

ANNEX E, Technical Specification

Project Name: Construction of two story building maternity ward in the existing CHC of Dasht-e-Archi district PARR

Proposed Activities: Construction of two story building maternity ward in the existing CHC of Dasht-e-Archi district PARR

Project Components: Construction of Maternity Building in two stories, Construction of elevated water tank, construction LPG Canopy, Construction CHU (Central Heating Unit) Room, Construction of Septic Tank, Construction of Walkways, Furniture and Oxygen/CHU&LPG Supply Systems.

General Conditions for Project Materials Selection

All materials should be selected based on reviewed submittal approved by Engineer, even if the source specified in the BoQ, Drawing and specs, its for verification of the origin and quality of the items.

Concrete Works

General

In general, and except where otherwise specified, the Contractor shall supply all labor, materials and plant required for the concrete work and all tests thereon and shall:

- Nominate the sources of materials, testing and mix design.
- Mix, transport, place, compact, finish and cure all concrete.
- Erect and dismantle all forms and formwork.
- Produce and install all steel reinforcement.
- Embed, as required, all items, whether supplied and erected directly or by other Contractors, in accordance with these specifications and drawings.

Cement

The type of cement to be used shall depend on the constructional circumstances and on the prevailing local conditions. Standard Portland cement, ASTM C-Type I, may be used at places not exposed to chemical aggressiveness. Moderate sulphate resistant cement and highly sulphate resistant cement shall be used per the recommendation of the soil investigation reports and written review of Engineer and the Employer. No extra payment will be made to the Contractor for the use of sulphate-resistant cement.

Cement shall be delivered to the site in bulk cement containers or in sealed bags clearly marked with the maker's name and shall be carefully stored in a waterproof shed with a raised floor or in a silo of reviewed design. Each consignment of cement shall be stored apart from earlier consignments and the cement shall be used in the order in which it is delivered.

The Contractor shall ensure that each consignment is accompanied by a certificate from the manufacturer certifying that the cement in that consignment meets or exceeds the minimum requirements of the contract specifications. Weathered or congealed cement, or cement more than three (3) months old after production, shall not be permitted to be used unless otherwise reviewed by the Engineer after the quality test.

Cement shall be stored in a suitable weather-tight enclosure on a board platform raised off the ground. The enclosure should be such that free circulation of air around the bags of cement is kept to a minimum. Any



cement that has become damp, caked or lumpy shall not be used. Concrete batching operations shall be organized so that cement that has been manufactured first is used first.

Each consignment of cement may, after delivery to the site, and at the discretion of the Employer, be subjected to the entire testing and analyses regimen by the standard Specification.

The Employer may reject any cement as a result of any failing tests, notwithstanding the manufacturer's certificate. The Employer may also reject cement that has deteriorated owing to inadequate protection or other causes or in any other case where the cement is not to the Employer's satisfaction. The Contractor must remove all rejected cement from the site without delay and expenses for the Employer. The Contractor shall arrange for these tests to be carried out at his own expense.

Aggregates

All aggregates to be used for the Works shall be crushed rock type complying with the requirements of BS 882 or equivalent in all respects and shall be subject to the tests specified in BS 812 or equivalent.

The Contractor shall furnish to the Engineer samples of both the proposed fine and coarse aggregates, together with such full details as the Engineer may require. No aggregates may be used in the Works until reviewed by the Engineer.

During the work, the Engineer shall order such tests he may consider necessary on the aggregates. Any aggregates found to have unsuitable characteristics at any time shall not be used in the Works and shall be removed from the Site. Aggregates are subject to the Employer's review.

The various fractions of fine and coarse aggregates shall be stored separately and in such a manner as to avoid the addition of soil in the concrete. Aggregates shall be handled in such a way that segregation is avoided.

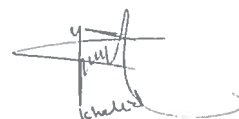
Maximum size of aggregate used in concrete shall not be more than 25 mm. The combined aggregate shall be as coarse-grained and dense-graded as possible. Fine and coarse aggregates shall be stored so that they are kept clean and free from contamination and are not subjected to segregation. Where a clean hard surface is not available for the stockpiles, the bottom 150 mm of the aggregate piles that are in contact with the ground shall not be used.

Grading of Aggregates

The grading of the fine and coarse aggregates shall be such that when they are mixed in the proportions specified for each class of concrete, the grading of the combined aggregate shall be suitable for making dense concrete of appropriate workability, containing the proportions of cement and water prescribed. The proportions of fine and coarse aggregates and the maximum size of the coarse aggregate to be used in each class of concrete shall be reviewed by the Engineer.

The Contractor shall be responsible for mixing the aggregates in the proportions reviewed by the Engineer for each class of concrete and each section of the work. Samples of the concrete material is to be submitted to the Engineer and the Employer well before starting any concrete work, as well as test results for the concrete materials. Concrete works must not begin until such samples and tests are to the Engineer's satisfaction. Fine aggregate (sand) shall consist of clean material or manufactured sands and coarse aggregate shall consist of clean gravel, crushed gravel or crushed stone. Both the fine and coarse aggregates shall comply with ASTM C33. Sulphate and sulphide shall be in such quantities that the whole proportion, in sulphur trioxide, will be less than 1 percent of the mass. Prohibited aggregates include:

- Feldspathic or schistose rock.
- Aggregates containing charcoals or their residues such as coke, ashes, clinkers, finders.



Water

The water to be used for mixing and curing of concrete shall at all times be kept clean and free from deleterious materials such as oil, silt, high acidity or alkalinity, etc. which affects to the cement, aggregate or the steel reinforcement. For each different water source used in the batching of concrete, water chemical analysis tests shall be carried out before commencement of foundation works. Water chemical analysis shall be carried out before commencement of foundation works and each time the source of water is changed.

Admixtures

No admixtures shall be used without written review of the Engineer and the suitability of admixtures must be proven in trial mixes in the presence of representative of the Employer's Representative. If required to improve the quality of concrete (workability, finish and water tightness), water reducing and set retarding agents and plasticizers shall be used in accordance with ASTM C-494. Under no circumstances shall calcium chloride or any admixtures containing calcium chloride be permitted in the concrete. Manufacturer's recommendations and instructions concerning overdosing of additives shall be strictly observed and mixture-containing chlorides shall not be used under any circumstance.

