CRS ENGINEERING TEAM

STANDARD SPECIFICATION FOR CONSTRUCTION WORKS

This Specification relates to the following contract:

Contract Title: Rehabilitation and Extension of Otterhound Piped network

Contract Number:

Location: Herat- Kushk -Rubat Sangi- Torghoundi

Description:

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Abstract

CRS Afghanistan is implementing a project named Early Recovery Response for Drought-Affected Households in Afghanistan. One of the main objectives of this project is to guaranty that drought-affected households have access to safe water throughout the year. The 2018 drought in Afghanistan has brought to the fore the changing character of recovery from extreme weather events like droughts and floods, and the relatively greater timeframe and complexity of acute needs. CRS technical assessments revealed that people across the targeted area are still reeling from the crippling effects of the 2018-19 drought and struggling to recover. The prolonged security instability combined with natural disaster has depleted resident's capability to cope with repeated shocks.

To ensure that these villages are guarded against environmental shocks such as drought in the future. The provincial rural rehabilitation department in Herat has requested CRS support to provide safe drinking water to the targeted communities.

CRS opts solutions which are affordable, environmentally sustainable and climate smart. As Solar Powered Water Systems (SPWS) have the potential to meet all of these criteria. Therefore, CRS Afghanistan is willing to grant the SPWS project implementation contract to a reliable company.

1.0 PRE-AMBLE TO THE SPECIFICATION

This Specification covers the minimum standards of workmanship and materials required by the contract. All the work shall be done in accordance with (ABS) Afghanistan Building Code, International Building and Construction codes, COMPASS design report, NFPA and NEC code (article 690) relevant to the PV system design and installation.

All works shall be carried out to the approval of the Engineer/Technical Advisor. Any items which do not meet the requirements of this Specification shall be repaired or demolished and re-instated at the contractor's expense. The contractor shall be liable for any delays to the project caused because of repairing or demolishing defective work.

Any items of work not described in this Specification but forming part of the works shall meet the minimum standards of workmanship and materials which can normally be expected locally. Where there is conflict between local standards of and this Specification, this Specification shall take precedence.

Any clauses which relate to items of work not covered in the Contract shall be deemed not to apply.

This document forms part of the Contract, and should be read in conjunction with the other Contract Documents: -

- Contract Agreement
- Terms and conditions of Contract
- Drawings
- Specification and standards
- Other documents referred to any of the contract documents

SCOPE OF WORKS

Activities that CRS being undertaking or has been undertaken

a. Preliminary survey/ technical assessment of project areas i.e. Selected Villages within targeted area.
b. Design solar powered system using COMPASS the most credible design software developed by LORENTZ company.
c. Design of a combined motorized and gravitational force water supply network.
d. Mobilize communities (Source point selection, Selection of area for Solar panel installation)
e. Water quality test: CRS will run water quality test during wells pumping to assure source water is potable and meet consumption and submersible requirement.
f. Pre-delivery inspection and quality control of procured items.
g. Quality control and Quality assurances: The three-phase control system required by the CRS of refers to Preparatory, Initial & Follow-Up inspections for each "Definable Feature of Work"
h. inspect the quality of construction/installation works and to order corrections or replacement, at no additional expense to the CRS, of items determined as not meeting the minimum standards.
i. Operation and Maintenance: Establishment of water management committee at targeted village. CRS staff will train a local Water Management Committee at the onset of the project they will be practically involve in the project implementation. At the end of the project they will collectively take care of the system. Two technicians and all members will be trained on the following topics. (Construction, Electrical, Hydraulic and Administrative parts).

2. Context of Requirements for Contractor Company

The works include seven major parts but not necessarily be limited to them.

2.1 Borehole:

Two boreholes have same characteristics and specifications about 150meters from each other are located close to a previous military compound (10-inch internal casing with total depth of 96meters- water table within each borehole is 11meters for the surface). To deduce crucial information on sustainable yield (Q) and the expected drawdown(s) within both boreholes the contractor should:

a- Simultaneously run a pumping test on both boreholes, the test should last at least for 24 continuous hours to ensure the safety of both submersible during long hot sunny days of the summer season. The required safe flow rate for borehole number one(35° 12.593'N, 62° 17.375'E) which supply daily demand of three villages is 13.29 liter/sec. also the required safe flow rate for borehole number two (35° 12.676'N, 62° 17.391'E) which supply demand of Thourghoundi ulia and elevated household is 6.78lit/sec.

b- Considering the worst-case scenario wherein, borehole fails to meet the flow rate requirements, the contractor should include the cost of drilling two new boreholes in as separated tentative expense line, as an agreed backup option. But if everything goes according to the plan and we do not need to drill new boreholes this amount will be deduct from the total agreed amount.

2.2. Construction work:

a- Restriction of solar panels area: A critical part of establishing a photovoltaic power systems (PVPS) is the selection of an appropriate site for the solar panels. The selected site for the installation of the PV array should be in the foreground of sunshine. Since the lifetime of such systems is as long as 25 years, selecting a location for the solar power plant that allows it to obtain maximum energy is critical. Given the construction costs, it will not be possible to change the location of the system after installation. CRS understands the importance of keeping solar plants close to dug well. Therefore, Selected site for the solar plant is only 15 meters' form borehole.

The elders of four villages are agreed to donate two plots of lands each 350 square meters (35*10) m close to boreholes.

To keep configurated system out of reach from children/irresponsible people and to ensure power system security, it is planned to surround the area with a boundary wall of 1.8 m high with 60 cm concertina wire on top.

b- Construction of frame (Stand)for PV-Panels configuration: Contractors need to evaluate the pros and cons of the layout and come out with the best configuration by fulfilling our requirements and the necessary installation direction according to the manufacturer's specifications.

Contractor should build the stand structure (as per technical drawing) from the base level to support the weight of the panels and installation. The whole structure should be built as per the most current and safe method of steel fabrication. Structure should be not only withstanding the load but also aesthetically welcome with the best possible finishing techniques. Structure should not have any safety issues, deformations, sags sections, uncovered and opened sections, poorly done joints, loose welded or poor welding joints, sharpen edges, misaligned section, worn-out parts, and any nonstandard finishing under any circumstances.

c- Well's room: Both boreholes are restricted by 3x3m rooms. The roofs of those rooms need some work. 1- construction of proper manhole for submersible installation and removal.2- strengthen the roof to withhold the applied load 3-Roof insolation against leakage, 4- Protecting and sealing well's final platform to eliminate potential contamination risks.

