

TERMS OF REFERENCE

Construction of Metal Fabrication/Automotive and Hair Dressing/Tailing workshop; Masonry workshop, store and office; a block of 3 classrooms; 2 blocks of 4 stances latrine (Male & Female); 20m3 Water Yard; Chain link fence (112.5x108.9) m, and 500m Access Road, Bentiu- Unity State.

PROJECT INFORMATION

1.1. Background

IOM South Sudan is seeking contractors to carry out the mobilizing and constructing of the various infrastructure at Bentiu TVET center to the required standards of construction, quality control, and health, safety, and environmental protection.

IOM requires prompt and immediate action in mobilization of a team for construction. As a result, the Contractor must provide a suitable and experienced team that can quickly and efficiently carry out the required construction work, as well as any required tools and transportation for the team to and from the sites. The Contractor shall furnish all the necessary materials, tools and equipment, labor supervision and other services for the satisfactory and timely completion of the works in accordance with this agreement.

1.2. Project Details

Project Name	Construction of Metal Fabrication/Automotive and Hair Dressing/Tailing workshop; Masonry workshop, store and office; a block of 3 classrooms; 2 blocks of 4 stances latrine (Male & Female); 20m3 Water Yard; Chain link fence (112.5x108.9) m, and 500m Access Road, Bentiu- Unity State.
Project Site 1	Bentiu TVET center, Unity State GPS: N: 9.258014; E: 29.81756
Scope of work:	Construction of 2 blocks of workshops, a block of 3 classrooms, two (2) blocks of 4 Stances VIP latrines, one with Urinal and the other with washroom attached, Chain link fence (112.5x108.9) m, Water Yard and 500m Access Road
Schedule	The project is expected to commence in December 2025 and be completed within 6 months with a twelve-months warranty period.

2. Supervision

The construction site and construction activities will be supervised by the IOM designated Site Engineer and Project Engineer.

The Lead Engineer is responsible for the overall project management of the contractor work with an oversight from the Programme Coordinator.

To avoid double reporting, the Contractor is not allowed to report externally to any other platform of coordination.

3. Scope of Work

These General Specifications are to be used with reference to the following documents:

Annex A.	Design Drawings
Annex B.	Bill of Quantities (BoQ)
Annex C.	Guideline for Standards on Workmanship and Materials
Annex D.	ECRP IOM Project Health and Safety Management Plan (HSMP)
Annex E.	ECRP IOM Quality Management Plan (QMP)
Annex F.	ECRP Environmental and Social Management Plan (C-ESMP)
Annex G.	ECRP Labour Management Procedure (extract from ESMP)

The following detailed scope of work is supplementary to the design drawings. Any discrepancies between the drawings and these specifications shall be brought to the attention of the Site Engineer for clarification.

Only IOM may approve any changes, modifications, deviations, and substitutions in the scope of work.

3.1. SPECIFICATIONS FOR THE CONSTRUCTION OF ONE BLOCK OF THREE CLASSROOMS

3.1.1. Site Layout

Orientation of block of classrooms: The orientation of the classrooms block shall be as per the site assigned by the school administration. Confirmation of the orientation shall be part of the initial site inspection.

Measurements: During the setting out, the Contractor shall obtain the correct measurements from the drawings and cross check the diagonals to see if they are equal.

3.1.2. Site Clearance

The Contractor shall clear the site and debris for an area as specified in the BoQ and as shall be guided by the Site Engineer.

Excavations for foundation work

The contractor shall excavate the foundation trenches as per the cross sections specified on the design drawing. The Site Engineer reserves the right to increase the foundation size subject to the exposed soil conditions per the following guidance:

The Contractor shall excavate for pad footing in black cotton soil to a depth of *1200 mm* and *1200x1200mm footing* and strip footing depth of *750mm* and *800mm* width all in accordance with foundation plan or layout.

3.1.3. Concrete foundation work

The Contractor should provide 150mm sand blinding to column bases and C15 (1:2:4) concrete blinding of *50 mm thickness for both column pads and strip foundation*. (Cement: Sand: Aggregate). The ratio must be measured properly with a gauge box of 300 mm by 300 mm by 400 mm. After the casting of the foundation the foundation must be cured for 5 days prior to plinth wall construction.

Provide column pads as per the layout drawings:

Columns pad of $1200\text{mm} \times 1200\text{mm} \times 250\text{mm}$ thick to receive columns C1 of $200\text{mm} \times 200\text{mm}$. For all columns, 4 Y-12 bars shall be installed with stirrup R8 spaced at 175mm C/C with an overlap of 50mm. Y-12 bars shall be used for the footing spaced at 180 C/C in both directions. Refer to C-1 in the drawings for more details on the reinforcement.

CHS base of $1000\text{mm} \times 400\text{mm} \times 200\text{mm}$ thick, to receive CHS $\varnothing 100 \times 3\text{mm}$ Steel Columns to support the roof.

3.1.4. Plinth Wall and Ground Beam

A plinth wall should be constructed to a *height of 500 mm* above the ground level with solid concrete blocks to receive the *300 mm depth x 200 mm width* ground beam. Mortar mix should be 1:3 (Cement: Sand) with wall thickness of *200 mm* for the plinth wall. For the ground beam, C-25 structural concrete shall be used (1:1:2 Cement: Sand: Aggregate). The ground beam shall have depths of 300mm and width of 200mm. For reinforcement details refer to the bar bending schedule for beams on different axes with their respective cross sections. All beams with stirrup R8 and reinforcement bars Y12 on all Axes (A, B C, 1,2,3,4 &5).

3.1.5. Back Filling the Soil

After completing the foundation work, the back-void spaces must be filled out with selected soil material. The selected material should be put in layers of up to 200 mm with each layer properly compacted. Min. 500mm thick Compacted selected fill to grade is required.

3.1.6. Concrete Slab

The floor slab will be resting on top of the murrum backfill, and damp-proof membrane (i.e., plastic sheeting). The slab shall be floating/isolated as per the design drawing.

A concrete slab must be cast (according to the drawing) with a thickness of 100 mm using concrete grade of C-25 (ratio of 1:1:2). reinforced with wire mesh reinforcement; BS 4483 A98 weighing 1.54 kgs per square meter, resting on spacers at least 50mm high. and should be resting on spacers at least 50mm high.

3.1.7. Walling

The contractor should construct a wall of a thickness not less than 200 mm by using good quality burnt clay bricks or concrete blocks, whichever is available, all round the classroom perimeter including partition walls. A damp-proof course must be laid on the floor slab prior to laying mortar for the walls. The length and height of the wall must be constructed according to the drawings. The mortar ratio should be 1:3 (Cement: Sand).

3.1.8. Ring Beam

The contractor shall form the ring beams in situ and provide formwork at the soffits fitted to the door and window openings. The ring beams are *300 mm depth x 200 mm width* C-25 concrete (ratio 1:1:2), reinforced with R8 stirrups spaced at 175mm c/c and 4-Y-12 bars, see reinforcement schedule for details on ring beam axes A, B, C, 1,2,3, 4, &5.

3.1.9. Roofing Work, Steel Elements

The contractor shall put complete roofing structure by using steel roof structure. The price includes construction of bonding elements for steel roof supporting structure according to standard practices all according to the design. For details and dimensions of the steel structure elements, refer to the Roof, Beam and Truss Layout and Truss T-1 details in the drawings.

The gable end roof shall have a pitch of 22-degree slope in accordance with the drawings. The contractor should put pre-coated corrugated galvanized iron sheet (28G) as per the specification mentioned in BoQ. The CGI sheet should be joined with the purlin with J-bolts and other necessary accessories. A 25 x 225mm high timber barge board with approved wood preservative shall be bolted to 100 x 100 x 8mm thick mild steel plate with 4 No 12mm diameter bolts: plates welded to edges of rafters; payment includes all joint and placement work to install the fascia board. A gutter shall be installed on the lower side of the roof and connected to the 10,000L water tank using the appropriate accessories and fittings.

All timber parts of the roof construction shall be protected with 2 coatings against termite attack using wood preservative.

3.1.10. Doors and Windows

The contractor should provide all the ironmongery work of good quality, two coats of red oxide primer shall be applied on the doors at point of fabrication before delivery.

