspension grid and access the joint.

Where suspended ceilings change level, or abut windows and louvers, bulkheads shall be formed. These shall either be constructed from steel angle frames filled with plasterboard or dismountable partitioning construction.

Suspended ceilings shall be installed after wall finishes have been applied.

10.1.22 Painting

General

Painting title covers the general requirements and standards of workmanship and the painting and protective coatings required to be carried out by the Contractor of the works, except where particularly redefined in individual specification clauses or as necessary due to a particularly corrosive local environment, the possible reaction of escaping chlorine on the works or on the structures or the reaction of chlorine residuals on phenolic paints (e.g. inside pipelines) , harmful or toxic paint in contact with process liquids, or other special requirements, in which case the Contractor submit his own special specification along with his tender.

No alternative or substitute painting standard or specification will be accepted unless it is specifically required for the above stated reason. No painting or protective coating will be accepted by the Engineer unless it is at least to the standard and of the quality specified herein.

Contractor's Responsibility

The Contractor shall be responsible for the complete cleaning, preparation, priming, painting and protection of the works carried out by him.

Workmanship Requirements

The application of paint and similar coatings to all areas indicated and the painting of walls and ceilings are to include painting of reveals, pillars, beams, conduit, valve openings, alcoves and the like.

Painting of doors includes door leaves and all edges.

If the floor is to be given a finishing coat and there is no skirting then the floor paint shall extend so as to cover approximately 100 mm of the wall bottom.

Trial Areas and Sample Pieces

Prior to the commencement of the site, painting work designated area(s) or section(s) of the works shall be completely painted as a sample of the work and workmanship to be carried out. The area(s) or section(s) shall include complete samples of all the major painting required in the works.

The area(s) shall be offered for review by the Engineer and shall, upon approval, be then preserved as a reference standard for the work.

No extra payment will be made for carrying out such protection or decoration in advance of the general work, or for the removal and repetition or improvement of the work if required by the Engineer in order to achieve the specified standard.

Plastic Paint

Plastic paint shall be in accordance with TS EN 13227 .

Acrylic Paint

Plastic paint shall be in accordance with TS EN 13227 .

Epoxy Resin Coating

Two component epoxy resin based coating (epoxy, methyl-methacrylate or other heavy duty acrylic resin binders) shall be used, and according to manufacturer's procedures for installation.

If there is no skirting then the fluid applied flooring shall extend so as to cover approximately 100 mm of the wall bottom.

Bitumen Coating

Bitumen coatings shall be applied to all concrete surfaces in contact with soil.

Precautions etc

All surface fittings, ironmongery, etc., except hinges shall be removed before painting and re-fixed on completion. They shall be entirely free of any droppings, paint smears and blemishes. Labels, pump and other machinery name plates, data plates, markings, etc., shall not be over painted but carefully preserved by removal and replacement or by masking.

The Contractor shall pay particular attention to the toxicity, inflammability and the explosive dangers related to the storage and application of the systems and shall take all precautions necessary to the satisfaction of the Engineer to protect his operatives, the public and other site personnel.

10.1.23 Finishing schedules

Location	Walls	Floors	Ceiling
Halls and reception area	Plastic paint	Ceramic tiles	Plastic paint
Office rooms	Plastic paint	Parquet	Plastic paint
Prayer room	Plastic paint	Parquet	Plastic paint
Medical Assistance room	Plastic paint	Parquet	Plastic paint
Meeting room	Plastic paint	Parquet	Plastic paint
Scada - Control Room	Plastic paint	Raised Floor	Plastic paint
Laboratory	Acid resistant ceramic tiles	Acid resistant ceramic tiles	Plastic paint
Dining room and kitchen	Plastic paint	Ceramic tiles	Plastic paint
New Water Tank building	Plastic paint	Terrazzo	Plastic paint
Guard House / Weigh-bridge container	Plastic paint	Parquet	Plastic paint
All Toilets, bathrooms	Ceramic tiles	Ceramic tiles	Plastic paint

and lockers in buildings			
All external walls	Silicone based plastic paint	-	-

10.1.24 Thermal insulation of buildings

Administration building, Weighbridge container and other heated buildings, mentioned in the Employer's Requirements, Section 3: Plant Description, shall be thermally insulated at base, walls and roof.