2.3 Power source (Solar panels configuration):

a- Based on COMPAS Calculation 84 No LC250-P60 PV-Panels are needed to be install in order to run the Motor of selected submersible (PSk2-15 C-SJ42-6) to pump the 305 cubic meters of water as average daily output **(**see COMPAS _ electrical calculation report**).**

b- COMPAS calculations indicate that 57 No LC250-P60 PV-Panels are needed to be install in order to run the Motor of selected submersible (PSk2-9 C-SJ17-11) to pump the 195 cubic meters of water as average daily output for Thourghoundi Ulia and households at elevated parts of all three villages (See COMPAS report).

Note: we have 49 No PV-Panels (Nigbo Solar, Model: TDB125X125_72_P 180WB. Pmax:35.4V, IMP5.08A) are also existed which can generate 8kw of the electricity. But as these panels aren't purchased from a certified vendor, therefore, their efficiency is not given nor guaranteed over the life span of pipe scheme (at least 25 years) we would use them but will considers as 60% of their efficiency over the design period of the project:
Power that can be generated by available 49 panel= (8820*60%=5.292kw/hour).
Total estimated Power is: 57*250= 14.250kw/hours
Extra panels needed = 14.250-5.292=8.985kw or 8985/250=35 No LC250-P60 PV-Panels
Total panels that would be installed in the solar plant = 49+35=**84panels.**

c- Pumps: Both pumps shall be supplied as specified on the drawings. Pumps shall be tested before completing the installation. Defective equipment shall be replaced by the Contractor.

2.4 Water reservoirs

a- Existed reservoirs: Two circular RCC reservoirs with total storage capacity of 200 cubic meters are constructed on top of Tourghoundi hill (35° 14.207'N, 62° 17.132'E). Both reservoirs are space out from 10 meters and located 3km away from main well.

Reservoirs do not have any leakages, but their covering slabs are damaged and fractured and its external parts also not properly plastered. Its constrictor's responsibility to inspect the reservoirs closely and remove any technical deficiencies thoroughly. (see pg-14. technical drawing).

b- 21 cubic meter metallic water tank is installed on the elevated part of Tourghoudi Ulia (35° 13.216'N, 62° 17.385'E). Initially it was considered as water regulator tank. The contractor should convert existed 21cubic tank to a five cubic elevated overhead water tank and install it at the top of Thourghoundi hill to serve 50 families. (see pg.19to22 technical drawing).

New reservoirs: To regulate the flow with demand and can preserve the yield as a backup for cloudy days where solar panels don't operate to its full potential, It is planned to build new RCC reservoirs with total storage capacity of 114 cubic meter. New reservoirs are: (see Pg. 5 to 13 technical drawing)

- 60 Cubic meter RCC water tank in Thourghoundi Ulia village.
    - 15.5 Cubic meter RCC water tanks in Western village.
    - 15.5 Cubic meter RCC water tanks in Eastern village.
    - 23 cubic meter water tank in Sufla village.

2.5 Repairing existed piped network.

a- Supplying main from borehole number one to 200m3 reservoirs:

1- The 3200meters long at 110mm PE-100NP10 supplying main pipe for combined project has reasonable condition, but the flow is interrupted in three points(35° 13.817'N, 62° 17.308'E),(35° 14.023'N, 62° 17.268'E)and (35° 14.077'N, 62°

17.264'E) by addition of sidle distribution branches. Contractor should cut these branches from supplying main and connect them to distribution main located at the other side of the road.

2- While submitting his offer the Contractor should estimate and consider total of 5%of repairing for this part of the project.

b- Supplying main from borehole number two to existed Metallic tank:

1- The 750meters long @90mmPE100NP10 pipe has low quality and cannot withstand available pressure. It needs proper inspection. Contractor should consider it as item that need 100% replacement.

c- Fittings: A few numbers of currently used fittings are male functioning; contractor should estimate it as a contingent expense.

2.6 New pipe and fittings:

a- Connection of all new reservoirs to the main regulating 60m3 RCC reservoir (as per EPANET simulation).

b- To connect new reservoirs with key inlets points of existed piped network, the contractor should provide: Total of 2000 meters long PE100PN10 pipes with four different diameters starting form 90mm, 75mm, 63mm and 50mm, its required fittings and skilled labour wages. Trenches excavation is community's responsibility.

2.6.1 Procurement of all related and required materials:

a- Contractor is responsible to supply and procure all required and estimated items (all necessary material, tools, equipment, vehicles required for this work) up to 100% completions of planned activities.

b- All electrical component (PV-Panels- Submersible – Inverters, other devices, accessories, cables, etc) required for this project should be the products of reliable companies that meet European standards.

c- All items and materials estimated for completion of planned work should meet the minimum standards described in the specification section of this documents. Any items of work not described in this Specification but forming part of the works shall meet the minimum standards of materials which can normally be expected locally.

d- Contractor should inform CRS technical team for preparatory inspection and take their approval for the shipments of the goods. Any items that supplied without pre-delivery approval and do not meet the requirements of this Specification shall be replaced at the contractor's expense. The contractor shall be liable for any delays to the project caused because of supplying of defective items.

Reminder:

The supplier is responsible, first to focus his resources on pump test of boreholes if pump test succeeded to supply the above-mentioned safe yield. then he will be permitted to proceed with the rest of the work as per agreed proposal. In case if the pump test fails to meet the purposed requirements the contractor. the contractor will be only paid based on the unit cost of completed

work. Because this case can affect the entire designed approach and may require adoption or complete change. once CRS technical and management team finalize their decision the contractor will be formally informed on next steps.

1- Any changes in construction or installation from this Scope of Work shall be approved in advance in written by CRS Project Manager or Grant Officer the Technical Advisor.
2- Iranian products are not permitted to be sue in this project.

