1. **Introduction**

This document is intended to outline the nature, description and methodology of the works related to the rehabilitation of households in different locations across Benghazi, Libya. This document should be read in conjunction with the Bill of Quantity (BoQ) for the above-mentioned works.

The document will also provide technical specifications and identify adequate methodologies for implementation works.

1. **Project Description**

The project aims to maintain and rehabilitate housing units in Benghazi, Libya. The houses are currently occupied; the Contractor is expected to perform all needed works while the houses are occupied.

The contractor shall make sure that all safety and security measures for the well-being of the occupants throughout the implementation period are in place as well as following all health measures and WHO instructions due to coronavirus pandemic in all stages of work and during any interactions with occupants. The Contractor shall comply with all relevant public health and safety laws, regulations and instructions.

This project includes around 70 items divides under 11 activities as stated in the Bill of Quantities, which includes but not limited to the following:

1. Worksite Preparation and cleaning.
2. Non-Structural / Civil Work.
3. Structural Works / Civil Work
4. Finishing Works
5. Insulation Works
6. Fixing Existing Doors and Windows
7. Doors and Windows
8. Marble Works
9. Plumping Works and sanitary works
10. Tiling works
11. Electrical works
12. Other Works - PWD
13. **Site access and safety**
* The Norwegian Refugee Council in Libya (NRC) is implementing a project aimed at rehabilitating and upgrading substandard and damaged houses occupied or owned by vulnerable families, in several locations across Benghazi, Libya.
* Contractor’s access to the work locations shall be coordinated with each family residing in the houses/shelters, all communications with the families should be done through or shared with NRC’s Engineers. During the implementation of the works, the Contractor will be responsible for notifying the families on the starting time of works on daily basis.
* The contractor will be fully responsible for the storage of any construction materials, equipment or machinery during the implementation works.
* The contractor shall place and store construction materials, equipment and machinery in a way that do not pose any risks to the residents of the houses. The contractor is responsible for the safeguarding of all works throughout the implementation period. The contractor certifies that NRC is not responsible or liable for any damage, theft, loss and/or vandalism of any of the contractor’s tools, equipment, materials, supplies and/or work in progress.
* The contractor is fully responsible on any damaged that might cause due of the implementation activities, and full responsible on fixing the damage.
* The contractor is responsible for protecting his personnel from any hazards and ensuring the safety and well-being of his staff and personnel during the implementation of the works.
* The contractor is responsible of ensuring that his staff, personnel, subcontractors, agents and representatives are fully complying with all local public health and safety laws and regulations and any instructions or guidance issued by the relevant authorities.
* The contractor shall make sure that all safety and security measures for the well-being of the occupants throughout the implementation period are in place as well as following all health measures and WHO instructions due to coronavirus pandemic in all stages of work and during any interactions with occupants. The Contractor shall comply with all relevant public health and safety laws, regulations and instructions.
1. **Quality/Safety Control**
2. The contractor remains responsible for ensuring that all works, and procedures followed for the completion of works are fully compliant with the relevant local laws, regulations, codes and the industry’s best practices.
3. In case of any discrepancies between the specifications outlined here and the BOQ or any of the relevant building regulations, codes and or laws, the contractor shall inform NRC prior to the commencement of any works.
4. For all materials that will be used for the completion of works mentioned in this document or stated in the Annex-a (Bill of Quantity / Items Specification and samples), the contractor at its own cost, should submit samples to the site for NRC to inspect as a part of the technical evaluation.
5. The contractor remains responsible for ensuring that all materials supplied in bulk or used for the completion of works match the approved samples that submitted and approved during the tendering package and reflected in the annex-a (Bill of Quantity Items Specification and samples), any deviation or substitution is only accepted if approved in writing by NRC.
6. The contractor shall give a three-day notice to NRC, whenever any works or parts of works are ready for inspection and before such works are covered up or put out of sight. The contractor shall only proceed with the next step of works once the works are inspected and approved by NRC. If the contractor fails to give the notice in sufficient time, the contractor shall remove or uncover such portions of the works as may be directed. After examination, the contractor shall restore said portions of the works to the standard required by the specifications, all at the contractor’s cost.
7. If an activity- as a result of an examination, inspection, measurement or testing of the materials, design or workmanship- is found to be defective or otherwise not in accordance with the Bill of Quantity or the technical details specified in approved samples document, NRC may reject the materials, design or workmanship of the activity by giving notice to the contractor, with reasons. The contractor shall (at its cost) then promptly restore the said portions of the works to the standards required by the specifications and make good the defect and ensure that the rejected item complies with the Bill of Quantity, technical specifications mentioned in this document and NRC’s instructions.
8. The contractor shall submit a notice request to NRC, to perform a final inspection of works and issue a taking over certificate as soon as the works, in the contractor’s opinion, are completed and ready to be taken over.
9. An inspection will be carried out by NRC as requested by the contractor. Following the inspection, NRC will issue a taking over certificate to the contractor if the works were found to be completed in a satisfactory manner or, will issue a rejection notice outlining the works and actions required by the contractor to remedy all defects and complete any outstanding works.
10. Notwithstanding any approvals of samples, works or issuance of any taking over or completion certificate, the contractor is fully responsible to ensure that all works performed comply with national building codes and regulations and any relevant laws or guidelines issues by the relevant authorities.
11. During the implementation of works and following the completion of works, the contractor is responsible for transporting any construction debris out of the work site to a dumping site assigned and approved by local authorities.
12. **Scope of work**