Concrete Mixing, Placing and Compaction, Protection and Curing

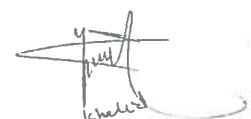
Mix Design

Full details of the components forming the concrete mix proposed to be used by the Contractor shall be submitted to the Engineer for assessment at least forty-five (45) days before the commencement of any concreting operations. Once the proposed mix has been reviewed by the Engineer, it shall not be varied by the Contractor unless the Engineer's prior review has been obtained. No concreting shall be commenced in any portion of the work until the preparations and the concrete mix design have been reviewed, and permission been granted by the Employer. The required minimum concrete class is a C 20, as per BS standard. The mix design of the concrete shall be reviewed, and its suitability proven in trial mixes at an approved concrete testing laboratory. In case of use of ready mixed concrete, trial mixes may be waived if an earlier proven mix design is used.

The concrete mix shall be designed and tested and the concrete mix submission shall include the following information:

- Source, nature and grading of both the fine and coarse aggregates.
- Type and supplier of the cement to be used.
- Proportions by weight of both the fine and coarse aggregates.
- Weight of cement per cubic meter of concrete.
- Water-cement ratio by weight.
- Estimated slump of the mix.
- Arithmetic mean compressive strength of the mix at 7 days and 28 days using cube compression test samples, plus the standard deviation of the test strengths and the number of cubes tested.

Any admixtures specified for inclusion in the concrete mixes or that the Contractor intends to use in his mixes (and have had the prior review of the Engineer) shall be included in these trial mixes. The ratio of the weight of fine aggregate (sand) to the total weight of aggregates shall be between 0.35 and 0.50. The minimum cement content shall be 350-400kg/m³ and the maximum water cement ratio by weight shall be 0.45. The Contractor shall allow for the cost of all such testing in his Tender as well as any further testing and additional reporting that the Employer/Engineer may require.



Mixing of Concrete

All concrete shall be mixed in power driven mixers, reviewed by the Engineer. If use of a power driven mixer is problematic (i.e., a mixing machine transportation problem), volume basis will be allowed as long as careful controls are maintained and written review from the Engineer has been received. The concrete materials shall be accurately measured to ensure the production of uniform batches of concrete. The Contractor will be required to proportion the materials by weight at all times. If required, the materials may be measured by volume and the proportions in each batch adjusted to suit whole bags of cement after receiving written review from the Engineer. Only unbroken bags of cement may be used. Bags of cement that have partially set, contain any lumps, or have become wet at any stage shall not be used.


Volume measurement shall be carried out using well-proportioned gauge boxes. Under no circumstances will the volumes be proportioned by shovels. The gauge boxes shall be loose-filled with the material being measured then struck off level with a straight edge then discharged into the mixer. The required volume of mixing water shall be adjusted to allow for the free moisture contained in the aggregates. Personnel in charge of the concrete mixing operations shall be trained and experienced in this method of concrete production. The batch mixture shall be rotated at a speed recommended by the manufacturer and all concrete shall be mixed for a minimum of 1½ minutes from the time the last of the materials have been placed in the mixing drum. The mixing shall continue until the materials are thoroughly and uniformly mixed and the concrete is uniform in color and texture. The entire batch must be discharged from the mixer before recharging commences. Each batch of concrete shall have a similar appearance. The slump of the concrete shall normally be between 25mm and 75mm corresponding to a stiff, plastic consistency. All plant for mixing shall be cleaned and free from all dirt and debris. All mechanical equipment (mixture, vibrator, etc.) and the stock of construction material (cement, aggregate and sand) shall be checked before starting a concrete placement (that is, pour) to ensure it is in good operational condition and sufficient is available for the foundation work. The Contractor shall always have at least two vibrators in operating condition at the location of the concrete placement.

In hot weather conditions, various means should be employed to lower the temperature of concrete including:

- Using cold water: the use of ice is to be limited to chill the mixing water, but no ice is to be used during batching.
- Avoiding the use of the hot cement.
- Insulating water supply lines and tanks.
- Cooling coarse aggregate.
- Shading and/or cooling mixer drums.
- Adequately watering of sub-grade, formwork and reinforcement.
- Avoiding concreting during the hottest part of the day.
- In no case should the temperature of freshly mixed concrete exceed plus (+) 30°C.

Placing and Compaction of Concrete

Concrete shall be conveyed from the mixer to forms by a method that prevents segregation or loss of the ingredients. It shall be placed as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. The placement of concrete shall be at such a rate that the concrete remains plastic and flows smoothly, ensuring that the concrete shall be dense and homogeneous in its final position. The placement of concrete in the forms shall be completed within ½ hour after the introduction of the mixing water to the cement and the aggregates in the concrete mixer. Batches requiring more than 30 minutes of mixing the concrete shall be rejected and replaced by fresh concrete without any extra cost to the Employer. Formwork shall be filled with concrete in a continuous operation. Written review is required for



construction (working) joints, if construction joints are required. Concrete shall be placed and compacted/vibrated in horizontal layers of not more than 300 mm thickness, and vibrators and other compacting equipment shall be to the satisfaction of the Engineer. An appropriate method must be adopted by the Contractor to prevent segregation of concrete when placing concrete in the foundations with a fall over 1 meter.