All work described in this Scope of Work shall be completed by the contractor. The methods that the contractor will use need to provide continuous progress on the job site according to the agreed project timeline.
The contractor shall provide qualified supervisory, technical, and labour personnel capable of meeting the CRS requirements. The labour force shall possess the Electrical, constructional, fabrication and fitting skills for this project and sufficient staff to accomplish the work in a timely manner.

3.0 DRAWING LIST

The works are detailed on the following drawings: -

1- The technical drawing document is consisting of total 22 pages.
2- The technical design (compass reports for solar sizing) are two separated PDF documents consisting of total33 pages.

4.0 Required details for each items line in the summary BOQ.

4.1 New borehole -Pump tests

Well pump test		
Pump test for determination of Hydro geological Parameters.	2	time
• To deduce crucial information on sustainable yield (Q) and the expected drawdown(s) within the dug well after several pumping hours, the test will last least 24 continuous hours to guarantee the safety of the submersible pump during a long, hot sunny day summer and to supply the required safe flow rate (13.29 liter/sec for borehole number one and 6.78lit/sec for borehole number two) to fill water reservoirs within eight productive hours of solar pump during the day. • During the test the discharge of pump should go sufficiently far away to prevent recirculation of groundwater.		

BoQ for drilling new borehole

Considering the worst-case scenario wherein, borehole fails to meet the flow rate requirements, the contractor should include the cost of drilling two new boreholes in as separated tentative expense line, as an agreed backup option. But if everything goes as per plan and we don't need new borehole this amount will be deducted from grand total.			
No.	**Item**	**Quantity**	**Unit**
1.00	Drilling with Percussion Machine new boreholes (internal diameter 18-inch)	200.00	m
2.00	PVC Casing pipe 110mm dia. 12 bar (Class – B) with installation	100.00	m
3.00	PVC Filter pipe 110mm dia. 12bar (Class – B)with installation	100.00	m
4.00	Providing gravels and gravel pack installation	2.00	time
5.00	wells development	2.00	time
6.00	wells disinfection	2.00	time
7.00	wells protection	2.00	time
8.00	wells pumping tests	2.00	pcs
9.00	Miscellaneous	1.00	Lum us

4.2 Construction work

Site preparation		
For all considered components of this project	800	M2
1- A part land which is selected for solar installation is covered by small size trees, its contractor's responsibility to cut and remove all the unwanted bushes or debris that can halt the construction process.		

Excavation and Back filling		
For all considered components of this project	2100	M3
1- Note: excavation of trenches for connection of new reservoirs to previous project is not included its communities responsibility.		

Stone masonry work		
Stone work (solar plant +new reservoirs)	125	M^3
1- Stone will be crushed stone, should meet all the spec described in this document.		

Shuttering		
For all considered components of this project	300	M2
1- Strength of materials used for formwork should be adequate to support structural load as well as other loads imposed on it.		

PCC (reservoirs, valve boxes, solar plant)		
For all considered components of this project	36	M3
1- Grade 1-M150 Concrete: - 1: 2: 4 cement: coarse sand: aggregate For PCC member we would use above specified marks while mixing the concretes.		

Well brunt bricks		
Bricks including transportation (Size, 22*11*7cm)	34500	pcs
1- well burnt brick will be used- all spec specified for burnet bricks and workmanship of brick masonry will be applied.		

Steel working (footing +column+ slab)		
Steel Bars are for all planned activities		
Steel bar 18 mm(Tashkent) (سیخ گول به قطر ۱۸ ملی متر(تاشکنتی	300	kg
Steel bar 16 mm(Tashkent) (سیخ گول به قطر ۱۶ ملی متر(تاشکنتی	285	kg
Steel bar 14 mm(Tashkent) (سیخ گول به قطر ۱۴ ملی متر(تاشکنتی	355	kg
Steel bar 12 mm(Tashkent) (سیخ گول به قطر ۱۲ ملی متر(تاشکنتی	2280	kg
Steel bar 10 mm (Tashkent) (سیخ گول به قطر ۱۰ ملی متر (تاشکنتی	750	Kg
Steel bar 8 mm(Tashkent) (سیخ گول به قطر ۸ ملی متر(تاشکنتی	660	Kg
Wire 1 mm سیم جستی یک ملی	46	Kg
The steel should be without rust, the tensile stress of steel is 2400 kg/cm2, and for deformed bars is 2800 kg/cm2 .		

RCC (reservoirs, valve boxes, solar plant)		
For all considered components of this project	66	M3
1- Grade 2-M250 Concrete: - 1: 1: 2 cement: coarse sand: aggregate For RCC member we would use above specified marks while mixing the concretes.		

Door and windows		
Purchasing and installing two new sliding doors as per drawing + 2manhole frame +Repairing and painting existed 2 doors and 2 windows	4	PC
SLIDING DOOR DOOR CASING -U-LARAN 16GUAGE DOOR PANELS- 18GUAGE-IRON SHEET DOOR RAIL -PROFILE (8x4)cm 16GUAGE DOOR GLASS PANELS - 4mm BLUE COLOR GLASS MANUAL LOCK AND LATCH SET AT BOTH SIDE PRIOR TO INSTALLATION DOOR SHOULD BE PROPERLY PAINTED WITH (ONE LAYER OF RUST PROOF ,TWO LAYERS OF SILVER COLOR OIL PAINT).		

Plastering		
Plastering of Water reservoirs, boundary wall borehole room	795	M2
1- The thickness of the plastering should not be less than 1.5 cm, at least 10 days curing, sand and water is clean, cement is fresh. 2- While plastering the internal parts of the reservoirs -damp proof powder should be sue.		