Heat insulation design report shall be prepared for all heated buildings.

10.1.25 Floor Finishes

General

All floor finishes shall incorporate control joints as required by the flooring manufacturer's / supplier and structural consultant, and shall be compatible with any structure below.

All floor finishes shall be hard wearing, have a high appearance and colour retention value, i.e. the appearance of the finish will not deteriorate after heavy wear and constant cleaning.

All floor finishes should allow for easy cleaning and be able to withstand daily cleaning by hand and machine as required.

All floor finishes should provide a safe surface for pedestrian movement particularly wet areas where the surface may be wet from hosing down water and weather conditions.

The junction of the floor and wall finishes shall be detailed to help easy cleaning and eliminate dirt traps.

Requirements / Workmanship

All floor finishes shall be slip-resistant without any abrasive projections or sharp edges which may be hazard to bathers.

All floor finishes shall not harbour dirt and be easy to clean by warm water or chemical cleaning agents.

All floor finishes shall be impervious, unaffected by warm chemically treated water, hosing down water or mechanical cleaners.

All floor finishes shall allow surface water to drain away where required.

All floor finishes except in Administration Building shall be able to resist industrial impact without cracking.

All floor finishes shall be detailed in conjunction with floor drainage channels or outlets as required.

All floor finishes in ‘wet areas’ should be laid to a minimum fall of 1 in 100. There should be no "ponding" in the surface where water can collect.

All floor finishes should be able to withstand staining from chlorinous chemicals or metal corrosion.

Critical Dimensions and Tolerances

Critical Factors to be Considered

- The detailed construction and specification of the structural base, screed and floor finish in relation to:
  - Ground conditions i.e support and water table
  - Position of the damp proof membrane. In addition to a d.p.m beneath the slab a further membrane may be required between the slab and the screed, depending on the water table and floor finish specified
- Falls: All the wet areas should be laid to falls to drain away hosing down water

Drainage: The method of draining all wet areas including floor and outlet designMovement joints, which may or may not be required depending on the position of structural expansion joints, floor finish specified, floor finish manufacturer and structural consultant’s requirements.

Junctions of floor and wall finishes

Care should be taken to ensure there are no bumps or recesses for ponding to take place in wet areas.

Corrosion resistant metal division strips should be provided at the junction of different floor coverings.

The surface finish of the sub-floor should be compatible with the applied floor finish.

Drainage Outlets - Requirements

- The outlet shall allow water to flow away quickly and shall not be easily clogged by waster matter
- The finished outlet shall not have any sharp projections that could be a potential hazard
- The outlet shall not be affected by warm, chemically treated water and cleaning chemicals
- The outlet shall be designed to be flush with adjoining floor surfaces and shall follow the profile of the drainage gutter (if provided)

The outlet shall be hygienic and allow access to the drainage gulley.

Industrial Flooring

Industrial flooring will be processed on the concrete slab. Powdering and sanding of the wet concrete surface should foresee with hardener.

Sanding of the top surface of the concrete, coating of the hardener material, color gray, sanding and compacting by mechanical means and then cutting the joins in 4x4 up to 5x5 canvas, as long as it is not a floor concrete slab.

a) Smoothing the concrete with a manual screeding system (float) and hand tools, before concrete sweating occurs.
b) Further smoothing the surface of the concrete with a power trowel.
c) Powdering of concrete with hardener material and compacting with sander.
d) Continuous sanding of the floor with the sander until the whole floor has been sanded.
e) Final sanding of the floor with trowel or broom.
f) Covering the floor for seven (7) days with a sheet of plastic or wet linen.
g) Cutting joints within 48 hours after laying the concrete if it is possible to cut without damaging the edges of the joint. The joints will have a width of 5 mm and a depth of approximately 25 mm unless otherwise stated in the structural design study.
h) Filling the joints with hot oxidized bitumen type 85/25 or asphalt mastic and removing the excess while it is hot.
i) Application of color self-leveling epoxy coating of high chemical and mechanical strength.
   The material is two-component, self-leveling epoxy resin, 1.5 - 3 mm thick.
   Application is made on the concrete surface after processing of the industrial floor as mentioned above.
   Other Properties:

Compressive Strength	> 80 N/mm^2	(EN 196-1)
Flexural Strength	>55 N/mm^2	(EN 196-1)
Adhesion	>1,5 N/mm^2	ISO 4624
Hardness Shore D	82	(DIN 53505)
Friction resistance	40 mg	(DIN 53109)
Resistance to chemicals		

Application Conditions, Restrictions, Instructions for Use according to the manufacturer's instructions.
If other work is foreseen after the construction of the floor, the contractor will take all necessary measures to protect the floor from possible wears (mechanical or chemical damages).
The floor should be delivered clean. It is clarified that the final floor surface will be completely flat, unless mentioned otherwise in the study.

10.2 Fences and Gates

The fence shall surround the total MBT Facility area.

10.2.1 Fences

The permanent fence shall consist of a galvanized steel mesh (standard 50 x 50 mm) and three rows of barbed wire above the steel mesh. Height of steel mesh 2.10 m. Fence poles per 3.00 m shall be galvanized iron pipe Ø 100 mm, t = 6 mm. The steel mesh shall be secured to the posts at 0.30 m intervals along the height of the posts and the chain link fence shall be supported by fixing to 3 wires strung from post to post. Furthermore, the steel mesh and posts shall be embedded in the concrete foundation.

10.2.2 Gates

A two-part wing gate shall be installed at the new entrance of the MBT Facilty
The gates shall be manual operated. Height of the gates 2.10 m. Construction materials: Galvanized tubular steel frame Ø 50 x 3.65 mm and galvanized steel mesh as used for the fence. Gate posts galvanized tubular steel Ø 150 x 5.00 mm.
The gates shall be complete with all fittings such as drop bolts; back catches, locking bars, lock plates and lock including three keys. The gates have to be provided with cylinder type locks.

10.3 Sanitary Systems

10.3.1 Scope of work

The work covered under this section comprises the providing of all labour, materials, equipment, accessories, services and tests, necessary and requisite for a complete and adequate sanitary system, such as:

- Drainage and vent pipe system
- Sewers and sewage disposal system, including connections
- Rain water system
- Potable water pipes between buildings
- Sanitary fixtures
- Hot and cold water plumbing

Also included are the following items:

- All work of a civil nature, such as placing of pipe sleeves through floors and roofs for the passage of pipes at the time the concrete is poured, hangers and supports, excavations and backfill, manhole with covers, inspection pits etc
- Protection and cleaning
- Testing

- Miscellaneous.

10.3.2 General

All materials and equipment provided by the Contractor shall be new and of the various qualities as required by these Employer's Requirements.

Sanitary piping and fire fighting design drawings shall be presented for the approval of the Engineer.

All workmanship shall be of the highest standard and to the satisfaction of the Engineer.

The Contractor shall submit full details, together with drawings, of his proposals for approval of the Engineer before commencing the work and shall carry out all tests and inspections of the finished work as may be considered necessary by the Engineer.

The word "complete" whenever used in these Employer's Requirements shall mean, in addition to the major items of Facility, all incidental sundry components necessary for the complete operation of the installation, whether or not these components are mentioned in detail. The word "piping" in these Employer's Requirements shall mean the inclusion of all pipes, fittings, nipples, valves, and all required accessories, supports, anchors, guides, etc., for a complete safe and operational network.

10.3.3 Pipes and fittings

The materials to be used for soil, wastewater, rainwater and ventilating pipes, including fittings, within the building shall be of PVC. Soil and waste piping for the drainage system outside the building shall be of concrete.

10.3.4 Joints and connections

Joints and connections in the sanitary system shall be gastight and watertight for the pressure required by test. Leaky joints shall be remade by using new materials. Joints in galvanized steel pipes shall be made by threading. Welding and bending are strictly prohibited on galvanised pipes.

Joints in PVC pipes shall be made with rubber rings and shall be carried out according to manufacturer's recommendations.

10.3.5 Unions

All distribution pipes shall be provided with unions at adequate intervals to permit easy disassembly for alternations and repairs.