Steel doors and windows to fit structural opening as per the doors and window schedule. One coat of enamel paint to be applied on site. The finish shall be clean and uniform in color with no blemishes. All surfaces shall be covered uniformly. Adjacent surfaces that have not been painted shall be protected from splashing. Any paint splashes shall be cleaned off at the contractor's expense.

3.1.11. Ramps

The Contractor shall construct ramps for ease of accessibility with 10% slope or ratio of 1:10 for pedestrian access. The ramps should be equipped with handrails on either side of the ramp as per the drawings and specifications. The ramp shall be constructed with C-20 concrete (ration 1:1.5:3) with BRC mesh A98 with a minimum thickness of 100 mm at all points. Install two lines of grip friendly handrails using CHS 50 diameter and 2.5 mm thickness on both sides of the ramp. The height of the handrail shall be at 1025mm, guide rail @500mm and metal baluster @ 250mm and 770mm from the ramp level with vertical support @ 1200mm c/c. Horizontal rails shall be parallel to the slope. The edges of the handrails shall have a smooth finish. All iron parts to be painted with two coats of antirust paint and one coat of enamel paint.

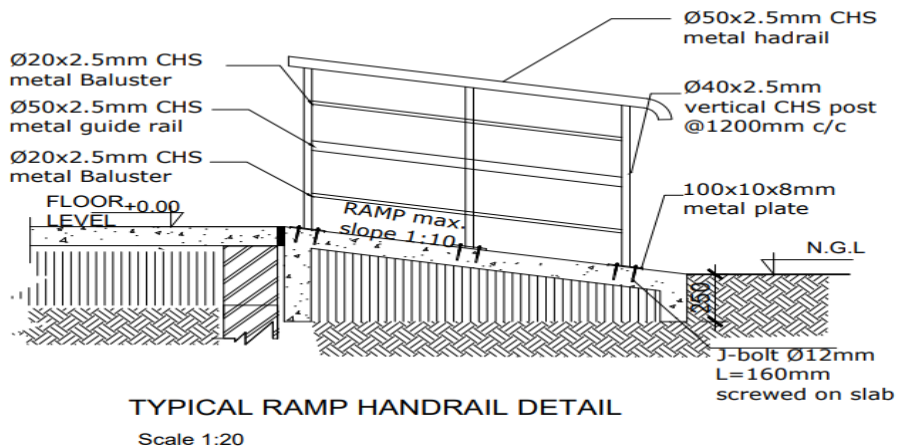


Figure 1 Typical Ramp Handrail Detail

3.1.12. Finishing work

For the floor finishing, a 50 mm floor screed should be applied on top of the slab. The ratio of cement to sharp sand should be 1:3.

The contractor shall provide 15 mm thick as plastering and rendering on internal and external sides of the walls. The plastering and rendering mortar ratio should be 1:3 (cement: plaster sand).

All the walls to be painted shall be clean and dry. Any dirt shall be removed through scrubbing. Specified color coats on the BoQ (Bill of Quantity) shall be applied to the satisfaction of the IOM Site Engineer. Spills on the floors, walls and roof shall be avoided and any accidental spillage should be thoroughly cleaned to a state that cannot be seen. The walls shall be painted with 1 coat of emulsion under coat and finished with 3 coats of matte vinyl paint in soft white for internal walls and emulsion weather guard paint in smoked grey for external walls. The wooden fascia board shall be painted with 1 coat of emulsion under coat and finished with 3 coats of an oil-based gloss paint in white. Paint color and where to apply to be coordinated with the IOM Site Engineer.

3.1.13. Drainage and Plumbing works

The contractor shall construct a 250mm wide x200mm deep storm water drainage ditch around the building to drain storm water to an appropriate discharge site. This shall be determined by the Site Engineer based on the site layout. The contractor will also put in place one water tank as per the water tank stand details in the drawing including the compacted earth base, brick walling (min. 200mm thick, cement mortar 1:3) to hold compacted murrum, 150mm thick top slab and 10,000L water tank with all fittings.

The contractor shall install 250x350mmx2mm galvanized metal sheet gutter with all the fittings and accessories (hoppers, delivery pipe, clips, washout pipe and overflow pipe).

3.1.14. Lightning Protection

Provide and install a complete lightning protection system in compliance with the specifications. Comprises air termination, down conductors, horizontal conductor, and earthing termination. Allow for earthing of the entire electrical installation compliance to drawing and BoQ.

3.2. SPECIFICATIONS FOR THE CONSTRUCTION OF METAL FABRICATION/AUTOMOTIVE AND MASONRY WORKSHOPS

3.2.1. Site Layout

Orientation of workshops blocks: The orientation of the workshop's blocks shall be as per the site assigned by the vocational administration. Confirmation of the orientation shall be part of the initial site inspection.

Measurements: During the setting out, the Contractor shall obtain the correct measurements from the drawings and cross check the diagonals to see if they are equal.

3.2.2. Site Clearance

The Contractor shall clear the site and debris from the area as specified in the BoQ and as shall be guided by the Site Engineer.

3.2.3. Excavations for foundation work

The contractor shall excavate the foundation trenches as per the cross sections specified on the design drawing. The Site Engineer reserves the right to increase the foundation size subject to the exposed soil conditions per the following guidance:

The Contractor shall excavate for pad footing in black cotton soil to a depth of *1200 mm* and *1200x1200mm* as per the column footing, strip footing depth of *750mm* and *800mm* width, and splash apron trenches (*400mm wide x 600mm depth*) and all in accordance with foundation plan or layout.

3.2.4. Concrete foundation work

The Contractor should provide concrete into pad footing after proper compaction of the soil, 150mm thick sand blinding, a concrete blinding (1:2:4) of *50 mm thickness on sand blinding*. The concrete for the foundation shall be as per BoQ. The ratio must be measured properly with a gauge box of 300 mm by 300 mm by 400 mm. After casting the foundation, the foundation must be cured a minimum of 5 days prior to plinth wall construction.

Provide column bases and plinth wall footing as per the layout drawings:

Column pads C1 of *1200 mm x 1200 mm x 250 mm* thick to receive columns of *200mm x 200mm*. For all columns, 4 Y-12 bars shall be installed with stirrup R8 spaced at *125mm C/C* with an overlap/hook of 50mm. Y-12 bars shall be used for the footing spaced at 180 C/C in both directions. Refer to Pad Footing Details (Section A-A) in the drawings for more details on the reinforcement.

Y-10 bars shall be used for strip footing reinforcing 200mm c/c. refer to Typical strip footing plan in the drawing.

3.2.5. Plinth Wall and Ground Beam

A thick plinth wall should be constructed to a *height of 500mm* above the ground level with solid concrete blocks to receive the *300 mm depth x 200 mm width* ground beam. Mortar mix should be 1:3 (Cement: Sand) with wall thickness of *200 mm* for the plinth wall. For the ground beam, C-25 structural concrete shall be used (1:1:2 Cement:

Sand: Aggregate). The ground beam shall have a depth of 300mm and width of 200mm. For reinforcement details refer to the bar bending schedule for beams on different axes with their respective cross sections. All beams with stirrup *R8@175 c/c* and reinforcement bars *6Y12* on all AT LEVEL +0.80 Axes (A, & C,1,4,5,10, & 11)-*Metal Workshop and Axes (A, & C,1,7,8, & 9)-Masonry workshop*

3.2.6. Back filling

After completing the foundation work, the back-void spaces must be filled out with selected soil material. The selected material should be put in layers not exceeding 200 mm with each layer properly compacted. Min. 700mm thick Compacted selected fill to grade is required.

3.2.7. Concrete Slab.

The floor slab will be resting on top of the treated backfill and damp-proof membrane laid on. The slab shall be floating/isolated as per the design drawing.

A concrete slab must be cast (according to the drawing) with a thickness of 100 mm using concrete grade of C-20 (ratio of 1:1.5:3). reinforced with Y10 spaced at 150mm c/c, resting on spacers at least 50mm high.

3.2.8. Walling

The contractor should construct the wall to a thickness not less than 200mm by using concrete blocks, all round the classroom perimeter including partition walls. A damp-proof course must be laid on the floor slab prior to laying mortar for the walls. The length and height of the wall must be constructed according to the drawings. The mortar ratio should be 1:3 (Cement: Sand).

