

TECHNICAL SPECIFICATIONS (PART 1)

1. Substructure Works

Siting and preparation of site

The latrine shall be sited as directed by the Employer's Technical Representative and should be sited not less than 50m from any well, bore hole or spring unless specifically requested by the Employer's Technical Representative. The latrine shall be sited at a minimum distance of 50m from any residence. The site shall be cleared of all vegetation and debris as follows:

Size of latrine	Dimensions of cleared area (m)	Area (m ²)
2-seater	15 x 11	165
2-seater (K.G Latrine)	10 x 11	110
4-seater	18 x 11	198

Excavation of pit

The dimensions of the pit shall be as follows:

Size of latrine	Length of pit (mm)	Breadth of pit
2-seater	3330	2100
2-Seater (K.G Latrine)	3125	2100
4-seater	6125	2100
4-Seater (K.G Latrine)	5700	2100

The walls of the pit shall be plumb.

The depth of the pit shall be 2.4m with 0.3m being the depth of excavation for footing of pit walls. Excavation shall not continue below the water table. There shall be not less than a 2m difference between the surface of the water table and the depth of excavation

Excavated material shall be placed not less than 2m from the edge of the pit.

Excavation of footing trenches

Trenches for footings shall be excavated to the following dimensions:

Type of footing	Width	Depth
Superstructure	450mm	450mm
Dwarf wall	450mm	450mm
Pit lining	450mm	300mm

Casting footings

All concrete footings shall be cast in-situ using a mix of 1:3:6

The depth of all concrete footings shall be 150mm.

Masonry lining

Pits shall be lined using solid sandcrete blocks of dimensions 150 x 225 x 450mm made with a mixture of 1:2.5 cement to hard sand and shall be cured by keeping the blocks continuously moist for at least 14 days. The blocks shall only be used after at least 21 days.

The first 2 courses and top 3 courses shall be fully mortared using a 1:4 cement/sand mortar.

The vertical joints shall be left dry in the remaining parts of the lining walls with a gap of 50mm between each block.

There shall be no straight joints and *no block cut to less than $\frac{3}{4}$* will be permitted. The space between the pit lining and the wall of the excavation shall be filled with coarse well-tamped material from the excavation after the blocks have been laid. The lining shall be continued to 300mm above the original ground level.

The partition walls between each compartment of the pit are constructed using the same blocks laid on flat to give a wall thickness of 225mm. The partition walls should be constructed at the same time as the lining walls and should be bonded / interlocking to them. The partition walls have fully mortared joints.

The pit walls shall be fully plastered with mortar of mixed ratio 1:4

Cast reinforced concrete beam

The beam shall be cast in-situ using a concrete mix of 1:2:4. 12mm diameter mild steel bars are used for the main bars and 6mm as links. The links/stirrups shall be spaced at 200mm centers. Care shall be taken to ensure a cover of at least 25mm of concrete from the lower surface and sides of the beam to the reinforcement and air bubbles removed.

Concrete casted shall be cured for at least 14 days (if suspended) and 3 to 7 days (if not suspended)

Underground Hidden T- Beams

There shall be reinforced underground concrete Tee beams as stated in the BOQ and the drawing. These shall be verified by the Employers Technical Officer before work continues. The dimensions shall be 275mm x 150mm.

Precast reinforced concrete slabs

All cover slabs shall be precast on the site in wooden or steel moulds. The slabs are cast reinforced with mild steel and have a thickness of 75mm of concrete 1:2:4. Care shall be taken to ensure a minimum cover of 25mm of concrete from the lower surface of the slabs to any reinforcement. Slab reinforcement shall be of 12mm diameter for main bars and 12mm diameter for distribution bars.

The concrete works for vent and squat slabs shall be cast insitu with a ratio of 1:2:4. The precast slabs are removed from the formwork 2 to 3 days after casting and are cured preferably under shade for 14 days.

Squat slabs

The surface of the slabs shall be finished smooth and have a slope to the drop hole. The drop hole shall have a diameter of 150mm and a length of 350mm. The urinal portion (optional) shall be 75mm wide and curved at the tip. The urinal slot of the squat hole for the female side shall be relatively wider.