Resizing, shipment and reinstallation for existed metallic water tank as per drawing		
Total expenses	1	Lum sum
1- As it is stated in the narrative part of this documents and illustrated in technical drawings current 21cubic meters water tank should to be converted and resize to 5 cubic meter overhead water tank. The resizing, shipment and re-installation should be done as per technical drawing and responsible engineer guidance. (Kindly see the drawing Pg. 19 to 22)		

Roof work-borehole rooms		
I-Beam (14cm-100kg)-	36.00	m
Rust proof paint	5.00	kg
wooden plates@3cm theckness (thorn wood)	24.00	m2
burlap	20.00	m2
Gutter -from iron sheet20guage	6	m
1 - Russian I-Beam having 14cm height and 100kg weight should be sued. 2 - I-Beam should be 2coat rust proof and 2coat silver color painted prior mounting on roof. 3 - Wooden plates are form thorn wood, with min 3cm thickness. 4 - Wooden plates should be covered with two layers of burlap. 5 - A Gutter -from iron sheet20guage would be fix on internal wall of stock room.		
Restriction solar plant		
Heavy galvanized Concertina wire (2kg/bondle)	85.00	bundle
Double line barbed wire with 4piece thorn.	680.00	m
Wire 1 mm	20.00	kg

Y-shape pole	70.00	no
After the boundary wall has been built, the concertina and barbed wire installation should be done accordance to drawing, each piece of pole or Y shape stand should be uniform and made form straight one-piece Gi Pies. All Y-shape stands needs to be properly fixed into the PPC of the capping. All metallic items should to be hot dip galvanized.		

Dry stone pitching boulders		
For all considered components of this project	10	M3
1- The soil will be well compacted prior to dry stone pitching. 2- Uniformed boulders with no larger diameter than10cm. 3- Boulders shouldn't be consisting of sedimentary materials.		

White washing out/inside with 100% emulsion (borehole room, solar plant -only outside of reservoirs) about 800m2		
Plastic Paint 100%	200	kg
1- With washing paint will be sued for 3 coat painting (in/outside) stock room, outside of all water reservoir and boundary wall of solar plant.		

Insulation		
Inside of water tanks with (general purposes bitumen) (200m2)	170	kg
Insulation (iso gam) for roof of stock room	32.00	m2
1- Inside of all water tank would be properly insulated with (high-quality general-purpose bitumen). 2- The roof of stock room should be insulated with bitumen math (Iso Gam).		

Site clearance		
Overall, the project site	1	Lum sum
1- To restore site conditions back to normal, contractor should properly collect and remove all the debris and leftover hazardous construction materials. should make sure to eliminate all potential risks that which may otherwise harm users or the environment.		

4.3 Gi- Pipe and Fittings

All GI-Pipe and fittings should to HOT DIP GALVANIZED, Made in THAILAND, Turkish or Taiwan IRANIAN tools are not acceptable.			
	(3"x2")BUSHING GALVANIZED(THAILAND)	2	PCS
	(3"x2.5")BUSHING GALVANIZED(THAILAND)	2	PCS
	(4"x1 1/2")BUSHING GALVANIZED(THAILAND)	2	PCS
	(4"x2")BUSHING GALVANIZED(THAILAND)	2	PCS
	(4"x3")BUSHING GALVANIZED(THAILAND)	2	PCS
	1.5" GATE VLAVE -100%BRASS(MAGHUL) OR (MADE IN THAILAND)	2	PCS
	1.5 "-GI PIPE SCHEDUAL-40	8	M
	1.5"-NIPLE-GALVANIZED(THAILAND)	4	PCS
	1.5"-UNION-GALVANIZED(THAILAND)	12	PCS
	2" FLANGED IRON CAST- GATE VLAVE -COMPLETE SET(NUT, BULT,GASKATE, INSIDE SCREW PLATE)	5	PCS
	2" GATE VLAVE -100%BRASS(MAGHUL) OR (MADE IN THAILAND)	2	PCS
	2.5" GATE VLAVE -100%BRASS(MAGHUL) OR (MADE IN THAILAND)	2	PCS
	2.5 "-GI PIPE SCHEDUAL-40	6	M
	2.5"-NIPLE-GALVANIZED(THAILAND)	8	PCS
	2.5"-UNION-GALVANIZED(THAILAND)	8	PCS
	2"-ELBOW-90DEGREE GALVANIZED(THAILAND)	16	PCS
	2"-GI PIPE SCHEDUAL-40	26	m
	2"-NIPLE-GALVANIZED(THAILAND)	18	PCS
	2"-UNION-GALVANIZED(THAILAND)	12	PCS
	3" FLANGED IRON CAST- GATE VLAVE -COMPLETE SET(NUT, BULT,GASKATE, INSIDE SCREW PLATE)	1	PCS
	3" GATE VLAVE -100%BRASS(MAGHUL) OR (MADE IN THAILAND)	2	PCS
	3 "-GI PIPE SCHEDUAL-40	6	M
	3"-ELBOW-90DEGREE GALVANIZED(THAILAND)	2	PCS
	3"-GI PIPE SCHEDUAL-40	12	M
	3"-GI TEE 90 DEGREE	2	PCS
	3"-NIPLE-GALVANIZED(THAILAND)	10	PCS
	3"-UNION-GALVANIZED(THAILAND)	4	PCS
	4" FLANGED IRON CAST- GATE VLAVE -COMPLETE SET (NUT, BULT,GASKATE,INSIDE SCREW PLATE)	2	PCS
	4 "-UNION-GALVANIZED(THAILAND)	4	PCS
	4"-ELBOW-90DEGREE GALVANIZED(THAILAND)	4	PCS
	4"-GI PIPE SCHEDUAL-40	9	m
	4"-NIPLE-GALVANIZED(THAILAND)	18	PCS
	AIR VENT-STUCK (AS PER DRAWING)	4	PCS

	LADDER-MADE OF FALVANAIZED 1" PIPE (AS PER DRAWING)	4	PCS
	PLASTIC TAPE (NAWAR TEFLOON)	6	BANDALE
	Tentative extra expenses	1	Lum sum

4.4 PE Pipes and fittings

All the PE Pipes and fittings should be product of High Standard Afghanistan or from Turkish company.		
PE Pipe and fittings		
110mmPN10PE100	2200	M
90mmPN10PE100	950	M
75mmPN10PE100	500	M
63mmPN10PE100	1850	M
50mmPN10PE100	950	M
40mmPN10PE100	750	M
PE 110mm-Butt-fusion -fusion	1	Total
PE 90 mm-STRAIGHT JOINTER-PN10PE100	8	PCS
PE 75 mm-STRAIGHT JOINTER-PN10PE100	8	PCS
PE 63mm-STRAIGHT JOINTER-PN10PE100	15	PCS
PE 50mm-STRAIGHT JOINTER-PN10PE100	10	PCS
PE 40mm-STRAIGHT JOINTER-PN10PE100	12	PCS
PE -75mm FEMAL ADOPTER	6	pcs
PE -63mm FEMAL ADOPTER	8	pcs
PE -50mm FEMAL ADOPTER	12	pcs
PE -40mm FEMALADOPTER	6	pcs
PE -110mm FEMALE -TEE 90 DIGREE-PN10	2	PCS
PE -90mm FEMALE -TEE 90 DIGREE-PN10	2	PCS
Miscellaneous expenses	1	Lum sum

4.5 Solar components

Scope of work for Procurement and Installation of Submersible Pump and Solar PV Electric system.

