

## **STATEMENT OF WORK AND TECHNICAL DESCRIPTION**

### **Context:**

NCA Afghanistan is implementing CR-WASH projects for the most vulnerable communities, in this project named PEARL NCA is implementing 10 water pipe schemes, among these 10 water pipe schemes 5 will be in South Afghanistan and 5 will be in North Afghanistan. Access to Improved Water and Sanitation Facilities Program funded by UNDP to the most vulnerable communities in Kandahar, Helmand provinces of south also Balkh and Samangan provinces of North Afghanistan.

NCA is currently seeking a reputable, licensed suppliers for construction of water supply systems in the targeted schools and clinics of Hesarak and Shirzad districts of Nangarhar province. The aim of this tender is to fix the prices of water supply schemes. The quantities and description will be provided in technical description part of this document.

### **Important:**

**The suppliers must read this document thoroughly, understand well, and consider this specification while giving their prices for the project, since NCA will ask the suppliers to fulfil the requirement of this specification during implementation of the pipe schemes project.**

### **Type of Services**

The services required under this RFQ is to provide NCA with construction of Solar Powered water supply systems containing bore wells, water reservoir, equipped with solar powered water supply system from bore wells to reservoir.

### **Scope of Work (SOW):**

The scope of works for this RFQ is as bellow:

- Drilling of bore well with rotary technic is selected according to the soil type of targeted villages with its development, casing, gravel packing, well testing for yield (mix discharge), water quality testing and compressor test.
- Construction of two RCC water reservoirs with volume of 10cum capacity, elevated water tank was designed since the area was flat. The water tank was designed as per population of each location. There were 60 families, for further detail refer to site plan and drawing.
- Solar electric system includes (solar panels, submersible pump, inverter, solar frame, and all other necessary equipment's).
- Water distribution lines (water pipe network) with HDPE pipes, its fittings, and other facilities such as gate valves, manholes, well protection for further detail BoQ and drawing is attached.
- Construction of water stand tap with installation of taps as per drawings.
- Construction of boundary wall and guard room for more details refer to BoQ and drawing.
- For ensuring sustainability of water pipe scheme and electrical system from WASH committee at least two people should be trained for operation and maintenance purpose of the system.
- Visibility and cleaning of the site after completion of the project.

The works should be accomplished accordingly to specification and design given. Changes to be made in accordance with NCA technical engineer in charge and vivid reason and approval.

**Protection:**

During the contract period, when work is not in progress, the boreholes shall be kept capped in such a manner as to prevent the entrance of unwanted materials. The Contractor shall remove any excess matter at his own expense. The work to be done considering safety measures in place e.g., avoid child labour, explosive material, and other practices with is not in line with OSHA (Occupational Safety and Health Administration) standards.

**Visibility:**

All project sites shall be marked with at least one project sign board. The contractor must ensure that the sign board will contain at least the following message:

“This project is financed by NCA and the Logo of the NCA and IP should be displayed. Additionally, the Logo of Original Donor should also be reflected. The sign board design by NCA shall be used.

**(Unsuccessful) Borehole:**

The bore well can be considered as negative after confirmation of NCA technical engineer in charge and considering reasons below.

**Costs of borewell which NCA will Bear 100%:**

- If the borewell is completed as per contract but failed due to pumping test or water quality test.

**Costs of borewell which NCA and Supplier will Bear 50/50:**

- If the borewell is completed as per contract but around well ground has collapsed and filled in the borewell. Therefore, the supplier should be more curious on how to install and remove the drilling machinery, and as well as when to use safety precautions for the borehole.
- If we find water in lesser depth and the suppliers goes to more depth and we lost water in the borewell.

**Costs of borewell which Supplier will Bear 100%:**

- For any reasons, contractor is unable to continue drilling and complete the construction of borehole to the identified depth, then this borehole is deemed to be an “**uncompleted borehole**”.
- If the supplier changes the approved drilling method extra cost and time will be on supplier’s shoulder.

Considering the above-mentioned points, drilling the borewell up to the required depth is not compulsory when we feel we have enough water in lesser depth, so the supplier must share the status report of the wells on timely manner.

**Delivery date:**

Since the project timeline is very short, the contractors should try much to implement it in this shorter period with the quality required. The implementation plans of contractors to be reviewed by technical committee of NCA and to be evaluated for project implementation.