3.2.9. Ring Beam

The contractor shall form the ring beams in situ and provide formwork at the soffits fitted to the door and window openings. The ring beams are 300 mm x 200 mm C-25 concrete (ratio 1:1:2), reinforced with R8 stirrups spaced at 175mm c/c and 4-Y-12 bars, see reinforcement schedule for details on beam axes AT LEVEL +3.80 Axes (A, & C,1,4,5,10, & 11)-*Metal Workshop and Axes (A, & C,1,7,8, & 9)-Masonry workshop*

3.2.10. Roofing Work

The contractor shall put complete roofing structure by using steel roof structure. The price includes construction of bonding elements for steel roof supporting structure according to standard practices all according to the design. For details and dimensions of the steel structure elements, refer to the Roof, Beam and Truss Layout and [Truss T-1 details](#) in the drawings.

The gable end roof shall have a pitch of 20-degree slope in accordance with the drawings. The contractor should put 28 Gauge pre-painted Super VIT4 sheet as per the specification mentioned in BoQ. The sheet should be joined with the purlin with J-bolts and other necessary accessories. A 25 x 225mm high timber barge board protected with approved wood preservative shall be bolted to 100 x 100 x 8mm thick mild steel plate with 4 No 12mm diameter bolts: plates welded to edges of rafters; payment includes all joint and placement work to install the fascia board. A gutter shall be installed on the lower side of the roof and connected to the 10,000L water tank using the appropriate accessories and fittings.

All timber parts of the roof construction shall be protected with 2 coatings against termite attack using wood preservative.

3.2.11. Ceiling

The contractor shall construct plaster ceiling applied on expanded metal lath attached to hard wood timber frames/joists of sizes as specified in the drawing. The ceiling frames to be firmly attached to the steel roof bottom chord by drilling and/or bolting.

3.2.12. Doors and Windows

The contractor should provide all the ironmongery work of good quality, two coats of red oxide primer shall be applied at the point of fabrication before delivery.

Steel doors and windows to fit structural opening as per the doors and window schedule. Two coat of enamel paint to be applied on site. The finish shall be clean and uniform in color with no blemishes. All surfaces shall be covered uniformly. Adjacent surfaces that have not been painted shall be protected from splashing. Any paint splashes shall be cleaned off at the contractor's expense.

3.2.13. Ramps

The Contractor shall construct ramps for ease of accessibility with 10% slope or ratio of 1:10 for the pedestrian access. The ramps should be equipped with handrails on either side of the ramp as per the drawings and specifications. The ramp shall be constructed with C-20 concrete (ration 1:1.5:3) with BRC mesh A98 with a minimum thickness of 100 mm at all points.

The contractor shall construct stairs, equipped with handrails on either side as per Drawing and specification.

Install two lines of grip friendly handrails using CHS 50 diameter and 2.5 mm thickness on both sides of the ramp and stairs. Fix Ø50x2.5mm CHS metal handrail at 1025mm, 50x2.5mm CHS metal guide rail shall be at 500mm and Ø20x2.5mm CHS metal Baluster at 250mm, and 770mm from the ramp and stairs level with Ø40x2.5mm vertical CHS @ maximum 1200mm C/C. Horizontal rails shall be parallel to the slope. The edges of the handrails shall have a smooth finish. All iron parts must be painted with two coats of antirust paint and two coat of enamel paint.

3.2.14. Finishing work

For the floor finishing, a 50 mm floor screed should be applied on top of the slab. The ratio of cement to sharp sand should be 1:3 finished smoothly in cement grout with steel trowel in all rooms except in masonry workshop room /space that should be finished in wooden float.

The contractor shall provide 15 mm thick plastering and rendering on internal and external sides of the walls. The plastering and rendering mortar ratio should be 1:3 (cement: plaster sand).

All the walls to be painted shall be clean and dry. Any dirt shall be removed through scrubbing. Specified color coats on the BoQ shall be applied to the satisfaction of the IOM Site Engineer. Spills on the floors, walls and roof should be avoided and any accidental spillage should be thoroughly cleaned to a state that can't be seen. The walls shall be painted with 2 coats of emulsion under coat and finished with 2 coats of matte vinyl paint in soft white

for internal walls and emulsion weather guard paint in smoked grey for external walls. The wooden fascia board shall be painted with 2 coats of emulsion under coat and finished with 2 coats of an oil-based gloss paint in white. Paint color and where to apply to be coordinated with the IOM Site Engineer.

3.2.15. Drainage and Plumbing works

The contractor shall construct a 250mm wide x200mm deep storm water drainage ditch around the building to drain storm water to an appropriate discharge site. This shall be determined by the Site Engineer based on the site layout. The contractor will also put in place one water tank as per the water tank stand details in the drawing including the compacted earth base, brick walling (min. 200mm thick, cement mortar 1:3) to hold compacted murrum, top slab and 10,000L water tank with all fittings.

Construct shade for the 10000 liters water tank reservoir as per drawing and specification.

The contractor shall install 250x350mmx2mm galvanized metal sheet gutter with all the fittings and accessories (hoppers, delivery pipe, clips, washout pipe and overflow pipe).

The contractor shall supply and install Hand washing basins, Gully traps and Manhole construction connected to soak away pit. All plumbing works shall as per the drawing and Bill of quantities.

3.2.16. Lightning Protection

Provide and install a complete lightning protection system in compliance with the specifications. Comprises of air termination, down conductors, horizontal conductor, and earthing termination. Allow for earthing of the entire electrical installation compliance to drawing and BoQ.

3.3. SPECIFICATIONS FOR CONSTRUCTION OF 2 BLOCK WITH 4 STANCE LATRINES (FEMALE & MALE)

3.3.1. Site Layout

Orientation of latrine block: The orientation of the latrine block shall be as per the site assigned by the facility administration. Confirmation of the orientation shall be part of the initial site inspection.

Measurements: During the setting out, the Contractor shall obtain the correct measurements from the drawings and cross check the diagonals to see if they are equal.

3.3.2. Site Clearance

The Contractor shall clear the site and debris for an area as specified in the BoQ and as guided by IOM Site Engineer.

3.3.3. Pit Excavation and Lining

The contractor shall excavate the pit for the block of latrine as per the dimension in the drawing and BoQ. The contractor must ensure that proper shoring of the excavation walls is installed. After the excavation is completed, place a 200mm crushed stones. The pit wall foundation beams should be formed according to the beam details, *200 mm thick C-25 concrete (ratio 1:1:2) with reinforcement bars* as per the beam schedule. A *100mm thick concrete (C-20 Ratio 1:1.5:3) with* shall be laid at the pit bottom

The 200mm pit walls to be formed with concrete blocks and cement mortar (ratio 1:3). The contractor shall plaster the lined pit internally to a thickness not exceeding 15mm with mortar ratio of 1:3. At the top of the wall, a RC intermediate beam with dimensions of 200 mm X 200 mm (breadth and height) and ground beam with dimension of 200 mm X 300 mm (breadth and height) should be monolithically casted with the suspended slab using C-25 concrete (ratio of 1:1:2). The concrete cover shall be 25 mm for beams and 20 mm for floor slabs. Refer to bar bending schedule for details of reinforcement.

3.3.4. Excavation for foundation work

Excavate as per the cross sections specified on the design drawing, *a rectangular C-shaped foundation strip on Axis B & C between 1 & 2 and on Axis 1&2 between B&C*. The site Engineer reserves the right to increase the foundation size subject to the exposed soil conditions based on the following guidance:

The Contractor shall excavate in black cotton soil to a depth of 750mm and width of 600mm as per foundation detail drawing

3.3.5. Concrete foundation work

The Contractor should provide a weak concrete blinding (1:3:6) of 50 mm thickness after proper compaction of the soil. Concrete for the foundation shall be C-20 (Ratio of 1:1.5:3) (Cement: Sand: Aggregate). The ratio must be measured properly with a gauge box of 300 mm by 300 mm by 400 mm. After the casting of the foundation the foundation has to be cured for 5 days prior to plinth wall construction.

Provide column bases as per the layout drawings: The pad footing shall have 6-Y12 bars, L=1200mm with 50 mm cover in both directions. Stirrup R8 shall be used spaced at 175mm c/c with an overlap of 50mm and 4-Y12 for all columns. Refer to C-1 to C-2 for more details on the reinforcement.