1- Inconsideration of design data (water demand and type of source) the selected water pumps are **PSk2-9 C-SJ17-11pump** and **PSk2-15 C-SJ42-6system** including **controller** with **Data Module, motor** and **pump end** which is best suited for deep well application that require relatively low volumes of water.
2- It is required to install low water sensor probe which will prevent the pump from running dry.
3- Supplier should provide enough quantities of LC250-P60 High-efficiency SERIES POLYCRYSTALLINE SOLAR PV Module, manufactured in ISO 9001:2000-certified factory, to run selected submersible as per COMPASS designed details.

4- Contractor should take the design idea that will be presented to you during the site visit and as per the drawings and come out of the proposal to mount the system in pre-restricted area. The design should be a Simplified array.
5- Contractors need to evaluate the pros and cons of the layout and come out with the best configuration by fulfilling our requirements and the necessary installation direction according to the manufacturer's specifications.
6- Contactor is responsible to analysis the structural integrity and the stability of the metal frame works required for panels.
7- Contractor should build the GI metal structure from the base level to support the weight of the panels and installation. The whole structure should be built as per the most current and safe method of steel fabrication. Structure should be not only withstanding the load but also aesthetically welcome with the best possible finishing techniques. Structure should not have any safety issues, deformations, sags sections, uncovered and opened sections, poorly done joints, loose welded or poor welding joints, sharpen edges, misaligned section, worn-out parts, and any nonstandard finishing under any circumstances.
8- The proposed system, accessories and all the installation work should be complying of COMPASS design report.
9- Contractor should also include the panel placement drawing together with the detailed technical broachers and description of their system. Placement of the panel, equipment and the accessories is a part of vendor's responsibility and it should meet the terms of manufacturer's recommendation. Any issues due to shadow, solar path, direction, or angle will be solely addressed by the supplier/ contractor.
10- Contractor should use sunlight and weather resistant materials for all outdoor equipment and installations. Module wiring, if visible from underneath, must be carefully concealed underground.
11- Contractor should design the system with a minimum of electrical losses due to wiring, fuses, switches, and inverters.
12- Install equipment according to manufacturer's specifications, using installation requirements and procedures from the manufacturers' specifications. It includes properly grounding the system parts to reduce the threat of shock hazards and induced surges.
13- All PV-Panels, inverters, monitoring equipment, interfacing equipment and accessories should be either LORENTZ or any other brand that can meet European standards.
14- Contractors need to include dedicated lightening arrester or protection system that will be eventually protecting the complete PV system as per the manufacturer's recommendation. The functionality and the performance standard are sole responsibility of the vendor.
15- Any other related, mechanical, electrical and fabrication works shall be completed by the contractor. It is required to carry out all the installation and related works in a presentable and aesthetically acceptable way so that the finishing will not be distorted the standard project site condition.
16- Train and engage local mechanic in practical work to Performs routine maintenance, replacement of spare parts of the pump clear solar PV panels and operate backup generator while needed.
17- Completion of the project will be accepted by the CRS only after completing the installation works and after the generated electricity from the solar PV system fed submersible to withdraw and lift designed water volume to considered water tank. Any

adjustment, system configuration, troubleshooting or change or parameters should be done by the contractor until such output is obtained.

Guaranties:

18- LORENTZ guarantee its PV panels for 25 years and submersibles for at least 10 years, the consultancy should also provide service for that period.

Warranties:

19- Selected contractor needs to propose a maintenance agreement for a list of appliances with the CRS and the cost will be separately shown as a line item. Service and maintenance of Solar PV Panels, Inverters, panel mounting structure, cabling and monitoring systems will be covered in this agreement as per the manufacturer's recommendation.

Deliverables

20- Technical specifications agreed between the contractor and CRS, as thematic technical persons from both sides will jointly review and finalize designed scheme and COMPASS reports.

21- On site implementation as per specifications (Weekly report from supplier to CRS, to track the work in progress to be completed well in timeline identified).

BoQ for Power Source (Solar Components)

All electrical component (PV-Panels- Submersible – Inverters, other devices, accessories, cables, etc) required for this project should be the products of reliable companies that meet European standards.

No.	Item	Quantity	Unit
1	Submersible (PSk2-15 C-SJ42-6)	1.00	Pump
2	Submersible (PSk2-9 C-SJ17-11)	1.00	Pump
3	Solar Panel (LC250-P60 PV-Panels)	119.00	Panels
4	24kW Solar Inverter - Three Phase	1	Inverter
5	18kW Solar Inverter - Three Phase	1	Inverter
6	25 mm² 3-phase cable for power and 1-phase cable for ground (0.6/1KV UNDERGROUND CABLE , TYPE :NYY, PVC INSULATED PVC SHEATHED)	200.00	M
7	PV Disconnect 440-40-6(Connection box with DC Disconnect Switch and optional lightning surge protection)	2.00	pcs
8	Surge Protector (Device to Protect LORENTZ Pump Accessories from Voltage Spikes)	2.00	pcs
9	Float Switch(Mechanically Activated Device for Water Level Detection in Applications with LORENTZ Solar Pump Systems)	2.00	pcs
10	Well Probe(Mechanically Activated Device for Dry Run Protection in Applications with LORENTZ Solar Pump Systems)	2.00	pcs
11	Smart PSUK2(AC/DC Converter -To supply PSK2 from local public grid or Electrical Generator)	1.00	pcs
12	Change over switch- Double knife switch Electrical knife switch	2.00	pcs
13	PV-STAND (MADE AS PER DRAWING) -PAINTED WITH (ONE LYAER RUST PROOF , TWO LAYERS OF SILVER OILL COLOR)	306.00	M2
14	Solar panel installation and configuration cost	2.00	TIME
15	Miscellaneous	1.00	Lum sum

5.0 MINIMUM STANDARDS FOR WORKMANSHIP AND MATERIALS

5.1 General

5.1.1 Quality of Materials

The Engineer shall check and inspect the quality of all materials prior and after delivery to the site. Any materials which do not meet the minimum standards shall be rejected. Such materials shall be removed from site and replaced at the Contractors expense with materials of the required quality.