**Project tests:**

The contactors are to submit the test results during project implementation:

- **water quality tests report:** (Biological test, physical and chemical tests)
- **Pumping test report:** in which the supplier must find (discharge of well, dynamic, and static water levels, drawdown, recovery time of the well, pump installation depth) the equipment which shall be used while doing pumping test include but not limited to flow meter, generator, submersible pump, water depth meter, stopwatch, and a legend for noting the time and other parameters). The discharge of well shall be enough and equal to water demand of the community otherwise the borewell is failed.

- **Concrete test report:** Temperature test, slump test, compressive strength test and air content test of concrete. While casting concrete the weather temperature shall be between 5 and 35 degrees and the concrete temperature shall be between 10 and 32 degrees, in case of fluctuation in weather conditions the approval from the government shall be taken whether to cast concrete in cold weather conditions using the strategy of cold weather concreting or not in case of approval the supplier can cast the concrete, but what is recommended from NCA engineering team is that after successful completion of the borewell the supplier should first start and complete the concrete (RCC and PCC) containing deliverables. The slump test of the concrete is generally considered from 75 to 100mm, compressive strength of concrete should much the standard requirement of proposed mark of concrete, for every item of the RCC concrete there shall be compressive strength test in case of failure of any of the test for 7 or 28 days, the supplier shall perform core cutting of jack hammer test if again the tests are failed then the supplier must remove and rebuild the item including all the items which are constructed after the failed item. all the casts shall be on suppliers' shoulder and there is no tolerance in this case from NCA side. Air content shall be at the range of 4 and 7 percent, if it is less than 4% then the supplier may add air content materials, it shall be used for slabs and beams only and the aggregate bigger size shall not exceed 19mm.
- **Cement required tests result:** tests which shall be performed over cement includes, setting time of cement, the recommended setting time as per Indian standard is 30 minutes but it shall not increase than 60 minutes in that case the cement won't be used but the supplier must use the chemical materials which manage the setting time of the cement, it will be selected as per the weather condition. And the item for which concrete is made. Consistency of cement shall be tested, early stiffening of cement, fineness of cement, density of cement, and compressive strength test of cement mortar these all-tests permissible range shall be checked with standards.
- **PVC and HDPE pipes test results:** Complete set of Laboratory test (Tensile Strength & Elongation of PE Pipe, Hydrostatic Pressure test (Normal Test), Heat Reversion Test, Density Test, Specific Gravity Test, Carbon Black Test, MFI & MFR Test, Physical Check) for (25-110) as per the BoQ mm diameters High Density Polyethylene pipe (PE 100) conforming To ISO 4427, DIN 8074-8075 & PrEN 12201 Specifications. And PVC as per BS-3505, ISO-2505 and ASTM D-1785 standard.
- **Steel test report:** for steel all tests shall be done for the grade 60 steel bars and the permissible range will be checked with standards.
- In case needed stone and bricks lab test result, it shall be required in specific cases and will be recommended by NCA engineers.
- Permissible range of all tests will be checked with standards and the supplier must provide the standard for every test.

#### **Technical staff:**

NCA suppliers requires to have at least one site engineer dedicated to only construction work to ensure quality and quantity of work, Engineer should not be involved in other tasks of suppliers such as logistics, admin, and finance. In the meantime, NCA staff will be in their support for technical and contextual issue.

#### **Monitoring and reporting:**

All the suppliers must have their own daily, weekly, and monthly reporting template, regular two-week timelines which will be updated every week, they must have on site meetings with NCA and partners technical and M&E staff in which the progress and the quality of work will be discussed. In addition, since NCA is working with PRRD in every province so PRRD engineer will be visiting the sites, their comments considering the contract should be considered, in case of any problem NCA should be immediately put in the picture. The supplier should have journal in every site no excuse will be there for missing the journal, in case of missed journal in the site the work on that day won't be counted for the suppliers. Moreover, journal should be in a diary notebook which should have stamp by relevant IP, and suppliers, also it should have page numbers.

The supplier must also have a check list for every deliverable of the project such as shuttering, steel work, concrete casting, installation of submersible and other electric devices, which should be signed prior, during and after completion of the specific task. If the suppliers don't have check lists signed by responsible engineers, then those

deliverables won't be accepted by NCA. The responsibility of taking signature of the responsible engineer in the site goes to the suppliers.