Unions shall be provided near valves and equipment, which need to be taken out for servicing or repairs.

The unions shall be of material corresponding to the pipes in which they are installed, and of the same weights and rating.

10.3.6 Hangers, spacing and supports

Piping shall be installed without undue strains and stresses and provisions shall be made for expansion, contraction and structural settlement. A sufficient number of horizontal and vertical supports shall be provided at proper intervals.

10.3.7 Manholes and inspection pits

Manholes shall be provided at suitable locations and additionally where ordered by the Engineer.

The dimensions of the manholes or inspection pits shall be approved by the Engineer. All manholes shall be provided with cast-iron covers.

10.3.8 Sleeves

The Contractor shall furnish and install all sleeves to be built in for the passage of pipes through structures.

The Contractor shall co-ordinate placing of the necessary sleeves, of the appropriate sizes for his requirements, at the time the concrete is being poured. It is strictly prohibited to break through reinforced concrete beams for the passage of pipe unless prior approval is obtained.

Pipe sleeves shall be of adequate size to allow free movement of pipes due to expansion and contraction, whether bare or insulated. Sleeves for pipes shall be PVC.

Pipe sleeves shall be finish flush with floors and roofs and shall project at least 3 cm above floors and approximately 15 cm above roofs or as otherwise agreed by the Engineer.

After the installation of pipes, the Contractor shall caulk the space between pipe and sleeve with an approved product to prevent the passage of air and vermin. The caulking shall be made in such a manner as to prevent it from coming off with pipe expansion or contraction.

Sleeves in walls of storage tanks for liquids, such as pump sumps etc., shall be sealed with elastic elements that fill the space between the pipe and the sleeve and can be tightened by a screwing device. The sleeves shall be of alloyed high grade steel.

10.3.9 Protection and cleaning

The inside of all pipes, valves, etc. shall be clean and free from dirt or other objectionable matters when erected. All lines shall be blown before placing in service. If necessary, all openings in the piping shall be closed during construction in order to keep the lines free from dirt, etc.

10.3.10 Floor drains

Floor drains shall have cast-iron traps and a minimum water seal of 7.5 cm and shall be provided with adjustable and removable strainers. The open area of strainer shall be at least two-thirds of the cross-sectional area of the drain line to which it connects. Strainers shall be made of stainless steel or brass.

10.3.11 Installation of pipes

Pipes passing through walls shall be protected from breakage. A soil or waste pipe passing through a foundation wall shall be fitted into a PVC-pipe cast in the concrete and furnished with sockets at both ends. The length of the cast-in pipe including sockets shall be according to the thickness of the wall. No piping shall be laid parallel to footings or outside bearing walls closer than 1 meter. Water service pipes, or any underground water pipes shall not be run or laid in the same trench as the sewer lines.

Drainage pipes can be allowed to discharge at a height of 450 mm maximum above the bottom of a manhole. If the vertical drop in the manhole should exceed 450 mm, a drop manhole shall be used.

Where it is required to cut rigid pipes it shall be done by a suitable pipe cutter so as to leave a clean and square end to the axis of the pipe.

Vent pipes shall extend through the roof and terminate at an efficient height and as may be agreed by the Engineer. The vent pipe passengers through roofs shall be made watertight and shall be provided with a PVC de-aeration caps on the roof. Where necessary, PVC-gratings shall be provided at the ceilings.

10.3.12 Inspection, storage and connections

All pipes shall be thoroughly inspected prior to laying and any suspected cracks or damaged material shall be rejected. The pipes shall be stacked horizontally during storage and the sockets must be prevented from resting on the ground. All connections shall be made watertight and gastight. Where vent pipes connect to a horizontal soil or waste pipe the vent shall be taken off above the centre-line of the pipe, and the vent pipe shall rise vertically.

No work of breaking into an existing public sewer and forming a connection shall be carried out without prior approval of the Engineer.

If any bedding or protection is removed to make a connection to a sewer or drain, the damage shall be made good.

Connections to sewers shall be made at existing manholes.