Slab placement

The slabs shall be set in a 1:4 cement/sand mortar. The cover slabs shall have a **gentle slope towards the back of the pit**. All loose soil and foreign materials shall be removed from the pit compartments before placing the cover slabs.

The latrine pit, block and walls shall be raised at least 300mm from the ground surface

Floor of privy

The floor shall be cast with a minimum thickness of 125mm of concrete 1:3:6 and the surface given a troweled finish.

Walkway

The walkway shall be cast in-situ with concrete 1:3:6 on a well compacted hardcore filling done in layers of 300mm. The walkway shall slope to the dwarf wall to provide adequate drainage.

2. Superstructure Works

Walls

The walls shall be made of 125mm solid blocks, laid with a 1:4 cement/sand mortar. When repairing cracks, they shall be opened up to 25-50mm wide and sealed with 1:4 mix of cement-sand mortar. Where cracks are very large reinforcement bars of diameter at least 12mm shall be fixed in the joint before filling with cement sand mortar.

There shall be no openings around any part of the building; this is to prevent the escape of flies.

Door and Doorframe

The door and door frame shall be made of galvanized aluminum metal pipes of size 900mm x 2100mm in the design drawing and directed by the Employer's Technical Representative.

The galvanized metal doors shall be fabricated to have an opening of 300mm attached to the top of the gate to ensure adequate ventilation. The opening (vent) shall be installed such that it (vent) opens as the gate is opened.

This opening shall be fitted with aluminium netting to prevent entry of flies. The metal gates shall be primed with anti-rust oil paint and then two coats of oil paint.

The metal doors shall open freely. All doors shall be having padlocks (as described by the Technical Officer).

Roofing

The roofing members shall be of odum treated with solignum and the roofing sheets are of aluminium running the whole length of the building and with an overlap of 600mm. 2x4" wood is to be used for the rafters at 1200c/c and 2x3" wood for the purlins at 1050 c/c.

Roofing sheets shall be 0.35mm thick corrugated Aluzinc roofing sheets laid two corrugations side lap and 150mm end laps and fixed to timber purlins at maximum 1050mm centres with coupled diamond shape bituminous felt washers.

Plastering

The interiors of all privies shall be plastered and smooth finished with cement, sand mix of 1:3. The area around the squat slab shall be given a smooth finish. The inside of the pits shall also be plastered using the above-mentioned ratio.

Dwarf wall

The dwarf wall shall be constructed of 125mm solid sandcrete blocks laid with a mix ratio of 1:4. The wall shall have minimum height of 1.5m. Where there is a partition between the male and female parts of the latrine, the partition wall shall be one course higher.

There shall be columns located in the dwarf wall as indicated on the design drawings. There shall be drainage holes in the dwarf wall to allow the escape of water.

Painting

The exterior and interior of the superstructure including both sides of the dwarf wall shall be painted with two coats of emulsion paint and apply oil paint for fascia board. Where there exist metallic components/additions to the building, it shall be painted with oil paint.

Murals

The contractor shall draw on latrine walls agreed WASH murals.

3. Hand Washing Facility and Rain Harvesting System

Siting and preparation of site

The site for platform shall be sited as directed by the Technician Employer's Representative (and shall be 300mm from the dwarf wall at the point of partition of the dwarf wall in case of institutional KVIP)

The site shall be cleared of all vegetation and debris as follows:

Dimension of cleared area (m)	Area (m ²)
3 x 2	6

Platform

Trenches for footings shall be excavated to the following dimension

Width	Depth
450mm	450mm

Casting of footings

All concrete footings shall be cast in-situ using a mix 1:3:6. The depth of all concrete footings shall be 150mm.

Masonry works

The platform column shall be constructed using solid sandcrete blocks of dimension 150x225x450mm made with mixture of 1: 2.5 cement to hard sand and shall be cured by keeping the blocks continuously moist for at least 14days

The height of the water storage platform shall be not less 600mm and shall be constructed as directed by the Employer's Technical Representative.

