**ANNEX D: Technical Specification for Light Rehabilitation of Eng. Shir Mohammad High School**

#### **1. General**

This specification defines the requirements for rehabilitating the Eng. Shir Mohammad High School, covering activities such as Removal of soil from the roof, PCC concrete work on the roof, Installation of 4 mm Iranian Isogam on the roof, Brickwork for the parapet wall on the roof, Two-side plaster work for the parapet wall and repair of damaged plaster, Replacement of precast RCC concrete slabs in rooms, Preparation and installation of wooden frames for doors, Window and door carpentry works, Two-coat painting of blackboards, Installation of wooden planks for doors, Plasterwork for corners and parts of windows and doors, Installation of steel mesh for windows, Procurement and installation of glass for windows and doors. Compliance with local building codes and industry standards is mandatory to ensure quality, safety, and durability.

1.1 Materials

1.1.1 Materials shall always be utilized according to technical rules and best Professional practice.

1.1.2 Supporting documents and certificates shall attest to the origin and quality of materials.

1.1.3 Brand names, or proven equivalents, shall be submitted by the Contractor before delivery.

1.2 Delivery

1.2.1 The Contractor shall transport to the site all materials and equipment needed to carry out the work, regardless of the distance of transport, before payment authorization. Delivery scheduling is very important.

1.2.2 Split deliveries as justification for price increase will not be accepted.

1.3 Storage

1.3.1 The Contractor may be required to provide a plan showing locations of material storage and storage methods.

1.3.2 The Contractor will be responsible for all costs of storage or damaged materials.

1.3.3 If storage locations interfere with smooth construction operations, the Contractor will vacate and relocate the storage immediately.

2. CONSTRUCTION PROCESS

2.1 BoQ, Drawing, SoW, and Specifications

* + 1. The Contractor shall follow all drawings, BoQ, SoW, and specifications.
  1. Material specifications

The contractor should follow the required specifications for the materials.

2.3 Dimensions and Layout

2.3.1 Dimensions and layout of structures and materials shall be in accordance with Contract

Documents

2.3.2 The Contractor is responsible for checking all measurement dimensions and layout for accuracy and matching and will assume responsibility for improper checking or any misinterpretation of any mismatched measurement dimensions and he will submit written suggestions for modifications and changes to the dimensions if required.

2.3.3 Dimensions and measurements shall not be changed without prior approval

3. ENVIRONMENTAL MANAGEMENT

# 3.1. Compliance with Environmental Laws and Regulations

The Contractor shall conform to Afghanistan’s Laws on the Protection of Environment and other relevant legislation and as well as adhere to YVO’s environmental policy. Environmental laws and regulations, be they national or local, related to the following, but not limited to:

* 1. Noise;
  2. Vibration;
  3. Air pollution;
  4. Water contamination;
  5. Solid waste disposal;
  6. Liquid waste disposal;
  7. Sanitary conditions;
  8. Barrow pit;

**DESCRIPTION AND GENERAL REQUIREMENTS**

**1.1 Excavation**

* + 1. Excavate for buildings, site improvements, and utilities. Foundation tranches should be excavated to the exact width and height as shown in the drawing.
    2. Should consider the roles for the removal of soil from the roof. Should provide legal (village-approved) disposal of excavated materials.

CAST-IN-PLACE CONCRETE

**1. DESCRIPTION & GENERAL REQUIREMENTS**

The work specified in this section consists of the construction of all concrete structures and requirements for concrete mixes and testing of concrete mixes. This work shall include, but not be limited to the construction work of PCC which should be well mixed in a mixer and should result in the required Mark of the concrete.

Concrete structures shall be constructed in accordance with this Specification section and conformity with the lines, grades, dimensions, and notes shown on the Drawings.

**2. MATERIALS**

**2.1 Cement**

2.1.1 Type: Use Portland Cement, Type I, meeting the requirements of ASTM C150 (AASHTO M85). The cement must be fresh and manufactured no more than three months prior to use.