10.3.13 Cold water pipes and valves

The Contractor shall obtain the Engineer’s approval to his proposal for the potable water distribution system on the site.

Cold water distribution pipes shall be PN 16 ductile iron for the main service pipes connecting to the city water meter. All precautions shall be taken to protect water supply and distribution pipes against contamination from the sanitary system.

Underground water service pipes and sewer lines shall be not less than 1 meter horizontally and shall be separated by undisturbed or compacted earth when they cross each other. Concealed pipes shall be installed in such a way as to permit easy access for maintenance. This applies particularly to valve locations.

All valves shall be fixed in neatly arranged vertical lines, and adequately pitched horizontal lines to allow the system to be properly vented and drained. Air pockets, traps and sags shall be carefully avoided. Pipes shall not be welded.

Gate valves shall be provided on all main and branch pipes for isolating sections of piping for maintenance. Each sanitary fixture shall be provided with a stop valve for washer replacement. The stop valve shall match the trim provided with the fixture.

10.3.14 Main cold water supply pipe

The Contractor shall furnish and install the main water supply pipe from the nearest source.

The main shall be buried with a minimum cover of about 1000 mm.

10.3.15 Plumbing fixtures

Approved water closets, bowls, urinals, washbasins and showers shall be delivered and installed according to the following Employer's Requirements.

European Water Closet

The WC pan shall be manufactured of vitreous china and shall be of the flush down type and in white colour. The pan shall have flushing rim to wash to entire internal surface of the bowl without splashing and shall be of the floor mounted type. Floor fixing screws shall be of non-ferrous material. The seat and cover shall be manufactured of black coloured plastic, unless otherwise ordered by the Engineer. The seats shall be flat on the underside and provided with four rubber or plastic buffers to rest on the WC pan rim. The cover and seat shall be fixed directly to the WC pan with copper hinges and compressible protective washers on both sides of the ceramic lugs. The flushing cistern shall be of low level type, connected to the WC pan by a PVC flushing pipe. The cistern shall be manufactured of vitreous china and shall be of the valveless siphon type of 9 litres capacity. The cistern shall be provided with a suitable ball valve, operating handle direct mounted, water supply connection and overflow pipe discharging indirectly to a suitable conspicuous outlet. The flush pipe shall be of 32 mm bore. The fill fittings shall be of the quiet type and the flush pipe shall ensure the discharge of the total contents of the cistern.

All WC pans shall be provided with a toilet roll holder.

Squatting Water Closet

The squatting WC shall consist of the pan, high level flush cistern, flush pipe, flush chain and handle and all other necessary accessories. The WC pan shall be manufactured of vitreous china and consist of a floor level bowl with a squatting plate which is provided with raised foot treads. The plate forms and impervious surround and shall be formed in one piece with the bowl. The bowl shall be provided with a back flush inlet and may be supplied with or without an integral. The flushing cistern shall be provided with a ball valve, siphon flush fittings and an overflow pipe discharging indirectly to a conspicuous outlet. The flush pipe shall be of PVC or painted galvanised steel with a diameter of 32 mm. The cistern shall have a capacity of 9 litres. All units shall be in white colour.

Bowl Urinals

The urinals shall be wall hung urinals provided with an extended lip and a spreader for flushing water to the whole internal surface of the bowl. The urinals shall be of vitreous china complete with outlet grids.

All urinals shall be provided with flushing. A single unit shall be provided with a manually operated flushing cistern. When the urinals are installed in ranges, they shall be provided with an automatic flushing cistern and dividing panels. The cistern shall discharge its contents automatically by siphonage, at intervals determined by the rate of water input to it. The capacity shall be 4.5 litres of water per standing space while the water supply shall be provided with a regulating cock and stop valve.

Wash Basins

The wash-basins shall be of vitreous china, wall hung and in white colour. The wash-basins shall be provided with a waste connection, piped water supply, overflow outlet, plug and chain and water taps.

The wash-basin shall be designed to eliminate splashing and spillage. All exposed metalwork shall be chrome plated. The wash-basin shall be supported by wall brackets of painted steel firmly fixed to the wall. Each basin shall form a waterproof edge with the wall. A mirror of approximately 40 x 60 cm shall be provided and fixed above each washbasin.