Protection and Curing

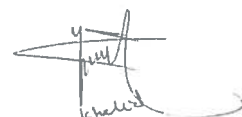
Cement-based repairs may require some initial protection, because rapid drying may halt the hydration of the cement and lead to shrinkage cracking, de-lamination and weakness. Careful curing is essential by covering with absorbent material that is kept damp, preferably covered in turn by polyethylene or similar sheets, which are sealed at the edges. Shading from the sun may be necessary. Alternate wetting and drying must be prevented because of the alternating stresses that it would cause. If repairs are to be carried out during hot weather, it is advisable to shade the work from direct sunlight in order to prevent rapid drying of cement-based repairs or over-rapid stiffening of resin based materials. Requirements for curing large volume repairs are similar to those for new construction. Although they are less critical than thin patches, curing is important for a durable result. Normal curing methods are acceptable. Sprayed-on curing membranes are suitable if a surface coating is to be applied later. During the initial stages of hardening, the concrete shall be protected from the direct rays of the sun and from drying winds. The formworks containing the hardened concrete shall not be disturbed. To ensure proper curing, all concrete shall be kept moist for a period of at least 10 days. Foundations shall not be backfilled before they have been cured and inspected. The foundations shall not be subjected to any loads in addition to those existing at the time of the placing of the foundation concrete until the curing period has elapsed. Curing compound membranes shall be applied uniformly by spray, leaving no pinholes or gaps, at a rate not to exceed 4.91 m² per liter. The curing compound shall be applied after finishing operations are completed and surface moisture has disappeared.

Ready-mixed Concrete

Ready-mixed concrete may be used in the Works, provided that adequate control is maintained of the supply, mixing, and placing of the concrete. Concrete shall be placed and compacted in its final position within 75 minutes of the water being added to the mix. If the Bidder/Contractor proposes the use of pumps for the transporting and placing of concrete, he shall submit a detailed method statement. The Contractor shall ensure that pumping shocks shall not be transferred from the pipeline to the formwork, to previously laid concrete or to the structure. The initial discharge of any pumped concrete shall be discarded completely.

Steel Reinforcement

The steel reinforcement shall consist of hot rolled deformed bars conforming to the requirements of ASTM 615 Grade 60, 420MPA yield strength. The specific number, type and location of ridges on the deformed bars shall be reviewed by the Engineer and the Employer. The number, placing and fixing of bars shall be in accordance with the drawings and reviewed bar bending schedules, or otherwise, as directed by the Engineer. All reinforcing bars shall be bent in accordance with the relevant standard. No reinforcement shall be heated. All reinforcement shall be rigidly fixed in position to the concrete cover specified by a reviewed means. All chairs, tie-wires or other devices used to connect, support, secure or fasten reinforcement shall be provided as per the requirement and as directed by the Engineer. All reinforcing bars shall be stored in a clean, dry place on platforms off the ground. Grease, oil, paint or any other substance that will affect the bond of the reinforcement shall not be allowed to come in contact with the bars. All such substances shall be cleaned from the reinforcement before concrete is placed.



All reinforcing bars shall have a protective cover of not less than 100 mm at the bottom of footings and on any surface of concrete that will be exposed to salt water and 50 mm for concrete exposed to weather or soil.

Deformed billet-steel bars for concrete reinforcement	AASHTO M 31 (ASTM A 615)
Deformed steel wire for concrete reinforcement	AASHTO M 225 (ASTM A 496)
Welded steel wire fabric for concrete reinforcement	AASHTO M 55 (ASTM A 185)
Cold-drawn steel wire for concrete reinforcement	AASHTO M 32 (ASTM A 82)
Fabricated steel bar or rod mats for concrete reinforcement	AASHTO M 54 (ASTM A 184)
Welded deformed steel wire fabric of concrete reinforcement	AASHTO M 221 (ASTM A 497)
Plastic coated dowel bars	AASHTO M 254 (Type A)
Low alloy steel deformed bars for concrete reinforcement	ASTM A 206

Formwork

The Contractor shall be entirely responsible for the design and construction of the formwork to be used for concreting.

The formwork shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in position. All formworks shall be of such tight construction that slurry cannot flow out at the joints during pouring and compaction. If required, joints shall be sealed with foam rubber strips. No concrete shall be placed until the Engineer or his representative has examined and reviewed the formwork.

Surface Finish

Unless otherwise shown on the drawings, all permanently visible concrete surfaces shall have a regular finish of uniform texture free from holes, pins and formwork. Should any section of the concrete present a rough, uneven, honeycombed, discolored or imperfect appearance when the shuttering is removed, it shall be removed to such a depth and refilled, and properly refaced with such class of concrete as the Employer may direct. In the event of excessive porosity being discovered, the defective area shall be removed and remediated as specified above, all at Contractor's cost. No plastering of such concrete areas will be permitted unless directed by engineer.

Concrete foundation edges above the ground level and 300mm below the ground level shall be beveled by inserting 25mm triangular edges in the formwork. Concrete foundation tops shall be designed and finished to prevent the accumulation of water. Concrete surfaces shall be wood float or steel trowel finished as specified on the Drawings or as

instructed by the Engineer. All finishing works shall be carried out in accordance with the relevant specification of British Standard and to the satisfaction of the Engineer. All concrete foundations shall be treated with an asphaltic or equivalent coating in order to be acid resistant. The surface to be covered must be perfectly clean. The coating shall be applied on the formed surface of the foundation with a layer at least 2mm thick. If specified within the contract documents, the required protective painting of foundations shall not be executed until the end of the curing period to obtain a completely dry surface. Painting shall be done according to the specifications of the supplier.



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Fixing of Steel Structures

Where shown on the drawings or as directed by the Engineer, steel items shall be embedded directly in correct positions in primary concrete. All brackets, anchor bolts and other steel items, for which recesses in concrete have been made, shall be fixed by secondary concrete after careful alignment to correct positions.

Testing of Concrete

The Contractor shall design and test concrete mixes, which result in a minimum compressive strength of 20N/mm² after 28 days. All testing of concrete shall be carried out in accordance with the requirements of BS 5328: Part 4 and BS 1881 or equivalent. During the placing of concrete for each section of the work and at such other times as directed by the Engineer and the Employer, quality certificates of all materials shall be submitted and 2 sets of test cubes, concrete test specimens (15cm x 15cm x 15cm cubes), shall be taken, each set consisting of 6 cubes. From each set three specimens shall be tested after seven days and the remaining three specimens after 28 days. The compressive strength of the cubes shall not be less than 20N/mm² after 28 days. That is, 12 cubes total are prepared and after 28 days all

12 cubes have been tested. Consistency and bleeding test and such other preliminary tests as the Engineer may direct shall be performed as often as directed by the Engineer or Employer. No concrete of any type or class shall be used in the Works before the preliminary tests have shown acceptable specified compressive strength and workability. All test specimens shall be well marked, recorded, and cured as specified.

