

CONSTRUCTION OF SOLAR-POWERED IRRIGATION SCHEMES IN NSANJE DISTRICT		
LOT 3: TECHNICAL SPECIFICATIONS		
Note: All contractors to supply Manufactures Authorization for the submersible pumps, solar panels and solar controller		
Bill No.	Description	DESCRIPTION
1	Preliminary and General	
1.1.1	Allow for contractors mobilisation of plant, equipment and personnel as specified	The contractor to mobilize to site within 7 days of site handover
1.1.2	Provide, erect and maintain contract signboard in accordance with specification	The drawing should have information of name of project, donors, duration, supervisor and contractor's name as shown in drawing
1.1.3	Allow for contractors demobilisation of plant, equipment and personnel	The contractor demobilises only upon successful completion and attainment of all ESMP clearances
1.1.4	Provide first aid kit for safety	The kit should contain necessary first aid materials and must be stocked throughout the contract duration
1.1.5	Contractor's ESMPs as prescribed	The ESMPs as described by the screening results must be complied to
2	Solar Structural Holders, Boreholes, Pumps and Associated Works	<i>Luckson Ngalu, UNDP Engineer</i>
2.1	Site Works	
2.1.1	Construct single line brick barrier and spread coarse aggregate, size 20 to 40 mm, 100mm thick	The barrier should be made of concrete hollow blocks having 10 mm mortar joints and plastered
2.1.2	Excavate 800mm*600mm circular pits for structural holder	The pits to be excavated upon bush clearance and top soil stripping of up to 150 mm.
2.1.3	Supply and erect 150mm steel pipe to support trusses and solar panels (per meter)	The main post must be 150 mm grad B GI
2.1.4	Concrete footing to hold solar steel pipe stand (per cubing meter)	M15 concrete grade to cover main post and fill the excavated chamber
2.1.5	Supply and Weld ripped Channels (150x50x20x2mm) on site to hold panel and prohibit easy removal of panels, hence limit theft	The ripped channels to be 150 * 50 * 20 mm placed on top of opposite main posts
2.1.6	Supply and weld angel iron 40x40x5mm Angle iron for trusses to hold panels spaced every 4 m	The angle irons to be 40x40x5mm placed perpendicular to the ripped channels
2.1.7	Supply and weld angel RT13 for solar trusses to hold panels spaced every 0.98 m	The RT13 should be placed in a way to hold solar panels and for easy riveting
2.1.8	Supply and installation of Clamps for solar modules placement	The clamps to be placed at one joint of adjoining solar panels to prevent lift off due to wind speeds
2.1.9	Red metal Primer for Solar Modules Structural Holders	45 - 560.01 Red metal Primer to be sprayed on double coats at 4mm wet and 2 mm dry applied at 2000 PSI and 0.017 tip
2.1.10	Turpentine for Solar Modules Structural Holders	The turpentine oil should have minimum specifications of 0.855 g/cm ³ density at 20 °C; 1.4600 refractive index and -36.0 optical rotation
2.1.11	2K Silver Paint for Solar Modules Structural Holders	The Paint should have anti corrosion properties
2.1.12	Hardner for Solar Modules Structural Holders	To be premixed with paint before spraying for epoxy based coating system
2.1.13	Thinners for Solar Modules Structural Holders	To apply industrial grade N.C Thinner
2.1.14	Provide 1 water taps and 100m 3/4" hose for solar panel cleaning	The tap to be erected inside the fence for solar panel structural holders and closer to panels for easy cleaning
2.2	Borehole Drilling and Associated Works	
2.2.1	Conduct Geophysical Studies to locate potential borehole sites	The driller to conduct the geophysical studies and produce a report on 10 possible water points hydrogeological feasibility
2.2.2	Borehole drilling to a depth of 70 m, permanent casing of 200 mm including borehole development and yield testing	The driller to produce borehole log and yield tests report
2.2.3	Construct Borehole manhole installed with lockable lid to protect pump from vandalism	The man hole should have masonry walls and concrete cover fully sealed to prevent vandalism with GI 100 Gate Valve, a 110 mm PVC breather pipe and flow meter complete with flanges
2.3	Solar Pumps	<i>Luckson Ngalu, UNDP Engineer</i>
2.3.1	Submersible pumps of 7.5kW 3x400VAC 50Hz, 6" pump 3" outlet discharging atleast 36 m ³ /hr at TDH 50m	The pump should be installed in the borehole at 5 m above the pipe endcup