Showers

Showers shall be fixed complete including piped hot and cold water supply, wall mounted taps and floor drains. All shower rooms shall be provided with a built-in soap holder and a shower curtain rail. The floor in the shower rooms shall be provided with a sill.

Sinks

The sink-units shall be manufactured of stainless steel and each sink shall be formed in one piece.

The sinks shall be provided with a single drainer, including plugs and chains, wastes and traps, piped water supply and taps. The sinks shall be provided with suitable built-in pipework, taps and fittings shall be chromium plated.

10.3.16 Testing of sanitary systems

The sanitary system shall not be accepted until it has been tested as specified below. All tests shall be conducted in the presence of the Engineer. No part of the sanitary system shall be painted, covered or enclosed until it has been tested, inspected and accepted. All equipment, materials, instruments and labour necessary for testing and inspection shall be provided by the Contractor, to execute the work as directed.

10.3.17 Pressure tests of drainage

The piping of the plumbing and drainage system shall be tested with water. After the plumbing fixtures have been set and their traps filled with water, the entire drainage system shall be submitted to a final test. The water test shall be applied to the drainage system in its entirety or in sections. If ap-

plied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest opening of the section under test. Each section shall be filled with water but no section shall be tested with less than 3 metres head of water.

The Contractor has to install temporarily a pipe of 3 metres height in order to apply 3 metres head at the uppermost sections of the system. The water shall be kept in the system, or in the portion under the test, for at least 4 hours before inspection starts. The system shall then be tight at all points.

Underground sewers outside the building shall be tested by plugging the end of the sewer pipe filling with water, and testing with not less than 3 metres head of water.

10.3.18 Pressure tests of water supply pipes

Upon completion of the potable water distribution system, it shall be tested and proved tight under a water pressure of 10 bar or 150% of the working pressure, whichever is higher. Care shall be taken that no appliance or fitting shall be pressurised higher than its rating. If such an appliance is included in the testing circuit, it shall be blinded prior to applying the pressure. A hand pump shall be used for this purpose. All lines shall be properly plugged or capped, making sure that all air has been vented from the system before pressure is applied. The pressure shall remain constant without pumping for a period of eight hours.

If any leaks in joints or evidence of defective pipe or fitting are disclosed, the defective work shall be immediately corrected by replacing defective parts with new joints or materials. No makeshift repairs or application of patching compounds shall be permitted. After the correction is made, supplementary tests shall be run until a satisfactory working condition is obtained.

10.3.19 Flow test

A flow test shall be made of all the sanitary system components and in case any obstructions are encountered in the piping or equipment, the Contractor shall disassemble, clean, repair and reassemble such piping or equipment.

A watertight test for sleeves and the passage of pipes through floor and roof shall be made. The Contractor shall repair any leaks.

10.3.20 Hot and cold water plumbing systems

The Contractor shall install hot and cold water plumbing systems, in polypropylene pipes in administration buildings, guard house, workshops, garage, pumping stations gate houses as required.

All other buildings shall be provided by washing water system.

Hot water shall be provided by means of electrically heated and lagged galvanised steel cylinders (minimum storage capacity 120 litres).

10.3.21 Heating and Cooling Systems

Heating of the New Administration building, guard house and all office rooms shall be made by air conditioners unless otherwise stated in the Employer's Requirements, Section 3: Plant Description.

Electricity installations, heating and cooling design drawings shall be presented for the approval of the Engineer.

General specifications of the air conditioners are as follows:

Demanded cooling power: 9000 Btu/h, 12000 Btu/h or 18000 Btu/h

- 9000 Btu/h for a maximum of 25 m² area
- 12000 Btu/h for a maximum of 35 m² area
- 18000 Btu/h for a maximum of 50 m² area
- Washable anti bacterial filter installed
- Air conditioner shall confirm the requirements in ISO 9001 and CE standards
- Noise level in the inside unit shall be maximum 37 dB(A)
- Noise level in the outside unit shall be maximum 55 dB(A)
- Power: 220 V – 50 Hz
- Air conditioner shall provide 50 % relative humidity at 23ºC.