### **Specification of Electric devices:**

**Solar panels:** along with the specifications written in BoQ the solar panels should be also fine and looking good physically, it should be new, its cells electrical connections (finger and bassbars) should be straight, and well connected without any cuts in the middle of them, the frame should be properly fixed, the space b/w frame and the cell shouldn't be more than 1.5 cm. in the back of solar panel the back sheet should be without knots (neither in the middle nor at the edges), it should be smooth enough. The junction box should be of the same company, the sticker should be from the company itself not pasted in Afghanistan (the sticker should be pasted in 90 degrees, the specification should match the output of the panel. Its clips, and cable should be of the manufacturing company. Prior purchasing or installation of the panel the supplier must provide the catalogue and fact sheet of the manufacturing company from which physical parameters will be checked. Moreover, prior installation the panel will be checked by MRRD in Kabul and accordingly by PRRDs in provinces.

The solar panels serial numbers will be provided to the IP, through IP to MRRD along with official letter after confirmation of the serial numbers the panel will be check physically. After the approval from both NCA and MRRD engineer's supplier can deliver the solar panels to provinces and in the province NCA and PRRD engineers will also check them according to the list provided by MRRD then the suppliers can install the solar panels. In addition, the supplier must provide certificate, data sheet, 25 years guarantee of the solar panels.

As we see taking approvals of the solar panels is a long process so the suppliers must initiate the process weeks before commence of installation period.

Note: approval procedure is for all electrical devices of the solar system.

**Submersible pump and Inverter:** Along with the specification written in BoQ also the submersible pump should have no return valve to prevent returning water to well through the submersible pump, and prior installing submersible pump and inverter their all specification will be written in a check list and signed by responsible engineers in the site in case it is matching the specification written in the contract and if it doesn't match then it will be rejected, without signing the checklist suppliers are not allowed to install them. As per MRRD the supplier should provide at least 3 years guarantee for inverter and submersible pump, its certificate, and data sheet. Moreover, the supplier should provide the submersible pump selection legend from which we can select submersible pump from total head and discharge.

### **Sizing of Electrical System:**

Sizing of the electrical system components depends on the total head of the system, the submersible pump will be selected from the legend provided by manufacturing company, the solar system will be designed for the proposed submersible pump and then inverter will be designed for solar system such that the input of inverter should be at least equal to the output of solar panels. Moreover, the cables for the system will also change with the change in the capacity of submersible and other system components. As now we can't estimate the total head of the borewell so later there may or may not be some changes in the design for example the capacity of submersible may vary from 3kw to 7.5kw or more, likewise the capacity of inverter may vary respecting the capacity of submersible. As a result, the suppliers cannot claim for extra cost if there are any changes in the design.

### **Solar Stand (Frame):**

Solar frames or stand will be made of metal (angel iron or profile), the structure will be truss, the design will be fixed frame. The frame should have bracings and should be strengthened with RCC footings, the design is attached with the bidding documents.

**Borewell and its components:**

While starting the drilling for borewell the supplier shall consider the selected site and method for drilling, during the drilling strata sampling should be done by supplier and well strata report should be prepared. Sometime the depth of the borewell will be from preliminary data so reaching to the depth won't compulsory any depth which is noticed having enough water is our required depth (for more detail see the part of unsuccessful borewells). After drilling the borewell is completed, the filter pipe should be designed as per well strata which has already identified the water containing aquifers, it is not important to start installing filter pipe in lower part of the borewell, but we should install filter pipe where needed. Alike the filter gravel packing should be done where it is needed around filter pipe otherwise backfilling materials should be put in around the PVC blind pipes. After the PVC filter and blind pipes are installed. The supplier should bring the gravel packing material which is well washed and matches the well strata and the filter pipe in terms of sizes. After the gravel packing and before backfilling with soil the gravel pack layer should be sealed with cement mortar, cement slurry or with clay mud whichever is suitable on the spot, if there are many layers of gravel packing all of them should be sealed off. It should also be noted that PVC pipes should be tested before installation. After completing the borewell in case of rotary drilling compressor test should be done with 16 bar pressure, the compressor test is a job which should be done till the water gets completely clean, no cleaning with submersible pump is considered as compressor test, only compressor machinery used cleaning is acceptable. After compressor test is done, pumping test will be done for at least 8 hours in case the water level is not reached to the stable level then pumping test should be continued till the water level is stable, while pumping test the supplier should find (discharge of the well, static and dynamic water levels, drawdown, pump installation depth, recovery time of the borewell), NCA has its own pumping test template and the suppliers have to use it while doing pumping test. Moreover, while conducting pumping test the equipment's should be present at least (flow meter, generator, submersible pump, HDPE pipe, water depth meter, stopwatch, and a legend for noting the time and other parameters). After pumping test is passed and it gives the optimum discharge then the water will be tested for its quality, if the water quality passed then the supplier can continue with other construction work, if the water quality test is failed then supplier is not allowed to start construction activities, if the supplier started the construction activities by their own and without any approval from NCA prior water quality test or after failure of water quality test then all the construction cost will be on their own, NCA will not pay for that. Moreover, in any part of the project if the supplier is doing activities by their own wish without presence of NCA or IP staff there will be no payment for that item from NCA side. Worth mentioning, that NCA has some PVC class D pipes in the stock, the supplier will install them in the wells and will receive their transportation and installation costs. If the PVC pipes are not enough then the supplier can purchase PVC pipes as included in the BoQs.