**2.2 Aggregates**

2.2.1 Aggregates shall consist of clean, crushed rock and natural sand. The combination must be approved by the Engineer to ensure the specified concrete mix ratio and strength grade are achieved.

**2.3 Formwork**

2.3.1 Formwork shall consist of plywood or metal panels, designed to meet structural requirements and ensure straight, perpendicular, and visually acceptable finishes. Planking may be used only with prior approval and inspection.

**3. CONSTRUCTION REQUIREMENTS AND PROCEDURES**

# Concrete Mixing

* + 1. General mixing will be with a machine mixer.
    2. All concrete shall be power machine mixed and machine vibrated.
    3. The approved type of mixer shall have a drum rotating about a horizontal or inclined axis and must be kept in good condition at all times. The drum shall rotate at the appropriate speed as approved by the Engineer.
    4. About 10 percent of the water required for the batch shall enter the drum in advance of the cement and aggregates, and the remainder of the water shall be added gradually while the drum is in action so that all the water is in the drum by the end of the first quarter of the mixing time. The concrete shall be mixed until a mixture of uniform color and consistency is obtained. For a mixer with a capacity of 750 liters or less, mixing shall continue for at least one and one-half minutes after all the water has been added. For each additional 500-litre capacity or fraction thereof, the minimum mixing time shall be increased by 15 seconds.
    5. The amount of concrete mixed in any one batch shall not exceed the rated capacity of the mixer. The whole of the batch shall be removed before materials for a fresh batch enter the drum. On cessation of work, including all stoppages exceeding 20 minutes, the mixers and all handling plants shall be washed with clean water. Any deposits of old concrete in the drum shall be cleaned out by rotating clean aggregate and water in the drum before any fresh concrete is mixed.
    6. Concrete mixed as specified above shall not be modified by the addition of water or in any other manner to facilitate handling or for any other reason.
    7. The Contractor shall carry out the design of concrete mixes under the supervision of the Engineer.
    8. In cold weather conditions, appropriate precautions must be taken to ensure proper concrete placement, curing, and protection, in accordance with best practices for cold weather concreting.

**1. Removal of soil from the roof (106 m³):**

* **Description**: Removal of soil from the roof and transfer it to a designated disposal site, including all related work.
* **Quantity**: 106 m³
* **Construction Method**:
  + Survey and assess the soil removal area before beginning work.
  + Clear the roof of any debris and loose materials.
  + Excavate and remove soil using either manual labor or mechanical means (e.g., shovels, wheelbarrows, or excavators).
  + Load soil into dump trucks for transport and dispose of it in the designated area, ensuring compliance with local regulations for waste disposal.
* **Safety Standards**:
  + Workers to wear gloves, helmets, and dust masks to avoid injury and inhalation of dust.
  + Use mechanical lifting devices for transporting large quantities of soil.
  + Mark boundaries of the work area to prevent unauthorized access and ensure worker safety.

**2. PCC Concrete work on the roof (35 m³):**

* **Description**: Application of plain cement concrete (PCC) with a thickness of 7 cm and M200 grade on the roof.
* **Quantity**: 35 m³
* **Construction Method**:
  + Clean the roof surface and ensure it is free from debris and dirt.
  + Prepare the concrete mix by combining cement, sand, aggregates, and water in the specified proportion for M200 grade.
  + Pour and level the concrete mix across the roof using appropriate tools.
  + Finish the surface to a smooth, even texture, and cure the concrete to ensure optimal strength development.
* **Cold Weather Concrete Application**

Cold weather conditions can significantly impact the placement and curing of concrete. By the American Concrete Institute (ACI) guidelines, cold weather is defined as a period when the air temperature drops below 5°C (40°F) for three consecutive days, or when the temperature is expected to fall below 5°C (40°F) for three days in a row during the curing process. During such conditions, special precautions must be taken to ensure the proper hydration, strength development, and overall durability of the concrete.