Inspection and Testing

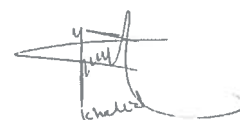
Scope

The whole of the works supplied under the Contract shall be subject to inspection and testing by the Employer or their representative during manufacture, erection, testing, commissioning, and after completion. The inspection and tests shall include, but not be limited to, the requirements of the Specifications. All plant, supervision, labor and services necessary to carry out all tests shall be provided by the Contractor unless specifically stated otherwise. All expenses related to the type tests, factory tests, field tests, and laboratory tests shall be borne by the Contractor.

Quality, Assurance, Inspection, and Testing

To ensure that the supply and services under the scope of this Contract, whether manufactured or performed within the Contractor's works or at his subcontractor's premises or at the site or at any other place of work are in accordance with the Specifications, the Contractor shall adopt a suitable quality assurance program to control such activities at all necessary points. Such a program shall be outlined by the Contractor and shall be reviewed by the Employer after discussion before the award of Contract. The Contractor's quality assurance program of the Contractor shall generally cover, but should not be limited to the following:

- Contractor's organizational structure for the management and implementation of the proposed quality assurance program.
- Documentation Control System.
- Qualification data of Contractor's key personnel.
- The procedure for purchases of plant, materials, parts, components and selection of subcontractors' services including vendor analysis, source inspection, incoming raw materials inspection, verification of material purchases.
- System of shop manufacturing including process controls, fabrication, and assembly controls.
- Control of non-conforming items and a system for corrective actions.



- Control of calibration and testing of measuring and testing plant.
- Inspection and testing procedures for the manufacturer.
- System for indication and appraisal of inspection status. System of quality audits.
- System of authorizing release of manufactured products to the Employer.
- System for maintenance and retention of records.
- A quality plan detailing specific quality control procedures adopted for controlling the quality characteristics relevant to each item of supply.

The quality plan shall be mutually discussed and reviewed by the Employer after incorporating necessary corrections by the Contractor as may be required.

Quality Assurance Document

The Contractor shall be required to submit all Quality Assurance documents as stipulated in the Quality Plan at the time of Employer's inspection of plant. The Employer through his duly authorized representatives reserves the right to carry out Quality Audits and Quality Surveillance of the systems and procedures of the Contractor's and the subcontractor's

Quality Management and Control Activities. The Employer through his duly authorized representatives reserves the right to audit the Contractors and the Sub-Contractor's processes and procedures involved in the fulfillment of this Contract.

Inspection, Testing, and Inspection Certificates

The provision of the clauses on Test and Inspection of the General Conditions of Contract and Special Conditions of Contract shall be applicable to the Supply and Construction portions of the Works. The Employer reserves the right to re-inspect at Employer's expenses any material, even though it may have been previously inspected and reviewed by Employer. If upon re-inspection the material is found to be defective, then the Contractor shall bear the cost of this re-inspection and shall bear the cost to re-instate / repair / replace the material in compliance with the Contract specifications.

Defective Activities/Materials/Procedures

Employer/Engineer also reserves the right to inspect any materials, construction activities, supply, materials' sources and procedures, and if found any defective action or defective work, the report will be share with contractor through an official tracking tools and tracking tools will be remain up to end of project for recording purpose.

Guarantees

Bidders shall state and guarantee the technical data sheet and guarantee forming a part of the other sections of the bid document. These guarantees shall be binding and shall not be departed from without the written permission of the Employer. The tolerance permitted in the IEC, BS, ISO or ANSI Standards shall apply, unless stated otherwise.

Tests at Manufacturer's Works

General

Where no specific test is specified, then the various items of Plant shall be tested in accordance with BS, IEC, DIN, ANSI, ASTM Standards, or any recognized International Standards. No Plant shall be packed,



prepared for shipment, or dismantled for the purpose of packing for shipment, unless it has been inspected or inspection has been waived by the Employer. All instruments and Plant used in the performance of tests shall be to the satisfaction of the Employer. If required by the Employer, the instruments and plant shall be calibrated to an agreed upon standard at a laboratory of National standing to be nominated by the Contractor and reviewed by the Employer/Engineer. The cost of carrying out calibrations shall be borne by the Contractor in all cases. Within 15 days of the completion of any test, a triplicate set of all principal test records, test certificates and performance curves shall be supplied to the Employer/Engineer.

Foundations and Civil Works

General

The Contractor shall supply all materials, plant and labor and perform all operations required for the construction of all concrete foundation as shown on the drawings and other relevant civil works, as specified herein and as evidently necessary to complete the work. Foundations shall be constructed for all the specified type of drawings. drawings and calculations shall be submitted by the Contractor for the review of the Employer before commencement of the works. The responsibility for proving the adequacy of the foundation type at each site shall rest with the Contractor. The necessary soil investigations including field or laboratory tests shall therefore be undertaken by the Contractor according to these specifications. Parallel to these soil investigations, the Contractor shall also take water tests (analysis) in waterlogged locations to ensure the application of the correct cement type. The results of these tests shall be documented by the Contractor and submitted to the Employer. Pile foundations or special foundation designs may be required in difficult locations or in exceptionally poor soil. The Contractor is required to design for each type of suitable foundations including pile foundations, if required, for each kind of soil encountered. Foundation designs for each type of soil shall indicate geometry and volume of excavation and concrete, and shall be submitted for employer/engineer review. The Contractor shall be free to propose alternative types of foundations to those specified in the technical specifications, provided that these comply with all requirements specified. However, only the types specified shall be included in the main terms.

Plain Cement Concrete (PCC)

The PCC shall be a concrete grade of M15 to cover the tops of the masonry and bottom layer of the foundation. The minimum thickness shall be 100mm or as directed by the Engineer. The unit price shall include supply of material, construction, tools and plant, transport and placement of material, to complete an effective installation, to the satisfaction of the Engineer.