**Pipe Network:**

These are the distribution lines of the water pipe scheme, and its hydraulic design is done by the help of WaterGEMS, the distribution lines are HDPE pipes which will be installed in the trenches, the design of the trenches are shown in the drawings, the depth of the trenches will vary according to freezing depth of every province and district but the width of the trenches will be the same everywhere, there will be 25cm meshed excavated materials if not available then sand under and over the HDPE pipe 10/15 cm each down and over the pipes respectively. The suppliers must excavate the trenches exact as per the drawing, bed of the trenches must be flat, not round, and the size should be as per exact dimensions. The HDPE pipes connection shall be with glue and there should be no leakage in the fittings of the pipes, after the pipe's connection is over it should be ensured that the pipe network doesn't have any leakage. What shall be done for ensuring no leakage in the network, first at two ends of the network pipes should be cut with a hight then all the pipes should be filled from water and left for at least 24 hours, after that it shall be checked if there is any drop in the level of water in two ends of pipe network, if yes it shows leakage if no it means the fittings are well connected with no leakage. After ensuring no leakage is there in the pipes and fittings then the supplier can start backfilling for the trenches. The suppliers are not allowed to do backfilling prior ensuring leakage in the network.

NCA has its own HDPE pipes in the warehouse, as per the design the supplier must use those HDPE pipes first, if any diameter is not available within NCA warehouse then supplier can buy those pipes. For the pipes available

in NCA's warehouse NCA will only pay the suppliers its transportation (from warehouse to the site) and installation cost.

### **Concrete.**

This project is designed based on ASTM standard and includes both PCC and RCC concrete, the steel bars for RCC is made in Tashkent with grade 60 tensile strength at least 620 Mpa and yield strength of at least 420 Mpa or Khan steel with the same specifications. The mixing methodology of concrete must be by mixer machine based on mix design considering local strengthen of concrete materials. The prepared concrete must be used within 30 min and after it would be expired and not allowed to use. The mix design should be by MANAK and by weight of gravel, Sand, cement, and water.

The materials used in concrete shall be proportionate by weight following the standard cement/sand/aggregate mix ratios as follows: -

For reinforced concrete mix - 1:1.5:3 mix ratios for all RCC works.

For brick masonry mortar mix- 1:3 Mix ratio –

For plastering mortar mix- 1: 3 Mix ratio –

For stone masonry mortar mix- 1:4 Mix ratio the aggregates mix, cement, and water content ratio shall be selected to obtain the best results for compressive strength, density, water tightness & durability, workability, and finishing quality. The concrete mix must be such that the design is compatible with the minimum water cement ratio to give each grade adequate concrete workability.