2.3.2	*Solar module 72 x 6" cells 16% minimum efficiency, minimum of 320 Wp each, where possible, total Solar Array Power to be 1.3 times Pump power	The solar modules should be fixed onto the solar rack firmly to ensure stability over wind speeds not more than 160 km/hour
	PV Array distribution box with DC 1000V fuses, 16Ade, IP66	Each PV Array distribution box should have a 1000V fuse
	Combiner box 2 inputs, with DC fuses 1000Vdc, surge DC protection, DC switch disconnector	The combiner boxes should have a power arrester
	Control Panel 7.5kW with electrical protections with inbuilt dry protection mechanism	Each control panel to have dry protection inbuilt mechanism
	Sinusoidal filter 11kW 24A IP20 (oversized by purpose due AC cable length)	Each filter should be fixed onto the wall and that when operating, the closer be exposed to free ventilation
	Meters solar cable 1x6mm ² , red color	2 mm diameter wire cable
	Meters solar cable 1x6mm ² , black color	3 mm diameter wire cable
	Meters electrical cable from PV Array to Control Panel, 3x4mm ² section	4 mm diameter wire cable
	Meters electrical cable from Control Panel to Pump, 4x10mm ² section	4 core armored electrical cable
	Resine connector for pump cable 4x10mm ²	4 core armored electrical cable connector to be used to connect the cable to the pump cables and immersed in the borehole
	Steel cable 50m for pump secure and fasteners, 5mm	anti corrosion Steel cable not less than 5mm thick
	Units grounding rods with clamp and electrical cable	The grounding roads should be at least 1 m long
2.3.10	Solar mounting frame	Made of aluminium plates serrated on the front to cover the cables inside the building
2.4	Security Fence	<i>Luckson Ngalu, UNDP Engineer</i>
2.4.1	Diamond wire for 3m high perimeter fence with razor sharp wire on top, including galvanised steel poles and lockable access gate. Steel poles in concrete foundation	3 mm diamond wire to be constructed around the perimeter of the pump control point

2.4.2	Supply and install security lights; 90W solar street lights installed on galvanise steel poles inside the security fence	Solar light placed at all corners of the fence and two on the opposite middle of the long section of the fence
3	Pump Control House	
3.1	Earthworks	
3.1.1	Excavation foundation trenches in soft material up to 1.5 m	Excavations to be done on cleared land and stripped of top soil up to 150 mm
3.1.2	Backfill to foundation	Backfill with appropriate material
3.2	Structural works	
3.2.1	50mm sand blinding	Sieved sand granules spread at the base not less than 50 mm thick
3.2.2	Provide DPC cover	2 mm thick DPC plastic sheet
3.2.3	Class C30 vibrated concrete to base as shown on the drawings	M30 concrete class well vibrated and cured
3.2.4	Concrete hollow block to foundation in 1:4 mortar	The hollow blocks 400 * 200 * 200 mm with ability of 7.3 N Compressive Strength
3.2.5	Concrete hollow block to wall 1:4 mortar	The hollow blocks 400 * 200 * 200 mm with ability of 7.3 N Compressive Strength
3.2.6	Plaster work to walls in 1:4 mortar	The wall should be plaster to 15 mm wall thickness, trimmed and shinned
3.3	ROOF	
3.3.1	Carpentry	<i>Luckson Ngalu, UNDP Engineer</i>
	Wrot sawn softwood timber	
3.3.1.2	Supply and fix 100 x 50mm x 5.5m purlins (2"x3"x18)	Soft wood timber saw sown to quality
3.3.1.3	Supply and fix 150 x 50mm x 5.5m bottom tie (2"x6"x18)	Soft wood timber saw sown to quality
3.3.1.4	Supply and fix 230 x 25mm x 5.5m fascia board (1"x9"x18)	Soft wood timber saw sown to quality
3.3.1.5	Supply and fix wood preservative	To be applied with brush coats
3.3.2	Metal work	
3.3.2.1	Galvanized wire hoop iron 10gg	4 mm steel wire
3.3.2.2	6 inches wire nails	60d nail sizes 152.4 mm long
3.3.2.3	5 inches wire nails	50d nail sizes 139.7 mm long
3.3.2.4	4 inches wire nails	40d nail sizes 127 mm long
3.3.2.5	Roofing	
3.3.2.6	Supply and fix 28guage IBR iron sheet - 11 ft	0.475 mm blue IBR sheets as specied in length
3.3.2.7	Screw roofing nails complete with washers	5 inch long
3.6	Miscellaneous	
3.6.1	Apply 2 coats of undercoat to walls	Undercoat to be applied as a PVC paint
3.6.2	Apply 2 coats of waterproof paint to walls	Acrylic paint to be applied as water proof
3.6.3	Prepare, prime and apply one undercoat and two finishing coats of full gloss enamel on door and frame	Gloss enamel paint sprayed
3.6.4	Provide steel doors attached to steel frames, tow-bolted on 3 places, lockable with mortice lock and pad locks. Supply with a mortice lock and 3 padlocks	Steel door frame made of 1.6 mm metal sheet while door made of 1.2 mm RHS of 80 * 40 and fixed with 3 lever mortice lock and secured to the frame with 3 padlocks