Reinforced Cement Concrete (RCC)

The RCC shall be a concrete grade of M20 for any foundation protection requirements. The unit price shall include supply of material (cement, reinforcement, sand, and aggregates), construction, tools and plant, transporting and placement of material, to complete an effective installation, to the satisfaction of the Engineer.

Excavation Works

The excavation works cover the cutting of slopes, revetment works, and foundation structures for RCC and where sufficient ground clearances are not available. The price shall include proper disbursement of



excavated soil. Payment shall be made per actual cut volume and the unit price shall include labor, plant, material.

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Soil Investigations Scope

The scope of work covers all the work required for geotechnical investigations and preparation of a detailed report. The work shall include mobilization of necessary plant, providing necessary engineering supervisors and technical personnel, skilled and unskilled labor and others as required, to carry out field investigations and tests, laboratory tests and analysis and interpretation of data and results, preparation of a detailed soil report including recommendations and providing technical services as when called for by the Employer. The investigation method shall be as described herein or any other methods reviewed by Employer giving the same information as needed to ensure that soil parameters are sufficient for reliable fill and backfill compactions and for reliable foundation design. The location for geotechnical investigations shall be reviewed by the Employer. The Contractor shall submit the method statement for soil investigation fieldwork and laboratory testing methods for review and approval by the Employer.

Codes and Standards

All work shall be carried out strictly in accordance with the Technical Specifications unless otherwise reviewed by the Employer in writing. Where not specified, the latest edition of one or more of the following codes of practice or any other applicable code shall be followed.

Table 0.11 Soil Investigation - Applicable Codes and Standards

Standard Title

BS 1377 Methods of Test for Soils for Civil Engineering Purposes

BS 1924 Methods of Test for Stabilized Soils

BS 5930 Code of Practice for Site Investigations

BS 6031 Code of Practice for Earthworks

BS 2004 Code of Practice for Foundations

Codes equivalent to these in American/DIN Standards may also be used.

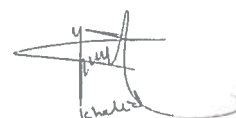
Calibration of Plant

The Contractor shall ensure that all the plant/instruments are properly calibrated and reviewed laboratory test certificates shall be submitted to the Employer. If the Employer desires to witness such laboratory plant/instruments' certifications and certification tests, the Contractor shall arrange for the same at his own cost.

Soil Investigation Work

It is essential that personnel on this work of geotechnical investigation and laboratory testing should have the appropriate experience. The entire procedure of geotechnical investigations shall be supervised by a suitably qualified and experienced engineer or engineering geologist. All the specified locations for boreholes and field tests shall be set out at site by the Contractor. The Contractor shall perform the minimum following activities during the field investigation work:

Method of Boring and Sampling



The Contractor shall submit a written plan for the following borings and samplings for review by the Employer. In soil strata, boring may be carried out by auger or percussion tools or hydraulic press or by methods reviewed by the Employer or Engineer. The diameter of the boreholes, unless stated otherwise, shall be such as to permit collection of undisturbed samples in the range of 50-110mm diameter. Where necessary, boreholes shall be cased, and whenever a borehole is cased, the bottom of the casing shall always be maintained within 150mm of the bottom of the borehole. The casing shall never be in advance of the bottom of borehole during undisturbed sampling or standard penetration tests. All the boreholes shall be sunk to a depth of at least 10m below the anticipated finished grade level (FGL) at test location. For locations on leaning ground, the borehole needs to be drilled on the downhill (lowest elevation) side of the footprint. The general sequence of sampling adopted shall be such as to obtain disturbed samples, as collected by the standard split spoon sampler, shall be collected initially at 0.5 meter below planned FGL, at every 3m interval thereafter and at any significant change of soil stratum. Alternatively, undisturbed samples shall be collected at 2 meters below planned FGL, at every 3 m intervals thereafter and at every significant change of stratum. Standard penetration tests shall be carried out at 1-meter intervals and at every noticeable change of soil formation and as per the BS or ANSI Standard. The tests shall be done continuously to 10-meter depth minimum. The standard penetration test shall be stopped when the total blow count, including seating drive, reaches 120, and the corresponding penetration shall be noted. At least one 10-meter deep borehole shall be taken within the footprint of each edge of the building (that is, within the area bounded by the four corners of the building). If rock is hit before reaching the 10 meters' depth, the Contractor shall drill another bore hole within the project footprint, but at a unique location (not adjacent to the earlier bore hole), to confirm that a subsurface high level rock condition exists. Once this rock condition of two boreholes of less than 10-meter depth is confirmed, the Contractor shall "rock bore" an additional 2-meters depth to confirm that the rock condition is continuous within the foundation influence zone. Even if groundwater is hit, the soil boring shall continue to at least the 10m depth below FGL. When groundwater is encountered, the Contractor shall take about one-liter water sample from the borehole and store in an airtight bottle. Water samples shall be tested as soon as possible after collection. The boreholes are not to be left open, but always protected against pedestrian and livestock harm. Once the sample gathering of the borehole is complete, each and every borehole shall be backfilled with ready-mix concrete to FGL. Boreholes that might coincide with one of the column foundations shall be concrete backfilled to the bottom side of the column foundation. The Contractor shall assign a reference number with appropriate labeling to each soil and water sample taken from the borehole as per order of depth and samples shall be transported safely as soon as possible. The specific observations to be made during boring are the sequence and thickness of different strata, ground water table, loss or make of drilling fluid, presence of lime, mica etc. and completion of field logs. The Contractor shall submit a written report for the above borings and samplings for review by the Employer. The Contractor's analysis from the borings are to be take in consideration to the design of the foundations.

Laboratory Tests

Laboratory tests shall be performed by qualified and experience personnel. The testing laboratory shall be reviewed before commencement of the testing works by the Engineer. The test report recommendations shall include but not be limited to the following:

- A brief geological description including faults, folds, etc. on the basis of published literature
- Seismic history including a brief description of previous earthquakes, giving time, period, magnitude, ground acceleration, epicenter, damage done
- Recommended type of foundation and safe/allowable bearing capacities
- Recommended type and size of fill and backfill compaction equipment to be used, plus field procedure of duration of and number of compacting passes.