The grades of concrete for the various works shall be as noted on the drawings and as below: C25: all reinforced concrete (foundations, slabs, etc.) - Characteristics compressive strength at 28days: 250kg/cm<sup>2</sup> - Minimum cement content: 400 kg/m<sup>3</sup> - water cement ratio: 0.5-0.55 - Max nominal size of aggregates: 19mm After placement, the concrete shall be vibrated by mechanical vibrator. The vibration method is to be approved by the WASH Site Engineer/works personnel before the operation. The vibrated and consolidated concrete is finished by towelling or floating the surface to a smooth and flat finish. Following placement, vibration, and finishing work to the concrete and after the initial set has occurred not to damage the surface of the concrete, appropriate measures, approved by the site Engineer/Works personnel are to be implemented to cure the concrete for a minimum period of 14 days. Where concrete previously placed as part of the works is to be butted, jointed, or raised with the addition of further concrete, except in the case where the initial concrete is blinding concrete, the first concrete surface must be suitably prepared by the scrabbling, i.e., removing the laitance (fine concrete surfacing) before placement of the other concrete. The method is to be approved by the Site Engineer/Works personnel. After scrabbling, the concrete shall be a thoroughly wetted and thin layer of cement slurry should be applied before pouring the new concrete. Steel reinforcement shall be positioned with a clearance or 40mm to the face of the concrete unless otherwise directed by the Engineer/Works personnel or shown in the Contract drawings. Formwork for the concrete shall be to the approval of the NCA Engineer and shall not allow slurry loss from the concrete mix. Prior to the concrete placement, the formwork is to be inspected and all harmful materials removed to the approval of the NCA and IP WASH Engineer/Works personnel. The Contractor must undertake no mixing or placement of concrete without prior permission by the NCA or IP WASH Engineer.

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.

Once mixed, concrete shall be used immediately. Any concrete, which had been allowed to achieve its initial setting, shall not be placed. Concrete shall be placed in layers with a maximum thickness of 250mm. Each layer shall be properly compacted with a vibrator. 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 suitable key. Old concrete shall be painted with liquid cement prior to placing new 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 adequately cured. Curing shall start as soon as the concrete has been set and shall continue until curing is completed after 14 days. otherwise, the concrete will be rejected, and all the main and associated costs would be on contractor.

**Concrete Clear Cover:** in order to safe steel from open air and soil it is compulsory for concrete element to have a clear cover of concrete between steel, soil and open air, the elements of concrete which are in contact with soil its clear should be at least 7cm, and the element that are in contact with air its clear cover varies from 1.5 cm to 5 cm, the below are clear covers for different items of concrete.

- |                                      |      |
|--------------------------------------|------|
| 1. For foundation the clear cover is | 7cm  |
| 2. For columns the clear cover is    | 4cm  |
| 3. For Beams the clear cover is      | 3cm  |
| 4. For shear wall the clear cover is | 3 cm |
| 5. For Slabs the clear cover is      | 2cm  |

#### **Concrete Checklists:**

Prior concrete casting as we must first fix shuttering and steel bars, so there will be checklist prior concrete casting, during concrete casting and after concrete casting.

1. Checklist prior concrete casting, after the formwork and steel work is finished the monitoring engineers will check the formwork and steel work quality and will allow the suppliers for concrete casting in case of no deficiency, and if there is deficiency in the formwork or steel work the supplier will rectify and then can start concrete (checklist format will be shared).
2. Checklist during concrete casting, the monitoring engineers will look for the activities and supplies which shall be done and present during concreting, such as (vibrator, mixer machine, skilled, unskilled labours, manak, scaffolding, safety tools, rubber hammer etc) if the suppliers fulfil the requirements, then it's OK otherwise should stop the concrete work until everything is in place during concreting. (Checklist format will be shared).
3. Checklist after concrete casting, after the concrete is casted, the concrete is set the supplier can remove the formwork after approval of the engineers then engineer will use the checklist after concrete casting to ensure the concrete quality is good and there is no deflection, crack and segregation in concrete item then the engineer will allow the supplier to start another item of concrete. (Checklist format will be shared).

The setting time for footings, columns and shear walls can be 24 hours in hot weather, and 48 hours in normal weather over 5 degrees Celsius. But for beam and slabs it shall not be less than 15 days in hot weather and 21 days in cold weather.

#### **Curing:**

After the casted concrete has set and achieved its stiffness then the curing shall start, in cold weather at least 7 days of curing is required, while during hot weather conditions 14 days of curing is needed. Till the mentioned time periods it is not allowed to keep concrete dry even for one minute. If the supplier failed to cure the concrete so there will be deduction from the cost of the item of concrete, the cost deduction will be 5% of the item per day, in case the supplier has cured the concrete for initial three days, but if the supplier fails to cure the concrete from the start then 50% of the cost will be deducted from the particular item.