3.3.6. Plinth Wall and Ground Beam

A plinth wall should be constructed to a height of 500 mm above the ground level with 200 mm solid concrete blocks to receive the 200mm width x 300mm depth ground beam. Mortar mix should be 1:3 (Cement: Sand) with wall thickness of 200 mm for the plinth wall. For the ground beam, C-25 structural concrete shall be used (1:1:2 Cement: Sand: Aggregate). For reinforcement details refer to the bar bending schedule for beams on different axes with their respective cross sections. All beams with stirrup R8 and four beams on *Axes 1, 2, A', B and C using Y-12* while the beam on *Axis A using Y-16*.

3.3.7. Back Filling the Soil

After completing the foundation work, the back-void spaces must be filled out with selected soil material. The selected material should be put in layers of up to 200 mm with each layer properly compacted. Minimum 500mm thick compacted selected fill to grade is required.

3.3.8. Hardcore Placing

The contractor shall place a 200 mm thick crushed stone/hardcore and compact the layer properly. The void shall be filled with marram, smaller aggregates, or broken bricks. Place a layer of 50 mm weak concrete blinding (ratio 1:3:6) to receive the damp proof membrane layer.

3.3.9. Concrete Slab

A reinforced concrete slab over the latrine pit (Y-10 mm 100 mm c/c both directions) must be casted according to the drawing with a thickness of 150 mm and concrete grade of C-25 (ratio of 1:1:2).

The floor slab of the lobby will be resting on top of the hardcore stones, with a weak concrete blinding and damp-proof membrane (i.e., plastic sheeting). It shall be cast monolithically with the ground beam over the excavated pit. The floor slab for the lobby is reinforced with wire mesh; BS 4483 A98 weighing 1.54 kgs per square meter, resting on spacers at least 50mm high.

The slab over the latrine pit should have openings for 2 squat holes (see drawing detail), 1 manhole of a size 600 mm x 600 mm and one ventilation pipe (PVC 4" diameter).

3.3.10. Walling

The contractor should construct the walls to a thickness of 150 mm by using good quality burnt clay bricks or concrete blocks, whichever is available, for all internal and external walls. A damp-proof course must be laid on the floor slab prior to laying mortar for the walls. The length and height of the wall must be constructed according to the drawings. The mortar ratio should be 1:3 (Cement: Sand).

3.3.11. Ring Beams

The contractor shall form the ring beams in situ with soffits fitted to the door and window openings. The ring beams are 150 mm x 300 mm C-25 concrete (ratio 1:1:2), reinforced with R8 stirrups spaced at 200mm c/c and 4-12Y bars, see reinforcement schedule for details.

3.3.12. Roofing Work, Metallic Elements

The contractor shall complete the roofing structure by using Timber roof structure. The contractor may submit a proposal for using a Metallic frame structure on Form QM06 - Approval for work/materials (AFW/M). The price includes construction of bonding elements for roof timber supporting structure according to the rules of craft using hoop iron, nails/roofing nails, and all according to the design. For details and dimensions of the timber structure elements, refer to the Roof, Beam and Truss Layout and Truss R-1 Detail in the drawings.

The lean-to roof shall be at 6-degree slope in accordance with the drawings. The contractor should put pre-coated corrugated galvanized iron sheet (28G) as per the specification mentioned in BoQ. The CGI sheet should be joined with the purlin with appropriate roofing nails and other necessary accessories. A wooden fascia board, 25mm x 225mm, shall be fixed to the rafters and purlins. A gutter shall be installed on the lower side of the roof and connected to the hand washing tank.

All timber parts of the roof construction shall be protected with 2 coatings against termite attack using wood preservative.

3.3.13. Doors and Louvers

The contractor should provide all the ironmongery work of good quality, two coats of red oxide primer shall be applied at the point of fabrication before delivery.

Steel doors and windows to fit structural opening as per the doors and window schedule. One coat of enamel paint to be applied on site. The finish shall be clean and uniform in color with no blemishes. All surfaces shall be covered uniformly. Adjacent surfaces that have not been painted shall be protected from splashing. Any paint splashes shall be cleaned off at the contractor's expense.

3.3.14. Ramps

The Contractor shall construct ramps for ease of accessibility with ratio of 1:10 for the pedestrian access. The ramps should be equipped with handrails on either side of the ramp as per the drawings and specifications. The ramp shall be constructed with C-20 concrete (ratio 1:1.5:3) with BRC mesh A98 with a minimum thickness of 100 mm at all points.

Install two lines of grip friendly handrails using CHS 50 diameter and 2.5 mm thickness on both sides of the ramp and stairs. Fix Ø50x2.5mm CHS metal handrail at 1025mm, 50x2.5mm CHS metal guide rail shall be at 500mm and Ø20x2.5mm CHS metal Baluster at 250mm, and 770mm from the ramp and stairs level with Ø40x2.5mm vertical CHS @ maximum 1200mm C/C. Horizontal rails shall be parallel to the slope. The edges of the handrails shall have a smooth finish. All iron parts must be painted with two coats of antirust paint and two coat of enamel paint.

3.3.15. Finishing work

For the floor finishing, a 50 mm floor screed should be applied on top of the slab. The ratio of cement to sharp sand should be 1:3.

The contractor shall provide 15 mm thick plastering and rendering on internal and external sides of the walls. The plastering and rendering mortar ratio should be 1:3 (cement: plaster sand).

All the walls to be painted shall be clean and dry. Any dirt shall be removed through scrubbing. Specified color coats on the BoQ shall be applied to the satisfaction of the IOM Site Engineer. Spills on the floors, walls and roof should be avoided and any accidental spillage should be thoroughly cleaned to a state that can't be seen. The walls shall be painted with 1 coat of emulsion under coat and finished with 3 coats of matte vinyl paint in soft white for internal walls and emulsion weather guard paint in smoked grey for external walls. The wooden fascia board shall be painted with 1 coat of emulsion under coat and finished with 3 coats of an oil-based gloss paint in white. Paint color and where to apply to be coordinated with the IOM Site Engineer.

3.3.16. Drainage and Plumbing works

The contractor should cast a latrine seat that is 400mm high from the floor as per the PSN seat detail. The top and sides of the seat should be finished with tiles. Furthermore, the contractor shall install footrests reinforced with wire mesh for the two standard stances including Urinal for the Males latrine and washroom for the female's latrine all finished as per the drawing and specification details.

The contractor shall construct a perimeter drain around the building to collect and convey storm water to an appropriate discharge site. This shall be determined by the Site Engineer based on the site layout.

The contractor will also put in place one hand washing station as per the hand wash tank stand details in the drawing including the foundation, plinth wall, concrete slab, brick wall, compacted murrum, top slab and 500L water tank with all fittings.

A 75mm diameter PVC pipe shall be connected from the hand wash station to the soak away pit. In locations where the soil conditions do not allow for effective infiltration, the grey water shall be directed to an appropriate discharge site located away from the facility.

A vent pipe should be installed with a vent cap and fly screen. The height of the vent opening shall be at least 50 cm above the roof height.

3.4. SPECIFICATION FOR CHAIN-LINK FENCE

3.4.1. Site Layout

Orientation of Chain-Link Fence: The orientation of the Fence shall be as per the site assigned by the facility administration. Confirmation of the orientation shall be part of the initial site inspection.

Measurements: During the setting out, the Contractor shall obtain the correct measurements from the drawings and cross check the diagonals to see if they are equal.

3.4.2. Excavation for foundation work

Excavate for sub-columns/Angle column posts as specified in the Bill of Quantity and on the drawing. The Site Engineer reserves the right to increase the foundation size subject to the exposed soil conditions based on the following guidance.

The Contractor shall excavate for black cotton soil to 300mmx300mm x 750mm deep *foundation for CHS* posts bases. And 1200mmx1200mm *pad* footing for concrete Gate Column the depth should be 1200mm deep.

3.4.3. Concrete work

The Contractor should provide concrete for the sub-column/post bases and shall be C-20 (Ratio of 1:1.5:3) (Cement: Sand: Aggregate). The ratio must be measured properly with a gauge box of 300 mm by 300 mm by 400 mm. After casting the bases, they must be cured for at least 5 days prior to installation of Chain-Link.

Provide 1200mmx1200mm, 200mm thick pad footing for Gate column. The pad footing shall rest on 50mm concrete blinding, 150mm thick sand blinding reinforced 8-Y-12 bars both ways, L=1400mm with 50 mm cover in both directions. Gate Column of 400mmx400mm should be reinforced with Stirrup R8 spaced at 150mm c/c with an overlap of 50mm and 4-Y-12 rebars.