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- Possibility and extent of scour in river beds.
- Recommendation of class of concrete to be used for foundation and vis-a-vis deleterious effect of ground water/soil chemicals concrete steel.
- Recommendation of type of cement to use.
- Earth pressure coefficient that may be adopted.
- Any other relevant information and data.
- Technical services as and when requested by the Employer

All costs related to the soil investigations will be paid at the unit price bid. Therefore, in the price schedule, the unit price shall include full compensation for all costs incurred in furnishing all materials, labor, plant, technical services, testing, reporting.

Excavation and Backfilling

Except when stated below, building shall be placed on undisturbed soil. Excavations shall be kept dry during installation of foundations. Whenever necessary or as required by the Employer, the Contractor shall re-excavate loose materials that have accumulated in previously prepared pits. No additional payment will be made for blasting, sheet piling or water pumping. Excavated soil may be used as backfill if it is suitable for compacting. Rock and soil not suitable for compacting shall at the Contractor's own cost, be removed and replaced with a suitable backfill material, to the satisfaction of the Employer. All filling material shall be free from cinders, ashes, refuse, vegetation or organic material, boulders and other material, which in the opinion of the Employer is unsuitable. Backfill shall be placed in layers of approximately 200mm thickness until 95% FDT result and certificates of works shall be prepared. Each layer shall be carefully compacted by means of suitable pneumatic or equivalent tampers. Backfilling shall be carried out to a minimum height of 200 mm over the original ground surface to compensate for the future settlement of the filling. All backfilling of foundations shall be protected from being washed away by surface water; the manner of backfilling is to be reviewed by the Employer. At all project positions, the surface of the ground shall be sloping from the foundations to provide drainage as required. No additional payment will be made for such work.

At certain places, additional protection against erosion may be required such as installation of riprap or ditches. Any such work, when decided in agreement with and authorized by the Employer will be paid for based on prices in the schedule of rates and prices in the contract.


Backfilling

Refilling of foundations shall be carried out only after all works within the excavations have been inspected and reviewed by the Employer. Unless otherwise directed, all filling shall be reviewed selected material, and shall be deposited and compacted in layers not exceeding 150mm thick for hand compaction and 200mm for mechanical compaction, loose depth. During the placing of backfill material, the hole shall be kept free from water. All temporary timbering and all decomposable material shall be removed from the excavations prior to backfilling.

Settlement

The Contractor shall be responsible for making well all settlement of filling due to any cause whatever which may occur up to the completion of the maintenance period.

Surplus Material



All material surpluses to the requirement of fill and all debris and rubbish shall be removed and deposited as directed by the Employer.

Shoring Works

This covers the general requirements of timber or steel shoring for open excavation for structure foundations. Shoring may be required to keep the sides of the excavations vertical to ensure safety of staff, of adjoining structures, or to limit the slope of excavations, or due to space restrictions or for other reasons. The Contractor shall submit the design calculations, drawings and method statement for shoring works for review of Employer/Engineer. All costs related to shoring works shall be included in the unit bid price for the construction of foundation work.

Koba Drilling of one water well Depth of 40m, and surface metallic water tank:

Drilling of deep water well with Koba machine, diameter of 12-13 inches including relevant extra work in accordance with the drawing of the project which shall be attached with BoQ, the depth of deep water well shall be taken 40 m. Supply and installation of UPVC high standard pipe with diameter of 6" Class D (D5WS4) with all concerned requirement works, Kawsar company or similar quality of product, Supply and Installation of UPVC filter pipe with diameter of 6" Class D (D5WS4) with all requirements - Kawsar company or similar quality of product. Supply and Installment of nylon rope high quality for holding the raiser-main pipe 1 inch (8-10mm diameter).
Description: PP Monofilament, Hollow Braided, 4800 lbs. breaking strength, Material: Nylon.

Water well shall be chlorinated according to rural and rehabilitation department (RRD) manual and guideline.

The amount of chlorine 4mg per L or 4ppm in drinking water and shall be done periodically, when its necessary according to RRD recommendation and guideline in every 3 months chlorine will be added.

Pipe HDPE d=25 mm, 16Bar 100 % best quality High standard or equivalent including installation and transportation cost, for tube-well with all required tools (fitting) and installation.

Supply and installation of metallic water tank insulated with glass wool, blue dark painting both side, tank cleaning spill way, cup locker, steel 4mm, six 1 inch's individual taps on both side with the capacity of 10,000 litter and all requirements, for more details drawing shall be attached.

Submersible Pump: Supply and installation of stainless steel pump 3phase IP65 with 3KW, 2.9HP, 220-230 V, 1 inches outlet, TDH=130m, having a discharge capacity of 50 liter/min with minimum warranty of 1-2 years with European certificate and shall be approved by RRD.

Insulation Class: F, Speed: 2900rpm

OPERATING CONDITIONS: Pumped Liquid: Thin, clean, chemically non aggressive liquids with a maximum sand content of 100gm/m³, Max. Liquid Temperature: +35°C, Max. Immersion Depth: 85m, Min. Borehole Diameter: 200mm, Pedrollo water pump or similar standard products by reputable brand or manufactures which accepted by Afghanistan government MRRD.

Inverter 5.5kW, V3 Phase 220-230V, Good performance,

Specification:

1. Output: Power: 1.5kw

2. Rated: Current: 13A

2. Rated Frequency : 50hz/60hz

3. Output Frequency Range: 0~400Hz

4. Input Voltage Range: 3 phase 220V±15%

5. Output Voltage Range: 3 phase 230V±15%




6. Control way: Open loop vector control (SVC) V/F control

7. Starting Torque: G type machine: 0.5 Hz / 150% (SVC)

8. Main function: Control and adjust the speed of the ac motor

joint tech brand or similar

approved by MRRD.

discharge test will be conducted for demand of water, as well as determining water table reduction, hydraulic conductivity, transmissivity, storage coefficient of an aquifer, establishing the hydraulic behavior of the well and well cleaning by compressor machine. Test of quality of water for all important chemical, biological and physical parameters with the report of the result.