Plastering

The platform column shall be plastered and smooth finished with cement, sand mix of 1:3.

Cast reinforced concrete slab

The slab shall be cast in-situ using a concrete mix of 1:2:4. 12mm diameter mild steel bars shall be used for both way reinforcement at 150mm c/c. Care shall be taken to ensure a cover of 30mm of concrete from the lower surface of the slab to the reinforcement.

Polytank

The Polytank shall be 1.4m³ (1400L) capacity.

Pipe installation

All pipes shall be installed using PVC pipes as shown in the drawings and diameters shall be 75mm and connected into the polytank as directed and agreed by the technical officer.

Drainage

2 No. washing chambers shall be constructed at the end of the walkway of the privy using 100-125mm solid blocks as shown in the drawings.

Soak away Pit

Excavation for the soak away pit shall not be less than 750mm. Walls of the soak away pit shall be 100mm to 125mm. The soak away pit shall be filled with rocks (20mm to 25mm).

Splash Guards, Gutters and Hangers

Splash Guards

The Splash Guards shall be fabricated into a right-angle channel of 140mmx65mm and shall span the full length of the building as shown in the drawings. The nails for fixing the Splash Guards to the roof of the latrines shall be two and half inches roofing nailing or similarly approved.

Gutters

The Collection Gutters shall be fabricated into a right-angle U-shaped channel of 150mmx150mmx212mm and shall span the length of the building as shown in the drawing. The material for fabricating the Splash Guards and Gutters shall be plain aluminum sheet of thickness 0.8mm

Hangers

The material for Hangers shall be galvanized U-shaped metal clips or similarly approved.

Installation of Gutters, Splash Guards & Hangers

The Roof Gutters shall be joined together by Emfiband with an overlap of 100mm. The Collection Gutters shall be installed from the Roof Gutters to the Poly-tank at a slope of 5%. The Hangers and Roof Gutters shall be installed to give a slope of 1% as shown in the drawings.

Gutters fabricated from plain aluminum sheets or ready-made gutters shall be provided and shall run the full length of roof length to collect rainwater for hand washing. The gutters are to be supported at spacing of 600mm c/c and should have splash guards spanning the whole length of the roof to prevent spillover of rainwater. The gutters are to be painted to avoid rust.

4. Disability Support Facilities

The two main entrances to the latrines shall have gentle ramps at a **Gradient / Slope of 1:12**. The entrances to the latrine shall not have any projection that makes the use of wheelchairs difficult.

There shall be a fixed disability support rail to enable squatting by the disabled as directed by the Technical Officer.

5. Squat Holes Footrest Details

The squat holes shall have a diameter of 150mm and shall be shaped in the form of a keyhole using moulds. The total length of the Squat hole shall be 350mm and base of the keyhole 75mm.

The squat hole shall be 200mm from the back wall and 300mm from the side wall. There shall be oval footrest (similarly approved) installed at an angle of 20 degrees to the key slot beginning at point of contact between the key slot and hole as shown in the design drawing. The footrest shall have a width of not less than 150mm and length not less than 300mm and will have a height of 25mm.

6. Vent Pipes

150mm diameter PVC pipe shall be installed as vent pipes and shall have a height of at least 0.5m above the latrine building. The pipes should be firmly held to the fascia board using galvanized U-shaped metal clips or similarly approved and shall be neatly fitted at the opening with aluminum netting.

The vent pipes shall be installed at right angle to vent slabs ensuring they are very straight and not slanted.

7. Pad Disposal Chamber

Pad disposal chamber shall be made entirely of burnt bricks and constructed behind the Girls Change room. The disposal chamber shall be connected to the change room using 150mm metal tubes (thickness not less than 2mm) with a cover to prevent the entry of smoke into change room when burning and allow dropping of used pads in the chamber.

The pad disposal chamber shall have installed in it at 1/3 of its height, fire bars (diameter of bar not less than 12mm) with spacing not greater than 300mm to enable burning/collection of pads.