The curing of the concrete shall be with direct watering through pipes, with wet sand over slabs, or with rapping wet bags (بوجى) around footing, columns and shear walls and wetting the bags continuously. Point to be noted that all costs of curing shall be included in the cost of concrete for both PCC and RCC works.

#### **Quality of the concrete Items:**

##### **Footings:**

For footing first need is the foundation, the foundation should be levelled, sides should be 90-degrees vertical, smooth, and well compacted, the compaction should be with 120kg compaction vibrating machine, if the ground is suitable for compaction then OK otherwise the supplier may put some compaction suitable material and do the compaction, but it is not necessary to change the material it will be decided as per site.

##### **Stone pitching:**

There will be stone pitching as per drawing the stone pitching shouldn't be vertical, all the stones should be flat with space among them, so while casting PCC there will be PCC between the stones.

PCC: after stone pitching PCC shall be laid as per the drawing, it shall be smooth and well levelled and shall be cured as per curing instructions. PCC shall be laid as per drawing; any extra PCC will not be counted for suppliers if they want to cast for easiness of their work for shuttering or other purpose.

**RCC Footings:**

For constructing of footing there so many activities, footings should be properly positioned deviation in the footings positioning is not allowed more than 1cm while cross checking, if there is more than 1cm deviation the footings shall be rejected and won't be counted for the suppliers. Shuttering for footing shall be levelled, in line as per drawing, plumbed, and very well fixed such that while vibrating the concrete the shuttering shall remain strong and wouldn't damage. The steel work for footings should be as per drawing, the overlaps are not accepted in the steel work of footings. Steel shall be clean from rust while using, every joint of the steel should be tied with building wire, random tying is not allowed and not accepted. Ends of the footing steel bars should have at least 10cm hoke or as per drawing if more is shown in the drawings.

**Columns:**

Columns should be properly positioned, no deviation more than 1cm is acceptable in the positioning of columns, columns should be properly plumbed, no deviation more than 1.5mm/meter is acceptable while plumbing the columns, no twist in the columns is acceptable more than 0.5cm. so the columns shuttering should be very well tied. The shuttering materials should be plywood, new, with no wounds and cracks, shuttering jacks should be used. In every side of the columns two jacks should be installed to prevent twisting of columns. In the back of the plywood timbers should be fixed, the timber should be tied with hokes such that while vibrating the concrete no slurry of cement should come out of the columns. All the steel bars for columns shall not be overlapped at one point and at the middle of the columns, half of the steels shall be overlapped at 1/3 down the middle of columns and half of the steels shall be overlapped at 1/3 over the middle of the columns, stirrups shall be with little space 10cm c/c in these two areas 1/3 down and over the middle but at the middle it can be more space 15cm c/c if not shown in the drawings.

**Beams:**

It is not allowed to cast columns and beams at the same time, but first the columns are constructed, set, the shuttering is removed then the supplier can start beams, although it is required to have fix joints of the columns and beams (steels of beam and columns should be inserted in each other), in beam alike columns the overlaps shall not be in one points, if possible half of the steels overlap in one side column and half of then overlap in another side column if not possible then 1/3 approach will be applied. Also, the stirrups spacing shall be the same as column in the middle with 15cm c/c and at 1/3 both sides 10cm c/c if not shown in the drawings. shuttering should be well fixed with no holes, wounds, and cracks to prevent waste of slurry. Plywood, timber, jack, and hokes shall be used in shuttering of the beams. Also, it would make the beam stronger, while fixing the shuttering the middle of the beam is curved means that the middle is around 1.5cm higher than the end of the beams.

**Slabs:**

Slab is horizontal element of water tank which is very important, and it is highly affected by moments and deflection, while fixing the shuttering it would be better if we fix the middle of the slab 1.5cm higher than the corners. In addition, for shuttering plywood, jack, and timber should be used. Also, while fixing the timbers the space should be considered. The spaced between two timbers shouldn't be more than 70cm and the space between two jacks should be considered 60cm not more than that. Steel work of the slab should be such that there should be no overlaps since the slab is very small, ends of the steel bar should have at least 10cm hoke if not shown in the drawings. While casting the concrete the slab should be well levelled, the surface should be well smoothened, no crack, (any type of cracks) is acceptable in slabs the causes of the cracks should be considered and precautions should be applied while casting the concrete to avoid cracks in the concrete. Curing instructions should be followed strictly.