Brick Masonry Strength:

What is the brick's minimum compressive strength? The minimum compressive strength for first-class bricks is 10 N/mm². It may be expressed as 105 kg/cm².

Measuring compressive strength in brick construction

- Take five random brick samples and submerge them in room-temperature water for 24 hours.
- After 24 hours, remove them, allow the excess water to drain, and then rinse them.
- Next, fill their frogs (and any other voids) with regular 1:1 mortar (1 part cement with 1 part sand).
- 24 hours later, store these bricks beneath wet sacks (to allow the setting of mortar).
- For seven days, soak the bricks in water. (This is done so that the mortar can harden.)
- Remove the bricks from the water, let the excess water drain, and dispose of the remaining water. After surface drying, the compressive strength of each brick is independently evaluated.
- Place the brick between two sheets of plywood with the frog end pointing up.
- The brick is then placed on the bed of the compressive strength of bricks testing equipment, and axial force is applied at a rate of 140 kg/cm²/minute. (This is quite crucial.)
- Take note of the force at which the brick collapses (gets broken). The compressive strength of a brick is calculated by dividing this load (P) by its cross-sectional area (A) (Co).

$$Co = P/A$$

- The arithmetic mean of the compressive strength values of all five bricks should be considered (not for all the bricks of a kiln).
- Based on the above-obtained (Co), the classification of the brick shall be determined.

Compressive resistance of bricks

- First-class brick has a compressive strength of 105 kg/cm².
- The compressive strength of a second-rate brick is 70 kg/cm².
- Common building bricks have a compressive strength of 35 kg/cm²
- The compressive strength of sun-dried brick is between 15 and 25 kg/cm².

Test for water absorption



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- Dry these samples to a consistent weight at 110 °C +/- 5 °C in a ventilated oven. This could take up to 48 hours.

- The samples are then submerged in water at room temperature for twenty-four hours.
- After 24 hours, the samples are extracted. Within three minutes of being extracted from the water, each sample is dried and weighed independently.
- Absorption value is computed using a straightforward relationship.

Where w_1 is the dry weight and w_2 is the weight after 24 hours of immersion.

- The water absorption of the brick shall be determined by calculating the mean of five values from five samples.
- It must fall within limits defined for the classification of bricks.

- Select five bricks at random.
- Place each brick on its end in a shallow dish with a flat bottom and fill it with distilled water.

- Keep the aforementioned dishes (bricks in water) in a warm (18°C to 30°C), well-ventilated area.

- When the bricks appear to have dried, add a fresh supply of distilled water.
- At the conclusion of the second drying, each brick is inspected for efflorescence, which is the emergence of a white salt patch on its surface.

Serious

Heavy

Over fifty percent of the surface is covered by salt deposits. There is no inclination to powder.

Moderate

Salt deposits cover 10-50 percent surface area. The salt produces thin layers with no propensity to flake off or become powdery.



Slight

Less than 10 percent of the surface area is covered with a very thin, sticky film of salt.

Nil

Even after repeated wetting, there is no salt deposition observed.

Efflorescence in different types of bricks mustn't exceed the prescribed level.

For example, in heavy-duty bricks, it must be zero, yet in first-class bricks, it must be minimal.

Dimensions tolerance test

The test is performed to determine whether or not the bricks meet the required dimensions. It is finished in the following way:

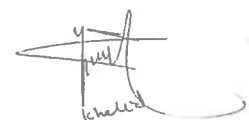
- Select twenty random bricks.
- Remove from the bricks any loose clay particles and protruding blisters, etc.
- Arrange the bricks in a straight line on a smooth, level surface so that the adjacent surfaces are in contact with each other.

The arrangement will be made in accordance with the measured dimensions of the bricks. Therefore, bricks will be put lengthwise for length.

- Bricks are put on their wide faces for width.
- Bricks are put on the side for height.
- In each instance, the overall length of the brick rows is subsequently measured. These must fall within the restrictions set for various types of bricks.

Brick Masonry Construction:

1. Bricks need to be wet adequately by immersing in water or by hosing with water for at least an hour prior to their installation so as to avoid absorbing moisture from the mortar.
2. The use of half or cut bricks should be avoided except for the purpose of bonding.
3. It is recommended to place bricks in English bond if the type of brick bond is not specified.
4. Work must be true to horizontal lines and perfect plumb.
5. Vertical joints are required to be truly vertical and align vertically with those of alternate courses.
6. Joint thickness should be within the range of 6mm to 10mm depending upon the size of bricks.
7. The total height of 9 cm brick with 5 courses and 5 mortar joints shall be 50 cm.
8. Horizontal joints on every floor should be at the same level so as to allow proper bonding at junctions.
9. It is advised to use non-shrinking mortar to avoid cracks in floors, columns, and soffit of beams.
10. Required datum levels must be established throughout the floor and only then the construction work may start.



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11. It is important to take into account levels of window sills, and lintels while finalizing courses and joint thickness.
12. For convenience and speed, gauge boards of exact width shall be fixed at the edges of masonry to correct line and plumb.
13. All iron fixtures, pipe outlets, hold-fasts for doors and windows shall be fixed when the brickwork is in progress.

Work Procedure

1. Mortar is spread on the top of the foundation course over an area to be covered by the edges of the wall.
2. The corner of the wall is constructed first.
3. The excess mortar from the sides would squeeze out which is cleaned off with a trowel.
4. The level and the alignments are checked and if a brick is not in level, it is pressed gently.
5. After having laid the first course at the corner, mortar is laid and spread over the first course and the end stretcher is laid first and hammered it on the laid mortar.
6. Perpendics must be kept vertical. This should be checked, as the work proceeds with the help of straight edge and square.
7. After having constructed the wall, jointing and pointing is done.
8. Finally, proper curing regime needs to be practiced to make sure that the mortar gains the designated strength.