3.4.4. Posts and Chain-Link

The contractor shall supply and install Ø50x4mm CHS for fence posts spaced at maximum 2.0m c/c. 40x40x3mm thick steel Angel @1000mm c/c welded on top railing and three line of barbed wire of installed onto. The height of the posts above ground shall be 2.0 meters. The poles shall be reinforced with Ø50x4mm top and bottom railing and 2 lines of tension wire Gauge 7 for the chain link. Corner posts supported with 02 diagonal bracing and 01 additional diagonal bracing provided at an interval of 14000mm c/c in and alternating direction

3.4.5. Vehicular Gate

The contractor shall supply, fabricate and fix 4000mm wide and 2300mm high double leafed sliding gate with 900mm wide by 2000mm high Pedestrian access gate embedded on one leaf. Gate casement shall be 2.5mm thick sheet as per the drawing and installed to Engineer's satisfaction.

Two coats of red oxide primer shall be applied at the point of fabrication before delivery. Two finishing coats of enamel paint to be applied on site. The finish shall be clean and uniform in color with no blemishes. Any paint splashes shall be cleaned off at the contractor's expense.

Apply 15mm thick cement sand rendering (1:3), steel trowelled finish, Paint: 2 coats of emulsion under coat, finish with 2 coats of emulsion weather guard paint in smoked grey.

3.5. Construction of 20m³ Water Yard

3.5.1. Borehole Sitting and Groundwater Investigation

Borehole location shall be identified in agreement with the vacation institute/school administration. Additional measures should be taken to ensure that sites are outside the minimum distances prescribed from sanitation installations, sources of pollution, landfills, graveyards, and animal pastures.

Prior to drilling and installation works commencing, the Contractor must perform a geophysical survey and analysis (hydrogeological survey) in the IOM pre-identified locations using geo-electrical techniques. The purpose of the surveys will be to identify optimal drilling position at the school, as well as two back up drilling positions. The hydrogeologist shall recommend one suitable site with the view that the proposed drilling will take place in the location where the demanded yield shall be attained as described in the TOR.

The results of these geophysical surveys will be compiled into a 'Geophysical Survey Report' to be submitted to the IOM Technical Lead Engineer prior to drilling operations commencing. This report will contain all results and locations of all geophysical profiles undertaken, and co-ordinates for the optimal and back up drilling positions.

The IOM Technical Lead Engineer will review this document and agree the proposed drilling positions are suitable prior to commencing.

3.5.2. Drilling stipulations

Any change in the set specifications for drilling such as: depth of hole, diameter of hole, depth of screen installation, materials for casing, gravel packing, etc., should be agreed by both parties (IOM and the drilling organization) and should be recorded in writing and signed by both parties in a variation order form.

3.5.3. Borehole depth and diameter

Drilling of one (01) borehole in all geologic environments with a minimum borehole diameter of 9", the average/minimum anticipated borehole depth shall be of 90m. Shallower or deeper boreholes may be encountered but the IOM Project Engineer shall formally validate the final depth of the borehole. No additional payment shall be made for meters drilled beyond the stated depth.

3.5.4. Verticality and alignment

It is a requirement to maintain verticality throughout the borehole depth as this will ensure the functionality and longevity of the INDIA Mark II pumping equipment as well as the submersible pumping system.

Good drilling practices must always be maintained to ensure the boreholes achieve acceptable verticality. The wellbore, casing and screens shall be set round, plumb and true to line. If required by the IOM Project Engineer, the Contractor shall make a verticality test during and after drilling by approved methods and at his own expense to demonstrate that the departure from the vertical does not exceed 0.1% between ground level and the bottom of the well. If this departure is exceeded, the Contractor shall make the necessary corrections with approval from IOM Project Engineer, without additional payment. If the error cannot be corrected, then drilling shall cease, and a new borehole shall be drilled. The abandoned borehole shall be backfilled and /or capped. No payment shall be made for re-drilling, the sealing/backfilling of the abandoned borehole, or for moving to a new site. Any materials (i.e., casing, screens, gravel pack, cement, etc.) lost in the abandoned borehole shall be at the Contractor's cost.

The Contractor shall include in their tender submission how they intend to maintain verticality of the boreholes and how they intend to check verticality of the borehole.

3.5.5. Drilling Method

The Contractor may use any motorized drilling technique that will achieve the depth and diameter required of the borehole, provided that the technique used is approved by the IOM. The rig to be deployed must be capable of drilling to at least a depth of 25% beyond the anticipated final depth at the required diameter.

Sufficient drill collars and down-hole stabilizers will be required to ensure that good verticality is maintained throughout the drilling operation. All drill bits used throughout the work will be in good condition with minimal wear to the cutting teeth.

3.5.6. Drilling Fluid

The Contractor should make exclusive use of direct or reverse circulation rotary and down-the-hole hammer drilling techniques, using an appropriate (biodegradable) drilling fluid.

During rotary drilling using air as the circulating fluid, approved surfactants and artificial foam stiffening additives may be used if ground conditions warrant their use. Bentonite based fluid additives will not be accepted. Cellulose based reconstitution powder, or liquid polymeric additives may be required for viscosity enhancement. The Contractor must state the type of polymer to be used and describe how the selected fluid additive will be mixed.

The Contractor shall make his own arrangements for obtaining, storing, transporting, and pumping of the water required for drilling purposes. IOM shall only supply logistical support, where the Contractor requests this in their response to the call for tender, and then agreed by the IOM Lead Engineer.

3.5.7. Strata sampling and borehole geo data

Representative, continuous samples of 125 grams minimum of the strata penetrated shall be collected for every 2m interval and when required by the IOM Project Engineer. The drilling organization shall take every precaution to guard against cutting contamination. Representative samples from the cuttings shall be preserved in polythene bags or suitable sealable containers and clearly marked in waterproof ink according to Location, borehole reference

identification number (supplied by IOM), date taken and depth [from – to] by the Contractor. The samples shall be stored in a position where they will not be contaminated by site conditions or drilling operations. Lithological logging shall be the responsibility of the Contractor. All samples shall be given to the IOM Site Engineer upon completion.

3.5.8. Total Depth of Borehole

The IOM Site Engineer will validate the total depth of the borehole. After the drilling process, the Contractor is required to pull out all the equipment out of hole and then run-in hole, reaming and flushing the borehole to total depth.

Once the borehole has been cleaned, the drilling assembly is pulled out of hole and prior to casing installation, a tagline supplied by the Contractor shall be used to check the true depth of the wellbore. This will ensure that no significant borehole balling, or collapse has occurred. In the event of the borehole bridging or having extensive collapse, the Contractor shall have to perform another borehole flushing run down hole.

3.5.9. Well Construction

3.5.9.1. Casings and Screens

The Contractor shall produce a well design, which must be validated by the IOM Site Engineer before the casing is installed. The Contractor may install temporary casings at their discretion as considered necessary to ensure the successful construction of the boreholes. Steel based temporary casings shall be extracted upon completion of the work to avoid groundwater contamination.

The Contractor shall install uPVC, PN10, drinking water standards, non-toxic plain casings with a 6" nominal diameter and 6.5 mm thickness for the total depth of wellbore except where screen casings are installed, regardless of the formation type.

Flushed or trapezoidal threaded connections are acceptable. Glued connections shall not be accepted. The intended casing joint type should be indicated in the tender submission.

The well design must include at least 3 meters of plain casing, fitted with a screwed on proprietary bottom cap, at the bottom of the casing column, to act as a back-sump for fine material which may enter the casing column during operation. The casing and screens must be centralized in the well so that an annular space. During installation, all casings and screens shall be accurately measured, and their lengths recorded in casing tally. The casing tally shall be part of the borehole report handed upon completion of the works.

The Contractor will supply and install screens with vertical slot size between 0.5mm to 1mm with a minimum of 6% aperture. Hand-slotted casing will be rejected.

The casings and screens shall comply with ISO 9001:2018 and DIN4925 standards.

3.5.9.2. Gravel Pack

The Contractor will supply and install filter gravel pack, which is washed, well-rounded of uniform grading from riverbeds consisting of particles with a diameter of 1-5mm. The gravel pack shall comprise of at least 95% siliceous material and must contain no clay, shale, silt, fines, excessive amounts of calcareous material or crushed rock. Prior to delivery, the IOM Project Engineer Lead for validation shall subject a sample of gravel pack to inspection.