The work should be implemented by the Contractor under the supervision of Norwegian Refugee council and according to Bill of quantities and this document, the Scope of works. NRC reserves the right to provide further clarifications/drawings, instructions or variations during the implementation of the works.

The technical specifications and details listed in this document and in the Bill of Quantities do not relieve the contractor from its obligations to ensure that all works comply with national building codes and regulations and any relevant laws or guidelines issues by the relevant authorities and with the industry’s best practices.

The Work shall include, but shall not be limited to the following (not necessarily in the order indicated):

1. **Worksite Preparation and Cleaning:**

**Worksite Preparation and Cleaning:**

* The work includes removal of block walls or parts of the existing walls to allow for the installation of doors and windows, demolition works also include the removal of any items that will be replaced as parts of the works.
* All demolition works shall be done in a way that does not cause any damage to the remaining walls or structures. The work includes leveling, finishing, plastering and filling any gaps resulting from the demolition and creation of openings in any walls or blocks. The Contractor is responsible for remedying any defects resulting from any demolishing works.
* Any construction or demolition debris, or any unwanted items on site that resulted from the works performed by the Contractor shall be removed by the Contractor and disposed in a dumping site assigned and approved by local authorities.

1. **Non-Structural / Civil Work:**

- The work includes demolition and removing and new installation of the CGI sheet 6\*1 meter with 3mm thickness for new roofing activity. As well as providing, the steel supporting beams 60\*60\*3mm size.

- The contractor shall apply an overlap between two CGI sheets 20 cm as a minimum overlap, as well as using the special bolts to fixing the sheet to the steel bars, and make sure that the maximum distance between two bolts is 50 cm.



*Figure 1 – Types of CGI roofing screws*

1. **Structural Work / Civil Work:**

**Block works:**

* The work includes repairing, filling the gaps and/ or re-construction of damaged and cracked walls inside houses.
* The Contractor Should Supply and fix hollow concrete blocks (40\*20\*20cm), with normal density and normalized average compressive strength of 35 kg/cm², bedded, jointed, and pointed in cement /sand mortar (1:3) including reinforced concrete lintels over openings, tied to steel or concrete columns and beams with steel anchors as per specification and NRC Engineer's instructions and approval.
* The block shall be sprayed with water for at least 15 days. It shall not be used in construction before twenty days and shall be sprayed with water for a period of not less than a week after the construction. The Contractor shall clean the site after the completion of work, the price includes all materials, labor costs, machinery, fuel, shovels, molds, guard and other equipment necessary for the completion of works.