**Protective Measures:**

1. **Temperature Maintenance:** Concrete should be protected to prevent freezing during the initial set and curing period. According to ACI 306R-16 (Guide to Cold Weather Concreting), concrete temperature must be maintained at or above 10°C (50°F) for at least the first 24 hours following placement. After the concrete reaches an early strength of 3.5 MPa (500 psi), the level of protection may be reduced. If the concrete has not reached this strength, protection must be maintained until the required compressive strength is achieved.
2. **Curing Methods:** To ensure adequate curing, two layers of protection should be applied to the freshly placed concrete:
   * The first layer should consist of plastic sheeting or tarpaulin placed at a sufficient distance from the concrete surface to allow for air circulation.
   * The second layer should include thermal insulation, such as glass wool, to trap heat and prevent the temperature of the concrete from dropping below the required level.

The curing period must continue until the concrete attains its desired compressive strength, ensuring that moisture is retained within the mix. In cases where the moisture content drops below 40%, supplementary water must be added to maintain consistency.

1. **Avoiding Freeze/Thaw Damage:** Freshly placed concrete must not be exposed to freezing temperatures until it has attained sufficient strength (at least 3.5 MPa or 500 psi) to prevent damage. If cold weather conditions occur outside the winter months, such as in spring or autumn, newly placed concrete should be covered for a minimum of 24 hours to protect it from freezing.
2. **Temperature Control in Mixing:** The water and aggregates used in the concrete mix should be preheated to ensure that the mix temperature is adequate for proper hydration and curing. The concrete mix temperature should be monitored carefully to maintain a temperature range between 10°C (50°F) and 32°C (90°F) to promote proper strength development. Materials contaminated with ice, snow, or other harmful chemicals should not be used in the mix, as these can adversely affect the concrete’s performance.
3. **Admixtures:** The use of accelerating admixtures may be considered to speed up the hydration process and reduce curing time in cold weather. However, these admixtures should only be used in compliance with ACI 306R-16 guidelines, and their application should not compromise the integrity or long-term durability of the concrete. Any admixture used must not introduce harmful effects such as corrosion of embedded reinforcement (rebar) or alter the mix’s performance under freezing conditions.
4. **Calcium Chloride:** The use of calcium chloride as an accelerator is not recommended in cold weather concreting. While it may accelerate curing, calcium chloride can lead to corrosion of embedded steel reinforcement, which undermines the long-term durability of the concrete. Alternative, non-chloride accelerators should be used if needed.

**Conclusion:**

All concrete placement and curing activities during cold weather must adhere to ACI 306R-16 guidelines to ensure that the concrete achieves its desired performance. Adequate protection, moisture retention, and temperature control must be maintained to avoid freezing and to allow for proper curing and strength development. Monitoring of environmental conditions and the use of appropriate curing techniques will help mitigate the risks associated with cold weather concreting and ensure the durability and integrity of the finished structure.

* **Safety Standards**:
  + Workers should wear safety boots, gloves, helmets, and protective eyewear.
  + Ensure that all equipment is regularly inspected and in good condition.
  + Keep the work area clear of excess materials to prevent tripping hazards.

**3. Installation of 4 mm Iranian Isogam on the roof (545 m²):**

* **Description**: Installation of a 4 mm thick Iranian Isogam waterproof membrane with proper overlap and sealing at corners and edges.
* **Quantity**: 545 m²
* **Construction Method**:
  + Inspect and prepare the roof surface by cleaning it and ensuring it is dry and smooth.
  + Roll out the Isogam membrane onto the roof and cut it into sections to fit the required dimensions.
  + Heat-weld the seams and overlaps to ensure a watertight seal, particularly at the corners.
  + Ensure the membrane is stretched properly and securely fixed in place.
* **Safety Standards**:
  + Provide heat-resistant gloves, goggles, and helmets for workers during installation.
  + Maintain proper ventilation during the installation process, especially when using welding tools.
  + Fire safety equipment must be available due to the risk of sparks from heat welding.