5.1.2 Quantity of Materials

The Engineer shall check that the required quantity of materials has been delivered to site and used in the works. The Engineer will not certify payment for any materials which have been specified in the contract but have not been used in the works, for whatever reason.

5.1.3 Quality of Workmanship

The Engineer shall be responsible for checking that the quality of workmanship by the contractor is of an acceptable standard according to this Specification. The Engineer will reject any works which have not been executed to the required standard. The Contractor shall redo any rejected works at his own expense and with no time delays to the overall scheme.

5.2 Buildings and Structures

5.2.1 Excavations

Excavations shall be clean and free of water. All excavations shall be inspected by the Engineer before work proceeds. The Contractor shall give the Engineer 3 days' notice of the inspection date.

Excavations are dangerous and liable to collapse, particularly in wet weather or waterlogged ground. The Contractor shall take all necessary precautions to ensure that all excavations are properly protected to prevent accidental or unauthorised entry. Excavations deeper than 1.2m deep shall not be entered unless they are shored up with wooden or other temporary bracing. The Contractor shall be responsible for safety, and be liable for any accidents which may occur.

5.2.2 Stone

Building stone should have below characteristics:

A)- Crushing strength: not less than 1000kg/cm2**,**

B)- Appearance: for face work Stone should be decent in appearance and they should be capable of preserving their color uniformly for a long time**,**

C)- Durability: A good building stone should be durable metamorphic stone should be sued not sedimentary stones.

D)-Texture: A good building stone having compacted fine crystalline structure free from cavities, cracks or patches of soft or loose material. The stones with such texture are strong and durable

E)- Water absorption: percentage absorption by weight after 24 hours should not exceed 0.60

5.2.3 Sand

Sand shall be clean and free from contaminants such as oil, silt, soil, wood, metal or vegetable matter. Very fine or smooth sand shall not be used.

Coarse Sand (used for concrete) shall have a maximum size of 5mm
Medium Sand (used for mortar) shall have a maximum size of 2mm
Fine Sand (used for plaster) shall have a maximum size of 1mm

Manufactured Sand (M-Sand) & Plaster Sand manufactured sand is required which have equal particles it should to be free of any organic or silt materials if sand is provided form the river then :
Silt Content should be less than 3% by weight (12% by volume in 10 min)
Sand should be free from Organic materials
Sand shall not contain any harmful impurities such as iron, pyrites, alkalies, salts, coal or other organic impurities
Sand should be screen at source to avoid waste on construction site.

5.2.4 Aggregate

Aggregate used for concrete shall be angular crushed rock varying in size from 5mm to 20mm for Grade 1 Concrete and 5mm to 60mm for Grade 2 Concrete. It shall be clean and free from contaminants such as oil, silt, soil, wood, metal or vegetable matter.

5.2.5 Cement

Cement shall be delivered in sealed bags to the site. It shall be kept clean and dry until usage. Partially used bags of cement shall be stored in a dry place until required. Any partially used bags which have become damp shall be rejected.
The cement which will be used, must be product of a reliable company and should pass the physical tests which are generally performed to determine the acceptability of cement:

- Fineness Test
- Consistency Test
- Setting time Test
- Soundness Test
- Strength Test
- Heat of Hydration Test
- Specific Gravity Test

5.2.6 Water

Water used for mixing concrete, mortar, plaster and other construction materials shall be potable, clean and free from organic material. If none is available on site, the contractor shall transport suitable water to site.

5.2.7 Concrete Mixes

Two grades of concrete shall be used. Unless otherwise indicated on the drawings, Grade 1 Concrete shall always be used for PCC members and Grade 2 concrete for RCC members. Concrete shall be mixed in the following proportions by volume:-

Grade 1 M150 Concrete: - 1: 2: 4 cement: coarse sand: aggregate
Grade 2 M250 Concrete: - 1: 1: 2 cement: coarse sand: aggregate

The water cement ratio shall be approximately 0.55 by weight, thus a mix containing 50 kg of cement will require 27.5 l of water. Too much water improves the workability but reduces the strength. Concrete which has too much water added shall be rejected.

5.2.8 Mixing Concrete

Concrete mixed on site shall be mixed on a clean dry platform of level boards. Concrete shall not be mixed on the bare ground. Mixing by hand shall be carried out in the following way:
First the cement and sand shall be thoroughly mixed. Second, this mixture shall be thoroughly mixed with the aggregate which has been slightly wetted. When the mixture is completely mixed and uniform in colour, the correct quantity of water shall be added, and the concrete thoroughly mixed.

If ready mixed concrete is delivered to site, the contractor shall produce certificates from the mixing plant describing the details of the mix. Ready mixed concrete suppliers shall be approved in advance. Any ready mixed concrete delivered to site shall be rejected if the supplier has not been previously approved by the Engineer.

5.2.9 Placing Concrete

Once mixed, concrete shall be used immediately. Any concrete which had been allowed to achieved its initial set shall not be placed. Concrete shall be placed in layers with a maximum thickness of 250mm. Each layer shall be thoroughly compacted with a wooden rammer. When placing on old or set concrete, the surface of the old concrete shall be thoroughly cleaned and wetted with water. If the surface is smooth it must be chipped to form a good key. Old concrete shall be painted with liquid cement prior to placing new concrete.

5.2.10 Formwork

Formwork shall be adequately braced and supported to withstand the pressure of the wet concrete before it sets. The faces of the formwork shall be smooth and clean, so that the faces of the fresh concrete are not marked. Mould oil may not be used to prevent the concrete adhering to the formwork.