The volume of the filter pack required must be calculated considering the length of the screened area and an additional 50% to allow for settlement above screen casings, and the annular space between the borehole and the external diameter of the casing. The installation of the filter pack should be done with the aid of a tremie pipe to ensure an even distribution of materials and to reduce the risk of materials bridging in the annulus. The use of a funnel (sheet metal, plastic sheet, or pipe) and flowing water shall also be accepted as a method of passing the gravel through the annular space between the casing and the sides of the borehole.

3.5.9.3. Sanitary seal and backfilling

The Contractor should ensure the installation of sanitary seal in the annular space between the screen casing and the borehole above the filter gravel pack to reach a minimum height of 3 meters. The sanitary seal shall consist of bentonite pellets of size between ¼" and ½". The bentonite pellets shall be installed in the annular space from the filter pack using Tromie pipe system. Above the sanitary seal, the annular space shall be backfilled with cuttings extracted through drilling up to 3 meters deep below the ground level. The sanitary top seal in cement grout corresponds to the first 3 meters below the surface. Including 2m of bentonite pellets and 1m of grout at the surface. If the Contractor cannot supply the bentonite pellets, a written request should be sent to IOM providing the justification and the specifications of an alternative sealing and plugging material for IOM to approve its installation.

3.5.9.4. Borehole development

After installing the casing and annulus backfilling, the borehole will be developed through air lifting methods to remove drilling debris and sediment from it.

The boreholes must be developed by airlifting for a minimum of 6 hours until a stabilized satisfactory yield is reached, and the turbidity is less than 5 NTU. The nozzle of the air eductor shall never be placed in front of the casing screens; it may be placed below or above.

3.5.10. Pumping Test

3.5.10.1. Step drawdown test

The Contractor shall conduct a step test for a minimum of 8 hours considering four steps with different yields ($Q_{mx/1}$, $Q_{mx/2}$, $Q_{mx/3}$ and Q_{max}) and a recovery step should conduct a step drawdown-pumping test. Each test should last a minimum of 2.0hr. The recovery test will be for one hour or such time when there is at least a recovery of 90% of the static water level noted at the start of the pump test. The water level for every step shall be measured every 1 min for the first 10min, every 5 min until 60min has elapsed and every 10min to 120min has elapsed.

3.5.10.2. Constant rate test

The Contractor shall also conduct a 6-hours constant rate test allowing at least 12 hours between the step drawdown test and the constant rate test. The pumping rate for the constant rate test shall be agreed and decided with the IOM Project Engineer. It is recommended to conduct the constant rate test at Q_{max} or $6m^3/hr.$ or whichever is more – this should be discussed and agreed with the IOM Project Engineer. The recovery test will be for one hour or such time when there is at least a recovery of 90% of the static water level noted at the start of the pump test. The water level for every step shall be measured every 1 min for the first 10min, every 5 min until 60min has elapsed, every 10min until 120min has elapsed, every 15min until 240min has elapsed 30min until 360min has elapsed 60min until 480min has elapsed.

Step draw down, constant pump test and recovery data should be reported on the IOM Pumping Test Log Sheet and should contain at least: Position of the WL measurement datum, Date of Test (Day, Month, Year), Total Depth of BH (m), Static Water Level (SWL) before test (m). Model of Pump used, Depth of Pump Intake (m), Discharge (Ltrs/Minute), Dynamic/Pumping water level (m).

The procedure should be discussed and agreed to by both parties (IOM Project Engineer and Contractor) before starting the pumping test.

In the event of a breakdown during the tests, the groundwater level must be allowed to recover to the static level and the test must be re-started a minimum of 12hrs later. IOM shall not compensate for any failed pumping test needing repetition.

3.5.11. Water Quality

3.5.11.1. Laboratory Testing

Water samples for testing the physical, chemical, and bacteriological properties shall be taken at the end of the test pumping. The Contractor will take two (2) times – one (1) liter samples in clean, properly sealable, sterilized plastic bottles for laboratory analysis. The Contractor shall be responsible for testing the water quality in approved water testing laboratories and as specified, furnish the IOM with the test certificate. The samples should reach the laboratory within 6 hours of the time of collection.

The water quality shall comply with the minimum South Sudanese quality standards. If one, or more, of the requirements are not met, the borehole will be considered unsuccessful and treated as a dry borehole.

3.5.11.2. Field Testing

The following parameters should be tested on site using portable water quality testing meters. The results of these tests shall be included as part of the final borehole records for each borehole.

- Date of test
- Electrical conductivity (maximum 1400 $\mu\text{S}/\text{cm}$)
- Total dissolved solids TDS (maximum 1000 mg/l)
- Temperature
- PH (6.5 – 8.5)
- Turbidity (maximum 5 NTU)

3.5.11.3. Borehole Disinfection

After collecting the water sample for testing, the borehole should be thoroughly disinfected with a chlorine-rich solution, preferably granular Calcium Hypochlorite (HTH) or Sodium Hypochlorite at a concentration of 500 grams per cubic meter of pack. This will initiate the process of sterilizing the borehole and the chlorine solution should stay in the borehole for at least 4 hours at the specified concentration, leaving a concentration of residual chlorine of 50 milligrams/liters (as per WHO (World Health Organization) standards). The disinfection procedure shall be discussed with IOM's Project Engineer to seek approval.

3.5.11.4. Water Yard Construction/Rehabilitation

The contractor shall supply and install a well head/Pedestal stand raised at least 50 cm from the ground, provided of a well cap for the borehole with holes provision for the riser pipe, electric cable and deep meter as shall be agreed by IOM supervisory team. The well head and well cap should be INDIA MK II pedestal. To protect the well head, a concrete platform should be constructed around it to a minimum height of 0.3m with a manhole with a cast iron trap fitted with a lockable system.

The selected contractor shall supply and install a solar system with one submersible pump comprising all the components including cable and uPVC rising pipe class 10 (min. diameter 50 mm), controller, submersible cable of at least 110m, float switch, and adaptor set, surge protector and lighting arrestor with a minimum of 1 piece of 8-foot copper-plated grounding rod. The submersible pumps and solar system should be able to deliver a yield not less than the critical yield calculated after the pump test at the final installation depth. The Pump should be branded Lorentz or Dayliff designed and approved by IOM supervisor corresponding to the characteristic of the boreholes and providing at least 36m³/day total considering 6 peak sunshine hours. The solar panels must be mounted on the water tower, tilted at 5-7° with the whole area protected by a fence. Mechanical flow meters shall also be installed for monitoring production. The pump specifications and the solar system should be agreed and endorsed by IOM's supervisory team in writing.

The contractor shall supply, fabricate, and install a 6m metallic water tower with a cat hooped ladder welded on it as per the engineering drawing having a capacity to hold a 20m³ steel tank, of water catering for free board of 200mm height. There shall be rail guards of 1m height constructed above the base of the tank mounted with 2 modular all-in-one solar streetlights, attached directly onto the tower, and secured by razor wire. The water tower should be at least 6m high from the ground level to the bottom of the tank, complete with concrete foundations as shown in the drawings. The tank technical specification shall be agreed by the IOM supervisory team in writing.

The contractor shall supply all construction materials and construction of 6 tap stand points as drawing and Bill of Quantities each with one (1) Talbot Talfow self-closing taps each including construction of a drainage channel, and a soak away. All water points shall have a manhole (Valve chamber) with a lockable cast iron trap.

All construction materials shall be mobilized to the site immediately after the completion of the pump test and shall be of the following quality:

- Aggregates shall be hard, clean, and free of all organic material. Coarse aggregates shall be comprised of clean, un-weathered, hard, well graded material of between 9.5mm and 20mm in size.
- Sand/gravel shall consist of grains with a maximum size of 9.5 mm. It shall be free of soil, clay, organic matter, and other impurities and shall contain no more than 5% silt.
- Water used for mixing concrete and for curing shall be clean and free from injurious amounts of oil, acid, alkali, organic matters, or any other deleterious substance. It shall be equal to potable water in physical and chemical properties.
- Cement shall be normal Portland cement (class 32.5). Bags shall be in perfect condition when delivered to the site. All broken bags or bags showing signs of dampness caking shall be immediately removed from the site. Reuse of spilled cement is not permitted.