**4. Brickwork for the parapet wall on the roof (12 m³):**

* **Description**: Construction of parapet walls using grade 1 bricks, mortar ratio of 1:4, with a length of 170 meters and a height of 30 cm.
* **Quantity**: 12 m³
* **Construction Method**:
  + Lay bricks in a stretcher bond pattern, ensuring the mortar joints are uniform and consistent.
  + Apply a 1:4 cement-sand mortar mix to bond the bricks.
  + Ensure the parapet wall is vertically aligned and level at every stage of construction.
  + Cure the mortar for the recommended time to ensure proper bonding and strength.
* **Safety Standards**:
  + Workers must wear safety gloves, helmets, and boots.
  + Scaffoldings must be stable and inspected regularly for safety.
  + Adequate barriers should be installed around the construction area to prevent falls.

**5. Two-side plaster work for parapet wall and repairing of damaged plaster (238 m²):**

* **Description**: Application of two-side plaster on the parapet wall and repairing of damaged plaster with a 1:3 cement-sand mix.
* **Quantity**: 238 m²
* **Construction Method**:
  + Remove any damaged plaster from the surface and clean it thoroughly.
  + Mix cement and sand in a 1:3 ratio and apply the plaster using trowels, ensuring smooth, even coats.
  + Apply a second coat after the first one has set to achieve the desired finish.
  + Allow proper curing to ensure the plaster is securely bonded and durable.
* **Safety Standards**:
  + Use gloves, helmets, and safety goggles for protection.
  + Ensure that scaffolding or ladders used for elevated work are stable and secure.
  + Maintain a clean and organized work area to prevent accidents from debris.

**6. Replacement of precast RCC concrete slabs (225 units):**

* **Description**: Replacement of precast RCC concrete slabs with new ones, fabricated from 250-mark concrete.
* **Quantity**: 225 units
* **Construction Method**:
  + Carefully remove the damaged concrete slabs while avoiding unnecessary damage to surrounding structures.
  + Lift and position new precast slabs using cranes or mechanical lifts.
  + Ensure each slab is aligned and leveled correctly before securing it in place.
* **Safety Standards**:
  + Workers should wear helmets, gloves, and steel-toed boots.
  + Ensure lifting equipment is inspected for functionality before use.
  + Keep work zones clear of unneeded materials to reduce tripping hazards.

**7. Preparation and installation of wooden frames for doors (2 units):**

* **Description**: Preparation and installation of wooden door frames with painting and finishing, replicating previous designs.
* **Quantity**: 2 units
* **Construction Method**:
  + Cut and assemble the wooden components to match the door frame design and dimensions.
  + Install the frames securely in their designated door openings using screws, anchors, or nails.
  + Paint the completed frames with the required type of paint and finish for durability and aesthetic appeal.
* **Safety Standards**:
  + Use protective gloves, goggles, and helmets when handling wood and tools.
  + Ensure proper ventilation when painting to avoid inhalation of fumes.
  + Maintain proper storage of materials to avoid cluttering the workspace.

**8. Window and door carpentry works (20 units):**

* **Description**: Replacing hinges and repairing other damaged carpentry components for windows and doors.
* **Quantity**: 20 units
* **Construction Method**:
  + Inspect the condition of the doors and windows to determine the necessary repairs.
  + Replace damaged hinges and fix any issues with the frame or panels.
  + Adjust the carpentry to ensure the doors and windows open and close smoothly.
* **Safety Standards**:
  + Workers must wear gloves, helmets, and safety boots.
  + Tools and equipment should be maintained and checked regularly for safe operation.
  + Ensure that no sharp objects or tools are left unattended in the work area.

**9. Two-coat painting of blackboards (27 m²):**

* **Description**: Application of two coats of high-quality black paint to the blackboards, including cleaning and preparation.
* **Quantity**: 27 m²
* **Construction Method**:
  + Thoroughly clean the blackboard surface to remove dirt and dust.
  + Apply primer if necessary, followed by two coats of high-quality blackboard paint.
  + Ensure sufficient drying time between coats to achieve a smooth and durable finish.
* **Safety Standards**:
  + Use gloves and masks during painting to avoid contact with paint and inhalation of fumes.
  + Ensure the work area is well-ventilated during the painting process.
  + Store paint containers securely to prevent spills.