Plastering Work:

Plaster work is an essential and important work in construction project and needs special consideration to cover minimize the completion period for painting work, so it should be;

1. Smooth surface finished
2. Uniform surface.
3. Not thicker than maximum 2.5 cm.
4. Well cured
5. Cement mortar ratio of 1:4.
6. Mark 400 kg/sqr.cm
7. No hair cracks.
8. Zero defects observed.

Internal Painting:

Internal painting should be best quality 75% plastic paint prior approved by engineer with below specs:

1. Smooth surface. (old paint should be removed by polishing and after becoming the surface smooth new paint will be applied)
2. Uniform surface.
3. One coat primary coat.
4. Three coats paint.
5. No hair cracks
6. Applied by dry plaster.
7. No color changes during defect liability period.



Charal

8. Qualified labors.

Exterior Painting:

exterior painting should be also best quality 100% plastic paint prior approved by engineer with below specs:

1. Smooth surface finishes.
2. Uniform surface.
3. One coat primary coat.
4. Three coats paint.
5. No hair cracks
6. Applied by dry plaster.
7. No color changes during defect liability period.
8. Qualified labors.

Construction Stone:

The minimum value of crushing strength of stone should not be less than 20 N/mm².

Crushing Test:

- To find the compressive strength to Stone.
- It be tested by the universal testing machine.
- Size of sample 40x40x40mm
- The specimen should be placed in water for 72 hours before testing.
- It is defined as the load per unit area at which a stone starts cracking.
- The minimum value of crushing strength to stone should not be less than 100 N/mm².

Important Points:

- An attrition test is used to find the rate of wear of stone.
- The hardness test is used to find the hardness of stone means no mark of scratching on the stone.
- An impact test is used to find toughness index of stone.
- The specific gravity of stones is 2.4 -2.8.

• Graduation Requirement for Stones

Nominal Thickness (mm)	Approximate Given Size		Equivalent Cubic Dimension (mm)	Total Size Smaller than Given Size (%)
	Weight (kg)	Volume (cu.m.)		
150	15	.006	175	100
	10	.004	150	80
	5	.002	125	50
	0.5	.0003	50	10*
	45	.018	250	100



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Nominal Thickness (mm)	Approximate Given Size		Equivalent Cubic Dimension (mm)	Total Size Smaller than Given Size (%)
	Weight (kg)	Volume (cu.m.)		
250	27	.011	225	80
	11	.005	165	50
	2	.0003	75	10*

Carpentry Work

Carpentry work specified to be from Russian Khar wood prior approved by engineer with qualified and experienced skilled labors, any defective piece of the wood observed by engineer shall be reject and replaced by other, any completed defective work having mentioned defect will not be proceeding for payment until completed correction action acceptance by engineer. The wood shall be first category in the market in terms of not having scratches, defects, longitudinal cores and defected by insects. If such items observed contractor is responsible to replace with zero defective items.

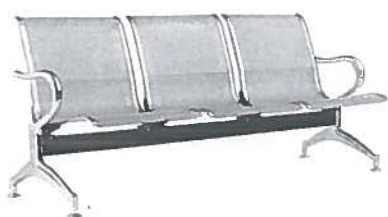
PVC Work

All PVC items and works shall be in accordance with ISO standards and prior approved quality test and spec by engineer,

Furniture:

all furniture should be submitted for prior approval and below are some hint for the technical understanding from the concept of the items.

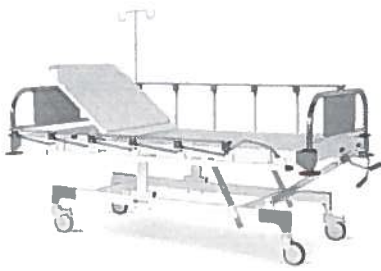
Waiting Hall Family Room, Boss Room, Chairs Based on Submittal: Delivery Desk based on submittal



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Recovery Bed based on submittal

Chairs for Patient Visit based on submittal



Doctor's Chairs



Special Clause of The Technical Specifications

Items' type, specifications and origin not mentioned in the BoQ, Drawings and technical specification, will be referred to the best quality available in the market after written review of the Engineer and his approval, the term applies for all items with no origin and no source.

Terms of Payment

Terms of Payment

The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in the Terms and Procedures of Payment hereto.

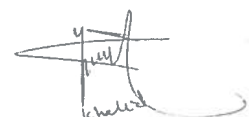
Terms and Procedures of Payment

All approved payments exclusive of the Mobilization Payment shall be made within sixty (60) days of receipt of invoice.

Plant, Working Space and Comp

50% amount payment will be made to contractor upon installation of working space, plant and comp after written approval from the engineer site in charge or as evidenced by delivery documents and 50% will be paid after demobilization verified by Engineer.

Construction, Installation, Testing and Commissioning, and Other Charges

Ninety percent (90%) of the measured value of work performed by the Contractor, as identified in the Program of Performance, during the preceding month, as evidenced by the Employer's authorization of the Contractor's application, will be made monthly upon successful tests (FDT, 28-Days Cube Crushing Test, Water Test, and Quality Tests) verification stated in the contract. said

Five percent (10%) of the total or pro rata value of installation services performed by the Contractor as evidenced by the Employer's authorization of the Contractor's monthly applications, upon completion of the Defects Liability Period without defect(s) in accordance with terms of contract.

Payment Procedures

The procedures to be followed in applying for certification and making payments shall be as follows and may be changed as agreed by and between the parties during contract negotiations. The Contractor is entitled to submit monthly Progress Payment Invoices to the Project Manager for approval and process.

Definitions:

In these Specifications and Scope of Works, the following words and expressions shall have the meanings hereby assigned to them.

"Technical Partner" means PACO (People's Action for Changes Organization).

Engineer: Means Technical Partner

Abbreviations

Wherever the following abbreviations are used in the Specifications or on the Drawings, they shall be taken to be the same as the respective expanded expressions.

Abbreviations	Expansion
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASA	American Standard Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Material
AWS	American Welding Society
BSI	British Standards Institute
ICAO	International Civil Aviation Organization
BSICP	British Standard Institute Code of Practice
FAA	Federal Aviation Administration
PCA	Portland Cement Association
UBC	Uniform Building Code