5.2.11 Reinforcement

Steel reinforcement shall be the correct diameter as shown on the drawings. The bars shall be clean and free from rust. They shall be securely fixed with wire before placing the concrete. The minimum cover to reinforcement shall be 50mm.

5.2.12 Curing Concrete

Sufficient water is required for concrete to harden through hydration. The concrete must be kept moist or "cured" to ensure that it does not dry out. Poorly cured concrete will shrink or crack, and not achieve its full strength. Concrete shall be cured by covering in plastic sheets, spraying with water, covering with wet sand or other methods proposed by the contractor and approved by the Engineer. The contractor shall ensure that all concrete is properly cured.

Curing shall start as soon as the concrete has been poured and shall continue until curing is complete after 28 days.

5.2.13 Concreting in Cold Weather

The rate of hardening is retarded in cold weather and stops if the concrete freezes. Freezing water expands and can prevent the concrete from ever reaching full strength.

In temperatures down to 4° C the contractor shall

- increase the curing time
- insulate the concrete to prevent heat loss

In freezing temperatures the contractor shall

- take the above measures
- heat the water to 35° before mixing
- ensure that the surfaces in touch with the concrete are not freezing
- enclose the concrete and continue to provide heat

Concrete which has been allowed to freeze shall be rejected.

5.2.14 Concrete Finishing

Concrete shall be finished to a smooth uniform surface and finished using a metal or wooden float. The surface texture shall be flat and smooth with no irregularities or air bubbles. When formwork is removed, the face of the concrete shall be flat and smooth. If there are signs of voids, air bubbles or inadequate compaction, the concrete shall be removed, disposed of and re-laid with a fresh mix.

5.2.15 Mortar

Mortar for brick and blockwork and floors shall be mixed in the proportion 1 cement : 4 medium sand by volume. Sufficient water shall be added to achieve the desired workability.

The surfaces of the blocks shall be wetted before placing. Mortar shall be placed on all horizontal and vertical faces between the blocks, with no gaps. Each block shall be placed to the correct line and level, and shall be level in all directions. Any gaps shall be filled with additional mortar rammed in with a small wooden rammer. The outside faces of blockwork walls shall be pointed. No excess mortar shall be allowed to stain the faces of the blocks.

5.2.16 Plaster

Plaster for internal walls and external rendering shall be mixed in the proportion 1 cement : 5 fine sand by volume. Sufficient water shall be added to achieve the desired workability.

The walls shall be wetted before applying the plaster. The plaster shall be 15mm to 20mm thick, and shall have a uniform flat finish free of irregularities and blemishes. At corners and between walls and ceilings, the finish shall be clean and precise in a straight line. Untidy or poorly finished plaster shall be rejected.

When the plaster is still damp, the wall shall be sprinkled liberally with dry cement powder and floated to a smooth finish with a wet steel float.

5.2.17 Blockwork and Brick Walls

Blocks and bricks shall be of uniform size and shape, and of the specified dimensions. The contractor may substitute alternative sized blocks with the prior approval of the Engineer, and at no additional expense.

Walls shall be straight, perpendicular and dimensionally correct, constructed as shown on the drawings. The lines of mortar shall be horizontal with no excess mortar staining the faces of the walls. The faces of walls shall be regular and even, with no irregular blocks or bricks.

Bricks

Bricks should have following properties:

- Bricks should be uniform in color, size and shape. Standard size of brick should be maintained.
- They should be sound and compact.
- They should be free from cracks and other flaws such as air bubbles, stone nodules etc. with sharp and square edges.
- Bricks should not absorb more than 1⁄5 of their own weight of water when immersed in water for 24 hours (15% to 20% of dry weight).
- The compressive strength of bricks should be in range of 2000 to 5000 psi (15 to 35 MPa).
- Salt attack hampers the durability of brick. The presence of excess soluble salts in brick also causes efflorescence. The percentage of soluble salts (sulphates of calcium, magnesium, sodium and potassium) should not exceed 2.5% in brunt bricks.
- Brick should not change in volume when wetted.
- Bricks should neither overburnt nor under-brunt.
- Generally, the weight per brick should be 6 lbs. and the unit weight should be less than 125 lbs. per cubic ft.
- The thermal conductivity of bricks should be low as it is desirable that the building built with them should be cool in summer and warm in winter.
- Bricks should be sound proof.
- Bricks should be non-inflammable and incombustible.
- Bricks should be free from lime pitting

5.2.18 Timber
Timber shall be well seasoned. Faces of cut timber shall be smooth, clean and perpendicular. Unseasoned, badly cut, split, twisted or badly knotted timber shall be rejected. Timber shall be fixed with the appropriate sized nails. Any timbers split as a result of nailing shall be replaced.

5.2.19 Nails
Nails shall be appropriate size for their application.

5.2.20 Painting
All timber and metal work shall be primed and painted with two coats of an appropriate oil-based paint, as shown on the drawings. The finish shall be clean and uniform in colour with no blemishes. All surfaces shall be covered uniformly. Adjacent surfaces which are not to be painted shall be protected from splashing. Any paint splashes shall be cleaned off at the contractor's expense.

5.3 Water Systems

5.3.1 Excavation
The pipe trenches should be at least one meter deep.
Pipe which need to cross the roads should be laid at least 1.5-meter-deep under the surface.

5.3.2 Steel Pipe
Steel pipe shall to the diameter and quality specified on the drawings.

5.3.2 Pipe Connections
Welded connections shall be cleanly welded and tested for leaks before burying the pipe. Untidy or leaking joints shall be re-made to the approval of the Engineer.
Threaded joints shall be sealed with an appropriate sealant to the approval of the Engineer.
All connections to pumps, pumping stations, valves and other fittings shall be threaded or flanged to enable removal.
All pumps branches and tees shall be fitted with isolation valves, as shown on the drawings.

5.3.3 Pipe Laying and Bedding
All pipework shall be laid in a trench with a minimum depth of 80cm. The pipe shall be surrounded with 10cm of road gravel. All pipes shall be tested for leaks before backfilling the trench. No pipe shall be backfilled without the approval of the Engineer, who shall observe the leak test. The contractor shall give the Engineer 5 days notice of the leak test.