**10. Installation of wooden planks for doors (6 m²):**

* **Description**: Installation of wooden planks made from Kunar wood for doors, including carpentry work and finishing.
* **Quantity**: 6 m²
* **Construction Method**:
  + Cut Kunar wood planks to the required dimensions.
  + Install the planks on the door surfaces, ensuring proper alignment and secure fastening.
  + Apply paint or wood finish to enhance the appearance and protect the wood.
* **Safety Standards**:
  + Workers should wear gloves, goggles, and helmets during installation.
  + Ensure that the tools used are sharp and in good condition to prevent accidents.
  + Follow proper lifting techniques when handling heavy materials.

**11. Plaster work for corners and parts of windows and doors (101 m²):**

* **Description**: Application of plaster to corners and parts of windows and doors using a 1:3 cement-sand mix.
* **Quantity**: 101 m²
* **Construction Method**:
  + Remove old plaster and debris from the affected areas.
  + Mix plaster in a 1:3 cement-sand ratio and apply in thin, even layers.
  + Ensure smooth finishing and proper bonding with the underlying surface.
* **Safety Standards**:
  + Use gloves, helmets, and safety goggles.
  + Ensure stable scaffolding or ladders for elevated work.
  + Keep the work area clean and organized to avoid tripping hazards.

**12. Installation of steel mesh for windows (51 m²):**

* **Description**: Installation of 1.5 mm thick steel mesh for windows, complete with necessary fittings and securing measures.
* **Quantity**: 51 m²
* **Construction Method**:
  + Measure and cut the steel mesh to the required dimensions for each window.
  + Secure the mesh in place using appropriate fittings (e.g., clips or screws) to ensure it is tightly attached.
  + Check the alignment and ensure the mesh is firmly fixed to prevent movement or dislodging.
* **Safety Standards**:
  + Workers must wear gloves, goggles, and helmets when handling steel mesh.
  + Ensure all tools are in good working condition and stored safely when not in use.
  + Use proper lifting techniques to handle the steel mesh and avoid strain or injury.

**13. Procure and install 4 mm glass for windows and doors (15 m²):**

* **Description**: Procurement and installation of 4 mm thick glass for windows and doors, including necessary fittings, framing, and sealing.
* **Quantity**: 15 m²
* **Construction Method**:
  + Procure high-quality 4 mm glass, ensuring it meets the required safety standards.
  + Measure and cut the glass to fit each window and door frame accurately.
  + Install the glass into the frames using glazing putty or sealant to ensure it is securely held in place.
  + Perform final adjustments to ensure the glass is flush with the frame and sealed correctly.
* **Safety Standards**:
  + Workers should wear protective gloves, goggles, and safety boots during glass handling and installation.
  + Ensure that the glass is handled with care to prevent breakage or injury.
  + Use appropriate lifting and handling tools to avoid direct hand contact with glass edges.

**3. Quality Assurance and Inspection**

* All materials utilized must comply with the specifications outlined in this document and be procured from approved suppliers.
* Monitor the quality of work at each stage to ensure compliance with the specified requirements.
* A final inspection will be conducted by a qualified engineer or project supervisor to verify that all work meets the established standards.

**4. Health and Safety**

* Comply with all relevant health and safety regulations, including those pertaining to working at heights, handling hazardous materials, and operating machinery.
* All workers are required to wear appropriate personal protective equipment (PPE) at all times.
* Site safety will be regularly monitored, and a fully stocked first aid kit will be readily accessible.
* Emergency procedures must be established and effectively communicated to all personnel.

### ****5. Documentation and Handover****

Upon project completion, the contractor will provide the following documentation:

* Certificates of materials and warranty information for all major materials used.
* Inspection and testing reports verifying that the work meets all specified requirements.
* A comprehensive final project report, including as-built drawings and any modifications to the original design.
* Final handover note approves by provincial education department.