The Chimney to the Pad Disposal chamber shall extend to at least 600mm above the roof. There shall also be a 600mm x 600mm galvanized metal doors (thickness not less than 2mm) to allow emptying of the chamber.

8. Girls Change Room

The girls change room shall have the following;

- Fixed on the walls a 1200 x 1200mm beveled edge mirror fixed with chromium plated dome-shaped screws to wall.
- A wooden hanger to allow for the hanging of clothing.
- A hand washing chamber in the girls change room as directed by the Technical officer

9. Additional Specifications for K.G. Latrines

Dwarf Walls to Walkway

- Footing depth to the dwarf walls shall not less than 450mm and shall have a concrete depth of not less than 150mm.
- The height of the dwarf wall at the front and side views of the latrine shall not be more than 450mm (2 Courses) from the walkway floor. (See attached designs)
- Finishing to these walls shall be as done to all other walls. (Plastering with mix ratio of 1:3 and painted with 3 coats of emulsion paints). Colour to be determined by the CRS Technical Officer.

Galvanized Steel Poles

- Galvanize steel pipes of diameter 100mm (4 inches) shall be used as support poles for walkway fencing.
- The galvanized pipes shall be 1800mm high above walkway floor level and at least 600mm below ground level.
- The base of the steel pipes shall have a metal shoe welded at the base with U - bar on top to receive 50mm steel pipes (Total Length-2400mm long)
- The galvanized steel pipes shall be primed or painted. All unprimed metalwork to be painted shall be cleaned down by wire brushing and scraping to remove all loose scale, dirt and grease, and shall be primed immediately afterwards.
- Metalwork which has been primed before delivery shall be inspected for errors by CRS Technical Officer. Unsatisfactory priming shall further be cleaned, wire brushed and primed or rejected for replacement.

Chain link fence

- The chain link fence shall not be less than 3mm thick

- The chain link fence shall be galvanized 50 x 50mm spacing square chain link fence/mesh (pre-coated with anti-rust).
- The chain link fence shall have an average height of not less than 1.45m or similarly approved as directed by the engineer
- The square chain fence shall be fixed to the steel post
- The square chain fence shall be held firm by strain wires installed vertically at 600mm c/c.
- The colour of the square chain fence link shall be pre-coated green or colour similarly approved by engineer.

Trap Door into Privy Rooms

- Frame for the door and plate shall be treated 50 x 150mm sawn hard wood 50 x 100mm in studs @ 1200mm c/c
- Fly screen (trap) door size shall be 900 x 1800mm. (double door)
- 2" x 2" wire mesh (Expanded Metal) burglar proof shall be provided for trap doors including spring and tower bolts to enable locking from outside
- Mosquito netting used on trap doors to allow ventilation and prevent entry or exit of flies shall be double fold
- 20mm x 48mm cover battens shall be used during the installation of the netting on trap doors.

QUALITY OF MATERIALS

Materials for concrete

Aggregates

Aggregates shall be hard, clean and free of all organic material. They should conform to the appropriate Ghana standards. Samples of all aggregates to be used shall be brought to the Employer's Representative for approval before use.

Coarse aggregates shall be comprised of well-graded material of between 6mm and 15mm in size. Sand used for concrete shall consist of hard material of size not less than 4mm and shall contain no more than 5% silt. Sand used for cement mortar shall be fine grained and if required shall be screened through a 3mm sieve.

Cement

Cement shall be normal Portland cement delivered in 50kg bags. The bags shall be in perfect condition when delivered to the site and shall be not more than 3 months old at the time of use. All broken bags or bags showing evidence of dampness or caking shall be immediately removed from the site. Reuse of spilt cement is not permitted.

Steel reinforcement

Plain mild steel bars shall be used for the reinforced beam and slabs. The Contractor shall remove any loose rust from the bars by brushing with a steel brush.

Water

The Contractor shall provide all water needed on the site. Water used for mixing concrete shall be clean and of a quality suitable for drinking.