3.5.12. Borehole Acceptance

The IOM shall accept the borehole upon satisfactory completion of all drilling operations, installation of casings and screens, development works, pumping tests, presentation and approval of complete drilling reports and logs and provided the borehole yield is above minimum recommended values and water quality tests are suitable for potable water according to the GOSS standards.

If completion of the borehole is prevented by any failure of equipment, behavior of the ground, jamming of the tools, or casing or any other cause, the well shall be deemed to be abandoned, and no payment shall be made for that borehole or for any materials not recovered.

In case of an unsuccessful borehole, the Contractor shall drill a new borehole. The option of declaring any borehole unsuccessful shall rest with the Contractor, subject to the approval of the IOM Project Engineer.

Reasons for abandonment:

- Yield – the borehole shall meet the minimum requirement as stated in the terms of reference for the work and if not shall be classified as a dry borehole.
- Water quality and Salinity - If the borehole is seen to have a high salinity (EC over 1400 $\mu\text{S}/\text{cm}$) during drilling, airlift or pumping test, the borehole shall be abandoned and re-drilled at an alternative position.

For any borehole abandoned, the Contractor shall retrieve as feasible all materials from the borehole. The materials salvaged remain the property of the Contractor and may be re-used if not damaged.

The abandoned borehole shall be backfilled with soil from the bottom upward using materials clean and free of contamination (organic matter, oils/ fuels, general waste, animal matter etc.). The last 3 meters shall be sealed by concrete, which shall be placed by a method approved by the IOM Project Engineer that will avoid segregation or dilution of material.

3.5.13. Loss of equipment

Any equipment lost down hole must be removed by the Contractor, or the borehole shall be considered unsuccessful. A replacement borehole shall have to be constructed at the Contractor's expense. In the unfortunate event that the Contractor cannot extract the foreign body, the Contractor shall not be entitled to further payments.

3.5.14. Defect liability period

The borehole will be guaranteed for 6 months after completion. In an event that there are defects found on the borehole within the 6 months' period, the Contractor will be notified and authorized to correct all the said defects before the Contractor is paid the retention amount.

3.5.15. Reporting

Upon completion of the borehole and the water yard, the selected Contractor shall submit a report of the borehole construction work. The report should include:

- Borehole location details including GPS data in decimal format.

- Daily journal record, capturing the activities performed each day from the day of mobilization, including downtime and failures and if applicable the drilling depth.
- Drilling pipe tally sheet with the start and end times of each drilling rod.
- Lithology log, capturing all the information pertaining to the appearance of water filtrations and aquifer, types of rock found and sampling details including geophysical testing analysis.
- Casing and screen manufacturer, size, positioning, and installation depth.
- Filter pack details: size and depth of installation in the annulus.
- Step drawdown test with details of the pump used, installation depth, date of test, and SWL with analysis and determination of the specific drawdown.
- Constant rate test with details of the pump used testing conditions and an analysis providing an estimation of transmissivity.
- Disinfection procedure followed and concentrations used.
- Submersible pump installation details: parts used, quantity and depth of installation.
- Water quality analysis
- Solar panels installation details: model, watts, dimensions, height of installation, etc.
- Variation orders capturing deviation from ToR and BOQ (BILL OF QUANTITIES) signed by the Contractor and the IOM Project Engineer.

The Contractor shall report the above information using IOM's ECRP reporting template. The Contractor will provide the original copy of Government of South Sudan's (GoSS) Borehole Completion Record Certificate in the approved form, dully completed, and signed by the State Director of Water and Sanitation or Representative at State Level of the State Ministry of Physical Infrastructure.

No payment will be made prior to reception of all the documents described above.

3.6. SPECIFICATIONS FOR CONSTRUCTION OF ACCESS ROAD

3.6.1. Road alignment, site surveying and chainage

The contractor shall select the most appropriate road alignment through a survey that would normally consist of a walk over the area, noting possible alignments or sites, potential quarry sites, and soil conditions, but not overly deviate from the original path shown by the IOM-ECRP engineer, any wrong alignment can result in delays to construction works, over-use of resources and consequently expenses. A line level, linen tape and short tape are the minimum tools required. The alignment should be selected to avoid areas of poor or difficult drainage, areas of poor soil or large earthworks and an understanding of criteria for setting a good road alignment is the best way to reduce costs.

The contractor shall seek the representatives from the line ministry and institution administration from the county during the survey process to check with the local landowners to see if there is any objection to the proposed selected road line. The contractor shall use wooden pegs of approximately 40 cm to mark the alignment and the levels of the road. The road chainage shall be marked onto the pegs with a waterproof marker. Before starting the construction works, the contractor shall place

reference pegs outside the road formation and ensure that these pegs are hammered deep into the ground so that they are not easily removed.

3.6.2. Bush clearance, cutting of trees and root grubbing

Bush clearing and grubbing involves the cutting down of trees, bush and other vegetation and the subsequent grubbing and removal of the root systems. Where the proposed site is too bushy with a lot of trees, the contractor may consider at their cost the use of machinery to do the bush clearing and root grubbing in agreement with IOM. The contractor shall at their discretion conduct a modest training to the laborers on manual clearing and root grubbing to increase efficiency of the manual labor.

For effective productivity and safety, the contractor shall ensure that,

- Trees within the area to be cleared should be cut first. The treetops should be cut, leaving a trunk about 5 m high. All side branches should be cut off using axes and saws. The timber resulting from the trees should be sawed up into convenient lengths and stacked to one side. Separate piles should be made for leaves and thin branches.
- Bush and other tough vegetation should be cut down, to ground level, if possible, cut to convenient lengths and stacked.
- Grass and remaining vegetation should then be removed at ground level by means of spades or hoes. The resulting debris should be raked to one side and added to the piles of thin branches and leaves.
- Once a large enough portion of ground is clear, a trench should be dug around the nearest tree and roots chopped through. The trench should be about one meter deep (less if the tree is small) and should attempt to undermine the tree stump. As soon as one tree has been trenched and all accessible roots cut through, a rope should be fixed to the top of the trunk and a team of laborers tasked to pull the tree down. As the tree moves, further roots may become visible and accessible: these roots should be cut free at the level of the base of the hole while the pulling team rests. Progressively the tree trunk is thus brought down, using the leverage of the length of the trunk to tear out as many roots as possible.
- Once the tree and stump have been brought down, they should be rolled away from the hole and cut into convenient lengths. Depending upon the specification, major roots may need to be dug out and removed to a specified depth.
- Large bushes should be trenched, and their root systems removed. The roots of smaller bushes can be dug out together with the grass roots.
- The soil dug out of the trenches around trees and large bushes can then be returned to the trenches. Roots should be carefully separated from the soil and only clean soil used for backfilling.
- The debris resulting from the clearing and grubbing should be disposed of as instructed. Timber will usually be snapped up by the local people for firewood. If regulations permit, the thin sticks, roots, and leaves can be burnt, and the ashes dispersed into the bush adjacent to the works

3.6.3. Excavating, loading, hauling, unloading, and spreading and compaction

Excavating, Loading, Hauling, Unloading and Spreading can together be referred to as ELHUS. These activities are often grouped together because they usually follow each other in sequence during earthworks, construction and involve the same material.

During trench excavation, the contractor shall ensure all materials in trenches shall be excavated by machinery.

Compaction of backfilling to trenches in areas not subject to traffic shall be placed in layers of thickness (before compaction) not exceeding 200 mm. Each layer shall be compacted 200mm starting from the reduced level, well compacted to achieve 95% MDD. Ensure road levels slope towards drainage area as per the drawing.

3.6.4. Excavation to Level

The contractor shall exercise care when approaching the final level to avoid over-excavation. It may be necessary to dig a small hole to the correct depth to show the worker where the final level is. These “demonstration holes” shall be set out with boning rods or stringlines. The team leader shall carry out quality control regularly during the excavation.

3.6.5. Excavating to shape

The contractor shall ensure excavations shall be made to specific shape. Out of shape excavations require more fill materials and increases costs unnecessarily. Stringlines and spirit levels or plumb bobs shall be needed to transfer the lines of the excavation to the floor of the hole. Ditches need the outer edges to be set out by pegs, joined by string. Use the ditch templates to control the width and side slopes. Templates must be used with a spirit level to bring in the required level. The contractor must regularly check on the quality and accuracy of the work and the condition of any templates being used.