 **Foundation works:**

* The Contractor shall cast in place reinforced concrete for isolated footing, concrete compressive strength should be fcu=25 N/mm² after 28 days. Dimensions of the isolated footings are 100cm width and 100cm length with 40cm depth.
* Steel bars for isolated footings should be 5 ᴓ14mm/m in both directions. Steel reinforcement must be high tensile deformed grade 60 according to ASTM 615A, yield stress 420 N/mm². Reinforcement details are shown in figure 2 below.
* Concrete vibrator, trowels and finishers tools should be used to achieve the required surface smoothness. Work includes formwork as well as concrete curing using fresh water for 7 days.
* All sub-structure concrete foundations, ground beams and walls (all concrete elements adjacent to soil) should be coated with two layers of emulsified asphalt or - Coal Tar if the emulsified asphalt is not available- to be used as water proofing layer applied in two directions, in addition to covering the bases of the foundations with polyethylene sheets 150 micron. Price also includes all tools, manpower and materials or any necessary requirements to complete the work as per NRC Engineer’s instructions and approval.

Referral to Drawing 4 for more details.

**Ground Beam (Tie Beam) Work:**

* The Contractor shall cast in place reinforced concrete for Ground Beams, concrete compressive strength should be fcu=25 N/mm² after 28 days. Dimensions of the Ground Beams are 20cm width and 40cm depth.
* Steel bars for GBs should be 2 ᴓ14mm/m in both directions with ᴓ8mm Stirrups each 20cm for spacing. Steel reinforcement must be high tensile deformed grade 60 according to ASTM 615A, yield stress 420 N/mm². Reinforcement details are shown in figure 3 below.
* Concrete vibrator, trowels and finishers tools should be used to achieve the required surface smoothness. Work includes formwork as well as concrete curing using fresh water for 7 days.
* All sub-structure concrete Ground Beams should be coated with two layers of emulsified asphalt or - Coal Tar if the emulsified asphalt is not available- to be used as water proofing layer applied in two directions, in addition to covering the bases of the GBs with polyethylene sheets 150 micron. Price also includes all tools, manpower and materials or any necessary requirements to complete the work as per NRC Engineer’s instructions and approval.
* Refer to Drawing 4 for more details.

**Columns Work:**

* The Contractor shall cast in place reinforced concrete for columns, concrete compressive strength should be fcu=25 N/mm² after 28 days. Dimensions of the columns are 20cm width, 40cm length and 3m height.
* Steel bars for columns should be 6 ᴓ14mm/m with ᴓ 8mm Stirrups each 15 cm for spacing. Steel reinforcement must be high tensile deformed grade 60 according to ASTM 615A, yield stress 420 N/mm². Reinforcement details are shown in figure 4 below.
* Concrete vibrator, trowels and finishers tools should be used to achieve the required surface smoothness. Work includes formwork as well as concrete curing using fresh water for 7 days.
* All sub-structure concrete columns should be coated with two layers of emulsified asphalt or - Coal Tar if the emulsified asphalt is not available- to be used as water proofing layer applied in two directions. Price also includes all tools, manpower and materials or any necessary requirements to complete the work as per NRC Engineer’s instructions and approval.
* Refer to Drawing 4 for more details.

**Two Way Slab Work:**

* The Contractor shall cast in place reinforced concrete for two-way slab, concrete compressive strength should be fcu=25 N/mm² after 28 days. Dimensions of the two-way slab should be compatible with the dimensions of the existing slabs.
* Steel bars for two-way slab should be 5 ᴓ12mm/m in both top and bottom. Steel reinforcement must be high tensile deformed grade 60 according to ASTM 615A, yield stress 420 N/mm². Reinforcement details are shown in figure 5 below.
* Concrete vibrator, trowels and finishers tools should be used to achieve the required surface smoothness. Work includes formwork for the slab
* The Contractor should provide all necessary materials, tools, equipment and manpower to complete the work according to NRC Engineer's instructions and approval.
* Refer to drawing 5 for more details.
1. **Finishing Works:**

**Cement plastering:**

* The Contractor should supply and make plaster of cement and sand (1:3) with two layers for internal walls and ceilings, taking into consideration the verticality and alignment of the surfaces according to the technical specifications and best practices, work includes joints between columns and walls, all tools, manpower and materials or any necessary requirements to complete the work as per NRC Engineer’s instructions and approval.
* Work includes fixing angle beads for external and internal angles also to use corner mesh for internal angles, galvanized 150mm Strip Mesh to be fixed on all utilities and joints between columns and walls, lintels, with needed approved additives, work also includes control joints and plaster stops.
* Metal lath should be fixed between blocks and all reinforced concrete elements such as columns and walls to avoid formation of cracks during temperature variation due to difference in thermal expansion of these materials.
* The Contractor shall inform NRC Engineer to inspect the plastering works as it progresses and should allow for the inspection of the works at the completion of each layer and before the final layer/coat is applied.