Concreting

Concrete mixes

The following concrete mixes are specified:

Use	Mix ratio	Coarse aggregate size
In-situ footing and floor (Plain)	1:3:6	< 38mm
In-situ beam (R.C)	1:2:4	< 19mm
Precast slabs (R.C)	1:2:4	< 19mm

Curing

All concrete works, including beam and slabs shall be protected from rapid drying for 14 days by covering with white polythene sheets and watered daily.

Formwork

Slab formwork shall have a maximum deviation from straightness of 5mm over the full length of the slab.

Mixing, placing and compaction

Casting of concrete slabs and mixing of concrete shall be carried out adjacent to the latrine and hand mixing shall be carried out on a wooden or metal sheet or cement platform. Concrete shall be mixed in the correct proportions as directed by the Technical Officer.

Cement mortar

Cement mortar for all block laying shall be made by mixing 4-parts sand with 1-part cement by volume. Cement mortar shall be mixed on a clean surface such as a cement platform or wooden or metal sheet. Mortar shall be mixed in small quantities and used within 1 hour. Mortar that has already hardened shall not be knocked up and remixed for use.

Materials for Rain Harvesting

Splash Guards and Gutters

The material for the fabricating of Splash Guards and Gutters shall be plain aluminum sheet of thickness 0.8mm

The nails for fixing the Splash Guards to the roof of the latrines shall be two and half inches roofing nailing.

SUPERVISION OF WORKS

The Contractor shall keep a works diary on the site at all times, which must be shown to the Employer's Representative if he requests it. The following information shall be recorded in the works diary on a daily basis:

- Weather conditions
- Daily record of workers employed
- Deliveries of materials to the site
- Details of concrete mixes used and quantity of cement used
- Other occurrences, e.g. accidents, strikes, storms etc.
- Visitors to the site

Written instructions by the Employer's Representative and minutes of site meetings will also be recorded in the works diary.

An A4 size duplicate book shall be provided by the contractor for use as the works diary.

At certain stages during the execution of the works the Contractor must have the approval of the Employer's Representative before proceeding. In each case it is the responsibility of the contractor to inform the Employer's Representative at least 48 hours in advance that his presence is required on the site.

SAFETY PRECAUTIONS

The Contractor shall ensure that the following safety precautions are observed:

- Boots and safety helmets shall be worn by persons working in the pit.
- A ladder shall be provided so that workers may quickly escape from the pit.
- At night or when work in the well has been suspended access to the site shall be closed off.
- When workers are in the pit one person shall watch them from the top of the pit.
- When workers are in the pit no other work shall be carried out within 2m from the edge of the pit

TECHNICAL SPECIFICATIONS Part II (compliance with EMP)

Safety, Security and Environmental Management

General

1. Before the order to commence any works, the contractor is required to implement the Environment Plan (EMP) for the project as specified in the Environment & Social Management Framework (ESMF) and Resettlement Policy Framework (RPF) prepared for this particular project. The plan shall spell out how the contractor should achieve environmental targets and objectives specified in the EMP (Excerpts available for reference). The plan shall include, to the extent practicable and reasonable, all steps to be taken by the Contractor to protect the environment in accordance with the current provisions of national environmental regulations and or the EMP established for this project.
2. Notwithstanding the contractors' obligation under the above clause, the Contractor shall implement all measures necessary to restore the sites to acceptable standards and abide by environmental performance indicators specified under the EMP to measure progress towards achieving objectives during execution or upon completion of any works. These measures shall include but not limited to the following:
 - a) Minimize the effect of dust on the surrounding environment resulting from earth mixing sites, dispersing coal ashes, vibrating equipment, temporary access roads, etc. to ensure safety, health and the protection of workers and communities living downwind of dust producing activities
 - b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and communities near rock – blasting areas.
 - c) Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels is maintained and/or re-established where they are disrupted due to civil works being carried out.
 - d) Prevent bitumen, oils, lubricants and waste water used / produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes. Regarding the adequacy or inadequacy of rehabilitation measures carried out on the bio-physical environment and compensation for socio-economic disruption resulting from implementation of any works.

3. If the Contractor fails to implement the approval Environmental Management Plan after written instruction by the Engineer to fulfill his obligation within the requested time, the Client reserves the right to arrange through the Engineer for execution of missing action by third party on account of the Contractor.