3.6.6. Excavating to stockpile

The contractor shall ensure that material excavated in borrow pits for use as wearing course be stockpiled to ensure homogeneity and consistency of quality during placing. The contractor with the approval of the IOM Site Engineer shall come up with a careful design of the borrow area such that continuous of material movement is possible and the need for double handling is minimized.

In borrow pits where the material quality is variable, the contractor shall assign a dedicated stockpile area away from the excavation area. Material should be excavated and dumped nearby. This should be spread in layers of about 200 mm thick over an area. A second and third layer of excavated material should be placed above this resulting in a layer of about 600 mm thick. The team leader should improvise wooden boards or planks to facilitate the movement.

The contractor shall provide testing of the stockpiled materials to ensure the correct quality is used. Generally, four samples per 1000 m³ are adequate: these samples should be randomly collected and

be representative of the full thickness of the stockpile. Where material removed from cut or adjacent to the road is to be used for pavement or wearing course layers, this needs to be relatively homogeneous. Variable materials will need to be stockpiled along the road and tested prior to use. Homogeneous materials can be placed directly on the road but will require more testing than is generally specified.

3.6.7. Quality control

The contractor shall ensure that the material quality is not compromised, and the geometrical compliance of the finished layer work is to the desired quality and complies with the density specification. Geometrical requirements shall be checked carefully and adjusted, during the rolling. To achieve quality work, the contractor shall ensure correct setting out and subsequent checking to ensure the excavation complies with the geometric requirements. For the finished layer the contractor shall ensure the material thickness are correct as per the design and the density achieved.

4. Role of the Contractor

The Contractor will have to provide for the construction and completion in every detail of the work described in the contract documents. All labor, materials, tools, equipment, transportation, and supplies required to complete the work in accordance with the specifications and terms of the contract should be well furnished. The Contractor cannot deviate from the construction designs or specifications without seeking permission and approval from IOM.

IOM reserves the right to reject any materials, equipment, or resources and to delete or reduce any work item, whether in whole or in part and update Annexes, as necessary and a reduced contract price shall be agreed.

If the Contractor is not able to finish the construction works or must abandon the works due to loss of tools, accidents or any unforeseeable circumstances, the Contractor should remove all unused materials from the site. IOM will pay only for the work done as per rates in the filled Bill of Quantities in the contract document.

The ECRP IOM Project Health and Safety Management Plan (HSMP) outlines the Contractor's roles and responsibilities in the management of activities to prevent dangerous acts that could lead to injuries, illnesses or serious incidents in the workplace and damage or loss of assets.

The ECRP Quality Management Plan (QMP) outlines the Contractor's roles and responsibilities for meeting the quality standards expected of this program and the process and procedure for verifying each step.

To complete the task timely and efficiently the Contractor should:

1. Deploy qualified and well experienced managers, site engineers and workers to complete the required tasks.
2. Prepare and submit staff deployment plan/organogram for the project implementation assigning the specific persons in charge of communication and coordination with the project supervisor.
3. Prepare and submit Work Plans, Emergency Preparedness and Response Plan, Waste Management Plan, Labour Management Plan and Environmental and Social Management Plan as per the HSMP
4. Preparation of "Resource Plan" (materials, machine/tools, manpower) in accordance with the submitted Work Plans.
5. Develop Risk Assessments using Form HS05 as per the HSMP

6. Based on the approved work plan, the Contractor shall execute multiple work activities simultaneously to save time.
7. The Contractor shall allow unlimited access to construction sites for the ECRP staff as required.
8. Follow Guideline GHS12 – Site Establishment in the HSMP,
 - A. The Contractor should arrange temporary office/accommodation at each site with necessary facilities for the staff and workers (water, toilets, first aid kits etc.)
 - B. The Contractor is responsible for maintaining pollution/contamination-free surrounding environment.
 - C. The contractor should display both work plan and resource plan at each site.
 - D. The debris from any demolition activity and garbage at the construction sites should be removed by the Contractor and disposed of in a safe area away from the site.
9. As per the Quality Management Plan (QMP),
 - A. Ensure that materials are properly packed and covered during transportation to ensure that the materials are not damaged.
 - B. Ensure that all materials, in particular cement, timber, paints etc. are properly stored on sites to prevent any deterioration of strength by water, moisture, or heat.
 - C. All structural works such as foundation works, erection of columns, beams, support structures etc. shall be executed in the presence of IOM personnel.

5. Health, Safety and Environment

The Contractor is required to comply with the *IOM Project Health and Safety Management Plan (HSMP)* and the *Environmental and Social Management Plan (ESMP)*. The following information is provided to guide the Contractor in the key aspects of HSMP only.

The main health and safety legislation and other relevant compliance requirements in South Sudan are described in the *South Sudan Legal Register* (Form HSE03).

Risk assessments for hazard identification and activities are required for safety-critical activities prior to each stage of work commencing. These shall be documented using Form HS05. All IOM personnel have the authority to stop any activity that has the potential to cause injury or damage to property until such times as the works are managed in a safe manner.

The Contractor's team leader shall take all reasonable precautions to prevent any death or injury to persons during said undertaken activities. These precautions shall include but not be limited to ensuring the crew wears the protective equipment such as safety helmets, hard-toed boots (safety boots) or gumboots, heavy-duty gloves and ensuring that all tools and equipment are in a safe condition and ensuring that their employees adopt safe working methods as instructed by IOM. No military-looking clothing will be accepted at any time. *Health, Safety, Social and Environmental inspection Site Reports* shall be carried out weekly on Form HSE05.

The project sites The Contractor's team leader has the obligation and responsibility to safeguard the safety and security of its personnel, the construction crew's equipment and other property, and personnel's personal effects and other property. The Contractor's team leader shall develop an *Emergency Preparedness and Response Plan* in consultation with IOM, including detailed procedures to cover evacuation, personnel, equipment, unlawful interference, and prevention of sabotage.

The Contractor is required to hire skilled and unskilled Labour from the local project area to execute the contract. The Contractor shall submit their *Labour Management Plan* in accordance with the guidelines in Annex F on the *Labour Management Procedures*. Justification must be submitted to IOM for approval before the Contractor can recruit non-local skilled Labour.

All selected staff to work as part of the construction crew are to abide by the Code of Conduct in the Construction Contract on the prohibition and prevention of sexual exploitation and abuse (SEA). The crew shall undertake a *PSEA (Prevention of Exploitation and Abuse), 1-day training* with IOM prior to conducting any work.

The Contractor is to ensure that all materials, solid or liquid, are stored in a manner so as not to damage or contaminate any surface by spillage. Further guidance is provided in *Guidelines on Environmental Management: GEM02 Waste Management & Hazardous Substances, GEM03 Protection of Water, GEM05 Borrow Pit Management, and GEM06 Preservation of Historical, Archaeological and Cultural Remains*.

6. Quality Management

The *Quality Management Plan (QMP)* outlines the Contractor's roles and responsibilities for meeting the quality standards expected of this program and the process and procedure for verifying each step. The following information is provided to guide the Contractor in the key aspects of the QMP only. A more detail guidance on quality of workmanship is provided in Annex B.

Section 5 of the QMP provides the framework for project staff responsibilities during Construction. From IOM, each site will be assigned a Site Engineer and Community Site Supervisor who are supervised by a Project Engineer whose main task is to monitor and report on the performance of works being implemented. The Lead Engineer is responsible for the overall contract management.

The QA process, in brief, starts with approval from the Lead Engineer for a construction activity to proceed (Form QM06). Once approval is obtained, the work can proceed. During the work phase and upon completion, the Contractor must allow testing of materials, inspection of construction activity and survey compliance checks to be performed. For *material testing*, relevant forms include QM07A Request for Inspection and Testing Results, QM07B Inspection of Materials on Site, and QM09 Inspection and testing plan. For inspection, the Contractor is responsible for submitting *QM10 Daily Logbook*, and *QM11 Weekly/Monthly Progress Report and Summary*.

Any materials or works that do not conform to the technical specifications, design drawings or BoQ shall be rejected with a *Non-Conformance Report (NCR)*. The Contractor will then be responsible for dismantling and removal of the rejected materials from the sites immediately. Rectification and reconstruction of works shall be carried out at the cost of the Contractor prior to continuing with the next phase of work. Refusal of this instruction will lead to immediate termination of the contract.