**Share walls:** After the slab is set the supplier can start their work on share walls maybe it will take 2 or 3 days depending on weather condition for slab to set well and allow us to work on it. The share walls should be 90-degree vertical there is no tolerance in verticality of share walls, if even one 1mm deviation have been noticed in verticality of the share wall that will not be accepted, the supplier will remove and rebuild it, since it is bearing

horizontal load so we cannot take any chance, so no deviation of plumb and twist is acceptable. For this reason, the suppliers should be very careful while fixing the shuttering, it should be very strong and not to move even 1mm. in addition it should be carefully vibrated no extra vibration is needed. The steel work of the share wall is also very important the supplier should pay full attention to this matter as well, share wall steel work should be don't while fixing the steel of the beam and slab such that the steel from share wall should overlapped into the slab and beam as shown in the drawings. After finishing the steel work and while casting the concrete it should be not forgotten to install water stope as instructed by the responsible engineer in the site.

**Cement.**

Fresh Cement type 2 (Portland 400 or 500) shall be delivered to the site in prime powder form and sealed bags. 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 Contractor will store the empty bags for the NCA technical team count and later disposal of them by the Contractor. The cement will be tested in lab and will be approved by NCA engineers if matches the standards. The cement will be approved once as per standard and availability in the market, there will be no changes in cement brand after approval, so the suppliers must propose the cement which is available in the market and are matching the standards.

The suppliers should have proper store for storing the cements, the cements bags should be piled up over each other such that it should not exceed 10 bags over each other, down the cement bags dry wooden timbers should be laid down to avoid surface contact with cement bags. If the suppliers don't follow the storing rules of cement and the cement is moist and transforms to stones, then the cement will be rejected, and all the responsibility will be on suppliers' shoulders. Also first comes first practice should be followed while using the cement bags.

The supplier should segregate the empty cement bags activity wise such as stone masonry, brick masonry, PCC, RCC etc.

**Bricks.**

First class burnt bricks shall be obtained from an approved source and of uniform colour, size (8\*11\*22) cm, and shape. Bricks shall have smooth rectangular faces with sharp straight, right-angle edges. Maximum absorption shall not be more than 15% of its dry weight on immersion in water for 24 hours. Minimum crushing strength shall be 140 kg/cm<sup>2</sup>.

**Stone:**

Stone shall be hard, sound, free from decay and weathering. Stones with porous matter or with boulder skin shall be rejected. The size of stones shall not be less than 15cm in any direction. Cement and sand for cement mortar shall be of standard specification. The stone should at least have three flat surfaces otherwise will not be allowed to use for stone masonry, if used by supplier then it shall be rejected. The percentage of mortar for stone masonry shall be not less than 35%, as per the ratio of the mortar (1:4) in every cubic meter of stone masonry 3 bags of cement shall be used, if less than 3 bags used, NCA engineers have the authority to reduce the cost or quantity of the stone masonry as a penalty for compliance of rules.

**Safety:**

The contractor should provide sufficient safety measures for skilled and unskilled labors and other hired workers on the Project site, the contractor should provide all required PPEs (personal protection equipment) to their workers and labors such as Safety glasses, Safety shoes, safety helmet cap, Gloves, and safety vest coat. If a labor injured/died in time of work in the project all the responsibilities go to the company and NCA doesn't have any responsibility in it at any case.

**Formworks:**

Frames should be from new and smooth surface plywood with no crakes or dotes in it (NO PLYWOOD IS ALLOWED TO BE REUSED WITH CRACKS OR WOUNDS). During framing metallic jacks shall be used and no wooden pole stanchion is allowed due to construction norms and safety issues. It is worth mentioning that in case breaching any construction rules in framing no paid of frames should be made to the contractor.