5.3.5 Pipe Fittings
Pipe fittings shall be as shown on the drawings

5.3.5 Pipe Bends
Pipes shall not be bent. The correct fittings shall be used such as bends, elbows and Tees. Any bent pipe shall be removed and replaced with the appropriate fittings.

5.3.6 Pipe Protection
All steel pipes and connections shall be protected with bitumen paint.

5.3.7 Insulation of Above Ground Pipework
As directed by the Engineer, all above ground pipework shall be insulated against frost with 50mm of fibreglass wrapped in tar paper and fixed with 1.8mm diameter aluminium wire securely fastened at 100 mm intervals.

5.3.8 Valves
All valves shall be of the correct type as specified on the drawings. All valves shall be protected with bitumen paint, their moving parts packed with grease, and the handles removed and stored safely to avoid unauthorised use. Valves in buried pipes shall be installed in concrete valve chambers for access.

5.3.9 Pipeline Markers
All buried pipes shall be marked with concrete posts indicating the depth and diameter of the pipeline to enable future location. The posts shall be installed at 200m intervals along straight runs, and at all changes of direction and junctions.

5.3.10 Air Release Valves and Washouts
Air release valves shall be installed at all high points on a pipe run as shown on the drawings. Washouts shall be installed on low points, as shown on the drawings.

5.3.11 Pumps
All pumps shall be supplied as specified on the drawings. Pumps shall be tested before completing the installation. Defective equipment shall be replaced by the Contractor.
Pumps and motors shall be rigidly mounted on new concrete platforms, securely bolted down. All pipe fittings shall be threaded, or flange bolted to allow for dismounting the pumps. Isolating valves shall be installed on the delivery side the pump, and the suction side if required.
The pipework in the pumphouse shall minimise the number of bends and junctions. It shall be neat and clean. Badly welded joints shall not be permitted. Old or existing pipework shall be replaced at the direction of the Engineer.
The correct type of coupling between the pump and motor shall be installed to allow for any differential alignment or movement. The pump and motor shall be correctly aligned.
Electrical equipment for pumps such as control panels etc shall be installed by a qualified electrician. Installations shall be neat and tidy and shall be carried out such that there is no danger of electric shock. All works shall be carried out to the approval of the Engineer.

5.3.12 INITIAL DISINFECTION
Before it is used for potable water a system should be disinfected to kill off any harmful organisms. Disinfections may also be necessary after people have carried out maintenance the easiest disinfectant to obtain is usually chlorine, (cl^2) which can be found in bleaching powder.

Initial chlorination of a system is done to disinfect all parts of the water supply system, which during the construction/rehabilitation may have been contaminated with disease causing organisms. If enough chlorine is added, some will remain in the water after all possible organisms have been destroyed. What is left is called residual chlorine. The recommended method to find amount of chlorine required for disinfection is called chlorine demand. It requires experimental determination. Generally, 1.5 mg of chlorine is required per litre of water for disinfection. Chlorine needs at least 30 minutes contact time with water to disinfect it.

How to use Chlorine required for different water volumes

Volume of Water (Litres)	Calcium Hypochlorite 65% required (gram)	Calcium Hypochlorite 36% required (gram)
100	0.2308	0.4167
200	0.4616	0.8334
500	1.154	2.0835
1000	2.308	4.167
5000	11.54	20.835
10000	23.08	41.67
20000	46.16	83.34
50000	115.4	208.35

5.5 Electrical

5.5.1 Safety

All electrical installations shall take account of the need to protect the beneficiaries from the danger of electric shock. Any installation which the Engineer considers dangerous shall be immediately removed. No access to bare or live wires shall be possible. All fittings shall be installed so as to be out of normal reach of adults except power sockets and light switches.

5.5.2 Wiring

The Contractor shall supply samples of the wire to be used for the various elements of the electrical system for approval prior to starting works. No deviation from the quality of the samples shall be permitted.

All wires shall run in straight, parallel lines, and be fastened at 1m intervals and at all changes of direction. Untidy or loose wiring shall be re-done at the contractor's expense.

5.5.3 Electrical Components

All electrical components shall meet be to approval of the Engineer, and as specified on the drawings.

5.5.4 Connections

All electrical connections shall be made in a junction boxes. No connections shall be made by twisting wires together.

5.5.5 Fuses

All circuits shall be protected with the ap

CRS Contact Details	
Person to Supervise the Work/Performance of the Service Provider	CRS staff - WASH PM and Technical Advisor - Project officer and Engineer - Procurement team Finance team
Progress Reporting Requirements	CRS intends to engage the services of **qualified firm** who will provide the services under the over-all supervision of Thematic Expert WASH Technical Advisor.
Expected duration of work	Total duration of the assignment will be 3 months, while the timeframe for the assignment is to be mutually agreed between the contractor and the CRS.
Contact Person for Inquiries (Written inquiries only)	Procurement.afg@crs.org

Pre-submission requirements	
Service provider should include below point while submitting their Technical Proposal.	
Qualifications of the Service Provider	The Service Provider must describe and explain how and why they are the best entity that can deliver the requirements of CRS by indicating the following: a- Profile describing the nature of business, field of expertise, licenses, certifications Accreditations. b- Business Licenses Registration Papers, Tax Payment Certification, etc. c- Latest Audited Financial Statement income statement and balance sheet to indicate Its financial stability, liquidity, credit standing, and market reputation, etc. d- Track Record list of clients for similar services as those required by CRS, indicating description of contract scope, contract duration, contract value, contact references; e- Certificates and Accreditation including Quality Certificates, Patent Registrations, Environmental Sustainability Certificates, etc.

Proposed Methodology for the Completion of Services	The Service Provider must describe how it will address/deliver the demands of the RFP; providing a detailed description of the essential performance characteristics, reporting conditions and quality assurance mechanisms that will be put in place, while demonstrating that the proposed methodology will be appropriate to the local conditions and context of the work.
Qualifications of Key Personnel	The Service Provider must provide: a- Names and qualifications of the key personnel that will perform the services indicating who is Team Leader, who are supporting, etc.; b- CVs demonstrating qualifications must be submitted if required by the RFP; and Written confirmation from each personnel that they are available for the entire duration of the contract.