SPECIFIC ENVIRONMENTAL ISSUES TO BE CONSIDERED

Worksite/Camp Site Waste Management

- All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals must be banded in order to contain spillage. All waste containers, litter and any other Waste Management Regulations of the Environmental Protection Agency of Ghana
- All drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with the Water Pollution Control Regulations of the Environmental Protection agency of Ghana.
- Used oil from maintenance shall be collected and disposed off appropriately at designated sites or be re-used or sold for re-use locally.
- Entry of runoff to the site shall be restricted by constructing diversion channels or holding structures such as banks, drains, dams, etc. to reduce the potential of soil erosion and water pollution.
- Construction waste shall not be left in stockpiles along the road. Waste and other excess material shall be used for rehabilitating borrow areas and landscaping around the road.
- If other spoil disposal sites are necessary, they shall be located in areas, approved by the engineer, of low land use value and where they will not result in material being easily washed into drainage channels. Whenever possible, spoiled materials should be placed in low-lying areas and should be compacted and planted with species indigenous to the locality.
- Stockpile areas shall be located in areas where trees can act as buffers to prevent dust pollution. Perimeter drains shall be built around stockpile areas. Sediment and other pollutant traps shall be located at drainage exist from workings.

Material Deposit

- The Contractor shall deposit any excess material in accordance with the principles of the EMP at areas approved by local authorities and/or the engineer.
- The Contractor shall in advance of the commencement of work clarify with the local authorities dumpsites or areas for hazardous deposits for contaminated liquid and solid materials, that cannot be used any longer as backfill.

Rehabilitation and Soil Erosion Prevention

- To the extent practicable rehabilitate the site progressively so that the rate of rehabilitation is similar to the rate of construction.
- Always remove and retain topsoil for subsequent rehabilitation. Soils shall not be stripped when they are wet as this can lead to soil compaction and loss of structure.
- Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.
- Re-vegetate the stockpile to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.
- Locate stockpiles where they will not be disturbed by future construction activities.
- To the extent practicable reinstate natural drainage patterns where they have been altered or impaired.
- Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute ground water and soil.

Traffic Management

- Location of access roads/detours shall be done in consultation with the local community especially where access road shall traverse important ecosystem component. Access roads shall not traverse wetland areas.
- Access roads shall be sprinkled with water at least five times a day in settled areas and three times in unsettled areas to suppress dust emissions.

Blasting

- Blasting activities i.e blasting of rocks during pit excavation shall be done during working hours and local communities shall be consulted on the proposed blasting times.
- Noise levels reaching the communities from blasting activities shall not exceed 90 decibels.

Disposal of Relocated Elements

- In some areas, no longer usable materials and construction elements will have to be disposed of, such as pipes and demolished structures.
- The Contractor has to agree with the local administration of the Client, which of these elements to be surrendered to the Clients premises, or in which way they could be recycled best.
- Unsuitable and demolished elements shall be dismantled to size fitting on ordinary trucks to be transported for the purpose of recycling to an official scrap-yard.

Health and Safety

- The contractor in advance of the construction work shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS
- Adequate road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.
- Construction vehicles shall not exceed maximum speed limit of 40km per hour.

Repair of Private Property

Wherever the Contractor, whether deliberately or incidentally damages private property it has to be repaired. For each repair the contractor has to obtain from the owner the certificate, that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.

In case where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the Engineer. This compensation is in general to be settled under the responsibility of the Client along with the particular EMP or even before signing the Contract. In unforeseeable cases the respective administrative entities of the Client will take care of compensation.

Cost of Compliance with the EMP

It is anticipated, that the compliance with the EMP is already part of standard good workmanship and state of art as generally required under this Contract. However, the awareness has to be conveyed to the Contractors staff. In addition, some costs are arising from establishing an individual EMP for each subproject or site respectively, as well as the related monitoring and reporting. The item "Compliance with the EMP" of the BOQ covers these costs. No other payments will be made to Contractors for compliance with any request to avoid and/or mitigate an avoidable negative environmental impact.