**Painting Activities:**

* This item about the painting work that might be needed during the rehabilitation activities, and that will be divided under two different items:
1. For the new wall (plastered walls), the contractor shall Supply and apply Internal painting, with two layers of foundation mortar and let the time between them at least 3 hrs. Then it should be adjusted by sand paper. After that, apply two layers of painting GLC brand or equivalent (Semi-gloss)
2. For the painted wall (just need to be re-painted), the contractor shall supply and apply Internal painting, by apply two layers of painting GLC brand or equivalent (Semi-gloss)
3. **Insulation Works:**

**Bitumen roles:**

1. The Contractor shall clean the existing roof surface and remove debris and any unwanted materials. All removed materials shall be transported outside the site by the contractor and disposed to a dumping site approved by local authorities.
2. The contractor shall remove all the sharp edges, remove all rusted layers and make sure the roof is ready, inspected and approved by NRC Engineer as a preparation for insulation.
3. The contractor shall fill the peeled and rusted areas and bullet holes on the roof by applying an insulation polyurethane foam and adjust the foam levels to be at the same level of the roof and wait until being ready to install Bitumen layers on top of it.
4. The Contractor shall supply & fix one layer of bituminous 4mm waterproofing membrane strengthened with aggregate hot torch applied with special bitumen primer coats, overlapping 10 cm and per manufacturer’s instruction, to horizontal surfaces & to vertical surfaces, including the same to the corners, pipe penetration, all according to NRC Engineer's instructions and approval and as per the specifications shown in figure 6 below.
5. The Contractor must provide all necessary materials, tools, equipment and manpower to complete the work as required according to NRC Engineer’s instructions and approval.



Figure 6 - Technical specifications of Bitumen Membrane

**Water proofing System:**

* The contractor shall clean and remove any debris on the surface that should be insulated.
* The contractor shall fill any cracks, gaps, holes, or any open joint by cement mortar epoxy.
* Once all is done, the contractor shall apply two layers of water proofing system with high quality, and should make sure the first layer is dry then apply the second layer.

**Light concrete (Foam concrete) layer System:**

* The work stating by cleaning all the roof form any garbage, and ensure no plumbing system, electric wires and any other objective is exposed to the concrete.
* Apply strings for the entire roof to determine the slope is available before start pouring the light concrete on the roof.
* Apply the light concrete system with respect of the slope.
* Once is completed finishing the surface by Helicopter tool,
* Apply a water on the roof and close all the drainage, for 24hrs, to insure no water is running out of the layer.
* The contractor shall provide all the tools, equipment’s, materials and labor to complete the work as required.
1. **Fixing existing doors and windows:**
* Maintenance of existing doors and windows includes the maintenance of wooden, steel or aluminum/PVC windows as specified in the Bill of Quantities. The works include but are not limited to filling in any holes or gaps in the doors or windows or the frame, changing the necessary accessories such as hinges, locks, handles, and painting of the window/door together with the frame. The works also include adjustment/calibration of windows and doors.
* The works also include supplying and installing glass of 4mm thickness to replace the broken glass. The works include removal of existing doors and windows and disposal in a dumping site assigned and approved by local authorities.
1. **Doors and Windows:**

**Wooden Doors:**

* The Contractor shall supply and install single or double leaf 4.5cm thick hollow core wooden doors, with 4.5mm thick veneer on both sides and an 8 cm hard wood frame. The width of the door will be based on the width of the opening and will be specified by NRC Engineers for each housing/shelter unit. The unit area/ measurement for wooden doors should be in square meters. Works include all hardware and accessories including cylinder, locks, handles, and fittings necessary for the completion of works. The door should be fixed on the frame with no less than 3 hinges for single leaf and 6 hinges for double leaf doors.
* Works include treatment and oil painting of wooden doors and frames with one prime coat and two putty coats, one under coat, two coats of oil paint and one coat of varnish. .
* Refer to Drawing 2 for more details.