4	Pipeline Works	
4.1	Main Pipeline (1000 m)	
4.1.1	Excavation works in soft material	Excavations to be done on cleared land and stripped of top soil up to 150 mm
4.1.2	Supply, install test and commission uPVC 110 mm class 6 pipeline	Class 6 PVC quick coupling 110 mm pipes
4.2	Secondary Pipelines (2600 m)	
4.2.1	Excavation works in soft material	Excavations to be done on cleared land and stripped of top soil up to 150 mm
4.2.2	Supply, install test and commission uPVC 90 mm class 6 pipeline	Class 6 PVC quick coupling 90 mm pipes
		<i>Luckson Ngalu, UNDP Engineer</i>
4.3	Supply Pipelines from boreholes to tanks (400 m)	
4.3.1	Excavation works in soft material	Excavations to be done on cleared land and stripped of top soil up to 150 mm
4.3.2	Supply, install test and commission HDPE 90 mm class 6 pipeline	90 mm HDPE pipe of class 6 category
3.5	Hydraulic Structures	
3.5.1	Excavate hydraulic structure foundations	Excavations to be done on cleared land and stripped of top soil up to 150 mm
3.5.2	Erect Distribution boxes (100*100)	The DBs to be 1m by 1 m and 0.6 m high with orifices as agreed based on flow routes
3.5.3	Supply and install 110 mm GI valve gates	GI Valves to be placed in the main pipeline to control flow to each secondary pipeline
3.5.4	Supply and install 90 mm ball valves	Ball valves to be used as hydrant opening mechanisms mounted on the riser of each DB
3.5.5	Supply and install 75 mm GI valve gates	GV valves to be placed on lines from tank stand to act as bypass and direct flow regulators
4.4	Plumbing Works	<i>Luckson Ngalu, UNDP Engineer</i>
4.4.1	Supply and fix 110 mm to 90 mm HDPE clamp saddles	The clamp saddles/ T Joint Pieces will act as ofroutes to secondary pipelines
4.4.2	Supply and Install 110 mm to 90 mm Tee	The clamp saddles/ T Joint Pieces will act as ofroutes to secondary pipelines
4.4.3	Supply and Install 90 mm uPVC Tee	The Tee pieces will connect risers from the secondary pipeline
4.4.4	Supply and fix 90 mm HDPE coupling	The couplings will connect several riser and hydrant pipes to give a hook shape
4.4.5	Supply and fix 110 mm HDPE 90 deg bends	The bend will help connect main and secondary pipelines at bend
5	Tank Stand Structure and Accessories	
5.1	Excavate 900mm*600mm circular pall pits for structural holder	Excavations to be done on cleared land and stripped of top soil up to 150 mm
5.2	Supply and erect 150mm steel pipe B Grade to support the tank deck	The main post must be 150 mm grad B GI or mild steel universal beam (152 *89 mm and 7.7 mm flange)
5.3	Concrete footing to hold solar steel pipe stand (per cubing meter)	M15 concrete grade to cover main post and fill the excavated chamber
5.4	Supply and Weld ripped Channels (150x50x20x2mm) to serve as deck holder and tension bar crosses	The ripped channels to be mild steel universal beam 178 * 102 mm and 7.9 mm flange placed on top of opposite main posts
5.5	Supply and weld angel iron 40x40x5mm Angle iron for deck support	The angle irons to be mild steel universal beam 127 * 76 mm and 7.6 mm flange places perpendicular to the ripped channels
5.6	Supply and installation of steel (2"x6"x18')	Full plained and drilled on tucking points
5.7	Supply and erect 50 mm square tubes pipes on the edges of the tank stand as guard rails	To protect the tanks from tipping and falling over when empty and protect workers during maintenance

5.8	Supply and weld 40*40*5 mm angle irons as ties and braces welded onto the steel poles	The ties and braces to be screwed / welded to help stability and avoid buckling
5.9	Red metal Primer for Solar Modules Structural Holders	45 - 560.01 Red metal Primer to be sprayed on double coats at 4mm wet and 2 mm dry applied at 2000 PSI and 0.017 tip
5.10	Turpentine for Solar Modules Structural Holders	The turpentine oil should have minimum specifications of 0.855 g/cm ³ density at 20 °C; 1.4600 refractive index and -36.0 optical rotation
5.11	2K/Silver Paint for Solar Modules Structural Holders	The Paint should have anti corrosion properties
5.12	Hardner for Solar Modules Structural Holders	To be premixed with paint before spraying for epoxy based coating system
5.13	Thinners for Solar Modules Structural Holders	To apply industrial grade N.C Thinner
5.14	Supply, fix and test 5000 L water tanks complete with all accessories	Heat resistant water tanks recommended