**General Recommendations:**

1. During implementation of the solar powered pipe scheme for every activity and items the suppliers need an advance approval from NCA or IP team. If NCA find any deficiency in the work, in any stage of the project and there is no written approval or checklist signed by NCA, then item is spontaneously rejected, if the item is affecting its predecessor or successor then those are accompanied with rejected item. No verbal or any scenario-based approval is acceptable.
2. The suppliers should finish all their borewell activity from start till water quality test within 15 days.
3. The suppliers should make a work plan and should strictly follow up their plan and achieve their milestones accordingly.
4. NCA technical team recommends the supplier to prioritize concrete work, first finish all the concrete works soon after water quality is approved then they must start other works, such as pipe network, solar system etc. since the weather will get cold and we would have already finished the works which are affected by cold weather.
5. The suppliers should have technical staff present in the site every day, if there is no technical staff NCA will stop the work, so the responsibility of delay will be on supplier, and it will be counted on the penalty days.
6. If the supplier is doing any activity by their own without prior approval, then NCA has the right to accept or reject the item and supplier has no right to claim.
7. The suppliers must coordinate all work progress or on-site quality of work with Ips, and NCA ground staff, but the issues which has cost implication or materials approval related should coordinate with NCA Kabul. Every approval should be in written.
8. As per project requirements supplier must follow the safety rules and shall equip all the skilled and unskilled labours by PPE (personal protection equipment) complete package.
9. The supplier will be asked to fulfill all the term within this specification, it would be the part of their contract, so they must read all the instructions carefully and consider them while giving their price and while implementing the project.
10. All the drawings and BoQs should be strictly followed, in case of need for any changes increase in the quantity, NCA technical and managerial teams should be put in picture and take approvals.
11. As shown in the BoQs NCA has its own available materials in the stocks in both regions (South and North) so the suppliers must use those items first and if there is something which is not available in NCA's warehouse then supplier can buy those items and put NCA staff in the picture. The available materials in warehouse are (HDPE pipes, Solar panels, Inverters, Submersible pumps, different sizes of cables, PVC pipes, and Steel).
12. There can be 10% of independency to site technical staff whether it is suppliers' engineer, IP or NCA staff to bring necessary changes while needed in the design while needed but that will be coordinated in advance with NCA or IP technical staff in Kabul. It is just for betterment of the implementation otherwise for changes in the quantities terms of contracts will be followed. Moreover, for every item every predecessor activity should be approved then the successor should be start.
13. The suppliers are not allowed to give the project on subcontracts with materials, they are only allowed to give the workmanship on contracts to skilled labours, such as they can give stone masonry only masonry on contract to the mason, or steel work or shuttering work only the work not with the materials. If NCA found that the supplier has given the project on subcontract with materials, then the supplier will face penalty as per NCA's policy.
14. In case of delay of project from the stipulated time mentioned in the contract the supplier will be fined as per NCA penalty policy.
15. Along with this specification, BoQ and drawings supplier will be provided with some other annexes, which shall be part of the contract of the suppliers the annexes are (Health and Safety plan, Quality Contract Plan, Risk Management Plan and Environmental Screening) which will be given to suppliers while signing the contract.
16. Steel bar of MELI and Tajikistan as it is already tested and are not standard, so they are not acceptable in this project, the supplier must try for Khan Steel (KSM) and Tashqand steel (Uz) which are standard and very common.

17. For excavation where there is no flat area the supplier should make its profile taking the elevation before and after the excavation, if the supplier fails to provide an excavation profile, then the quantity of the excavation will be counted as per drawing, the supplier has no right to claim for more. For profile there should be approval from NCA or IP site responsible engineers.
18. Health and Safety rules should be applied as per OSHA rules for PPE, Scaffolding, trenching, excavation, and for compaction, around water tank based on need there should be four-sided scaffolding and green curtain. For elevated water tanks from ground up to the top slab there should be scaffolding and green curtain.
19. The supplier must bear in mind that while giving their cost for the projects, if they are finding any mismatch in the design or BoQs, then prior giving their cost they have to clear their doubts and confusions with NCA technical engineers, if not later while implementation of the project they cannot claim for extra cost and they have to work as per instructions of NCA and IP engineers.
20. Since NCA and IP are lacking enough staff, so NCA and IP won't be able to monitor the construction works of pipe schemes regularly, so the suppliers must construct quality work. In case NCA finds any deficiency at any stage of the work NCA has the authority to reject the items or ask the suppliers to redo the work.
21. The suppliers can receive their final invoice only if the projects are handed over to relevant PRRDs and receives the hand over official letter.
22. If the workflow was stopped by NCA or IP because of deficiency in the work by supplier, the supplier will be responsible for the delay of the work and shall not be counted for them as justification for the extension of the contract.