**Metal Doors:**

* The Contractor shall supply and install 3mm steel sheet fixed on L-Shaped 3\*3cm frame with thickness of 3mm. Works include all hardware and accessories including cylinder, locks, handles, and fittings necessary for the completion of works. The door should be fixed on the frame with no less than three hinges for single leaf and 6 hinges for double leaf doors.
* Works include painting with anti-corrosion prime coat and two coats of oil painting, works also include dismantling and removal of existing doors as instructed by NRC Engineer.
* The dimensions of the door will be based on the dimensions of the opening and will be specified by NRC Engineers, the dimensions of metal doors might vary from one housing unit to another.
* All steel sheets and pieces must have smooth regular surfaces and free from defects, granules, cracks and air spaces. All welding works shall be carried only by highly skilled workers and technicians. The necessary precautions shall be taken during work from all damages resulting from the welding process.
* The contract shall remedy, smoothen the surface and paint any parts that are damaged or scratched during the installation process.
* All hardware and accessoriness should be homogeneous and compatible with the color of the metal sheets and frames installed.
* The steel frame and sheets must be fully painted before installation with a protective paint against rust (Zircon). All steel doors and windows and or sheets shall be painted with anti-corrosion prime coat and two coats of oil painting with colors specified by NRC Engineer.
* Following the installation, the contractor shall calibrate all doors and windows installed to guarantee smooth opening without any resistance or noise.
* Refer to drawing 2 for more details.

**PVC doors and windows:**

* The Contractor shall supply and install PVC doors, windows and frames made from high quality, size of the PVC frame depends on the size of the openings and will be specified by NRC Engineer.
* The works include the installation of the frame, the sub-frame, ironmongery, accessories, caskets, hinges, locks and all necessary hardware for the installation of the windows or doors. All aluminum frames and parts shall be powder coated no less than 50 microns. The works include glazing using 6mm thick clear and transparent glass.
* Refer to drawings 1 and 3 for more details.
1. **Marble works:**
* The Contractor shall supply and install good quality marble (with no defects) for windows/ door sills/ jambs/ lintels/ and replace the damaged marble with new marble of the same color and fixtures of the existing marble.
1. **Plumping Works:**
* The contractor is responsible to provide all technicians, labors, equipment, supplies and materials to install all sanitary, mechanical and plumbing works as stated in the Bill of Quantity and as per NRC Engineers instructions on site. All works shall comply with the relevant building codes and relevant laws and regulations.
* All plumbing and mechanical works shall include installation costs and other works such as drilling holes or making trenches for pipes or cutting tile for sanitary fixtures.... etc.
* Pipes and fittings shall be cleaned before installation to remove all burrs, furs, sand, slag etc., all pipes and fittings that will be used for the completion of works shall be new, unused and completely free from any damage.
* When installing plastic pipes, the Contractor shall provide expansion joints in plastic pipes by means of loops or other methods in accordance with the manufacturer's recommendation and in line with NRC Engineer’s instructions and recommendations.
* Jointing rings, couplings and adaptors shall be from types recommended by the manufacturer of the pipes being jointed, or from the same type of the pipes, and shall be compatible with the type and nature of pipes used.
* Cut ends of pipes and gutters shall be clean, square and chamfered internally or externally if required using appropriate tools.
* All underground pipework shall be pressure tested, underground pipework shall be protected against corrosion and mechanical damage. All works should be completed with all necessary valves, fittings, blind caps and all accessories. Work also includes excavation, drilling, reinstatement, bidding and backfilling if required, all according to NRC Engineer’s instructions and approval.
* The Contractor’s total price for sanitary and plumbing works as per BOQ shall include the supply, execution, completion, and testing of all fixtures and related system, as per NRC Engineer’s instructions, recommendations and approval.
* Works may include installation of:
1. Kitchen sink with accessories of high quality and certified brand, sink shall be supported on brackets, each sink shall be provided with 40 mm Chrome Plated waste coupling.
2. Wash basin for bathroom of high quality and certified brand, and all accessories are included.
3. HDPE water tanks of a capacity of 1,000 or 2000 liters. The work shall include all required fittings such as Tees, bends, including inlet & outlet connections and all necessary fittings and accessories.
4. Single faucet of good quality.
5. Water mixer for wash basin and shower of good quality.
6. Squat Toilet of good quality.
7. Toilet seat of good quality.
8. Piping PPR 20 mm for the existed network. The work shall include all required fittings such as Tees, bends, and all related work and accessories.
9. PVC pipes 4 inches for sanitary works for each toilet and connecting the pipes to septic tank. The price includes the needed piping works and connections to complete and finish the works.
10. Water heater 50 liters of good quality. The work shall include all required fittings such as Tees, bends, and all related work and accessories.
11. Bidet taps of good quality.
12. Water pump with one 1 HP- automatic of good quality, the work shall include all required fittings such as Tees, bends, and all related work and accessories.
13. Wash basins shall be white color and made of porcelain of good quality, with size and dimensions as specified by NRC Engineer’s instructions and as per the Bill of Quantity. Under cut Oval/circular wash basins shall be supported by a pair of CI brackets.
14. Supply and install of Bathtub one foot for a shower, dimensions 120 \* 80 \* 17H cm,
* The Contractor shall submit samples for all the above-mentioned items and seek NRC approval prior to the installation of any items; the Contractor is obliged to remove any items that is fixed without NRC approval.
1. **Tiling works:**
* The Contractor shall supply and install ceramic tiles for floors and walls to replace the damaged and broken tiles, first class heavy duty, and non-slip, homogeneous texture, water resistant and free from defects.
* For floors, work includes laid on sand bed and cement screed 50 mm with proper leveling and cement mortar and grouting.
* For walls, work includes fixing with cement mortar with no less than 2.5 cm, proper leveling and cement mortar and grouting.
* The new tiles should be similar and matching the existing tiles in fixtures and color.
1. **Electrical works:**
* The contractor is responsible to provide all technicians, labors, equipment, supplies and materials to install all electrical fixtures, connections or any of the electrical works specified in the BoQ as per NRC Engineer’s instructions on site. All works shall comply with the relevant building codes and relevant laws, regulations and best practices.
* All supplied materials should be good quality and approved by NRC Engineer.
* The wirings paths will be in straight lines (vertical and horizontal) and will be specified by NRC Engineers, and the wires should be fixed properly on the walls using nails at least each 30 cm.
* The Contractor shall supply, install and test materials & works for the electrical items described in Bill of Quantities.
1. **Other Items - PWD:**
* Cast and prepare a special ramp for the main entrance. With a slope not exceeding 1:12% and a width of not less than 1.20 meters, and providing all the necessary materials, workers, and others to complete the work as required.
* Supply and install an auxiliary single armrest next to the toilet, with specifications and manufacture, and conforming to international specifications. And the item includes all the necessary tools, materials, and others to complete the work as required.
* Supply and install an auxiliary due armrest next to the toilet, with specifications and manufacture, and conforming to international specifications. And the item includes all the necessary tools, materials, and others to complete the work as required.
* Supply and install an auxiliary support for the bathtub, with specifications and manufacture, and conforming to international specifications. And the item includes all the necessary tools, materials, and others to complete the work as required.
* Supply and install of stainless steel handrails with a good quality and manufacture. It includes providing everything necessary to complete the work as required.
1. **Reporting:**
* Weekly progress reports shall be prepared by the Contractor and submitted to NRC Engineer in two copies and in a form to be approved by NRC Representative.
* Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking over Certificate for the Works.
* Each report shall include:
1. Detailed descriptions of work progress, Contractor's Documents and testing.
2. Details of Contractor's Personnel and Equipment.
3. Copies of quality control documents, test results and certificates of Materials.
4. List of Variations, Claim Notices and other notices that might be requested from the Contractor.
5. Safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations.
6. Details and duration of adverse weather conditions.
7. A revised working program and comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract and the Contract Program, and the measures being (or to be) adopted to overcome or mitigate any delays.