**ANNEX D: Technical Specification for Light rehabilitation of Mandal High School**

#### **1. General**

This specification defines the requirements for rehabilitating the Mandal High School, covering activities such as the removal of soil from the roof, placement of PCC concrete on the roof, installation of 4 mm Iranian Isogam waterproofing on the roof, interior painting of the building, exterior painting of the building, replacement of precast RCC concrete slabs, installation of 6-inch locks on classroom doors, installation of 4-inch locks on doors and windows, fabrication and installation of Kunar wood frames for windows and doors, installation of 4 mm glass for doors and windows, and plaster work on corners, windows, doors, and other areas. 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 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**

* **Description:** This activity involves the removal of accumulated soil from the roof area of the building (13x39 meters) and transporting it to a designated disposal area. The work includes the use of appropriate equipment and labor for excavation and removal.
* **Quantity:** 76 m³
* **Construction Method:**
  + Excavate soil carefully using shovels or mechanical equipment.
  + Load the removed soil onto transportation vehicles for disposal.
  + Ensure no damage is done to the roof structure during the process.
* **Safety Standards:**
  + Ensure proper safety equipment (gloves, helmets, etc.) is used by workers.
  + Implement safety barriers and signage around the working area.
  + Workers should be trained on safe lifting and handling of materials.

**2. PCC Concrete Work on the Roof**

* **Description:** Plain Cement Concrete (PCC) of M200 grade will be placed on the roof to strengthen and level the surface. The thickness of the concrete layer will be 7 cm.
* **Quantity:** 36 m³
* **Construction Method:**
  + Prepare the surface of the roof by cleaning and leveling.
  + Set up formwork and place reinforcements if necessary.
  + Mix M200 grade cement, sand, and aggregate in the correct proportions.
  + Pour and finish the concrete to the required thickness and level.
  + Cure the concrete for a specified period to achieve the desired strength.
* **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:**
  + Ensure workers wear appropriate protective gear, including safety boots and gloves.
  + Ensure proper ventilation and dust control measures during mixing and pouring.
  + Use mechanical equipment where applicable to prevent strain injuries.

**3. Installation of 4 mm Iranian Isogam Waterproofing**

* **Description:** Installation of 4 mm thick Iranian Isogam waterproofing sheets on the roof to provide long-term water resistance and protection.
* **Quantity:** 575 m²
* **Construction Method:**
  + Clean and prepare the roof surface, ensuring it is dry and free from debris.
  + Unroll the Isogam sheets, cut to the required lengths, and apply them using adhesive or heat welding.
  + Overlap the edges of the sheets to ensure a continuous waterproof layer.
  + Inspect and test the installation for any gaps or defects.
* **Safety Standards:**
  + Use proper lifting techniques to handle heavy rolls of waterproofing material.
  + Ensure that workers use gloves and masks to avoid exposure to chemicals in adhesives.
  + Ensure that the work area is secured to prevent accidents.

**4. Interior Painting of the Building**

* **Description:** The interior walls of the building will be painted with two coats of 75% Distemper paint to enhance the aesthetic appeal and provide a protective finish.
* **Quantity:** 300 m²
* **Construction Method:**
  + Clean and prepare the surfaces to be painted.
  + Apply a primer coat to improve adhesion.
  + Apply two coats of 75% Distemper paint using rollers or brushes.
  + Allow each coat to dry before applying the next.
* **Safety Standards:**
  + Ensure proper ventilation in the working area to avoid inhalation of paint fumes.
  + Use personal protective equipment (PPE), such as gloves and safety glasses.
  + Ensure scaffolding is securely placed if working at heights.

**5. Exterior Painting of the Building**

* **Description:** The exterior walls of the building will receive three coats of 100% Weather shed paint to ensure durability and resistance to weather conditions.
* **Quantity:** 400 m²
* **Construction Method:**
  + Clean and prepare the exterior surfaces, including scraping old paint and smoothing rough areas.
  + Apply a primer coat to promote adhesion.
  + Apply three coats of 100% Weather shed paint, allowing proper drying time between coats.
* **Safety Standards:**
  + Use appropriate PPE, including safety harnesses, helmets, and gloves, when working at heights.
  + Ensure that the working area is marked off and protected to prevent accidents.
  + Use lead-free, low-VOC paints to minimize health risks.

**6. Replacement of Precast RCC Concrete Slabs**

* **Description:** Replacement of damaged precast RCC concrete slabs with new slabs made of 250 Mark concrete.
* **Quantity:** 304 units
* **Construction Method:**
  + Carefully remove the damaged slabs from the ceiling or roof.
  + Inspect the area for any underlying structural damage.
  + Install new precast RCC slabs, ensuring they are aligned and leveled.
  + Secure the slabs and ensure proper curing of the newly installed concrete.
* **Safety Standards:**
  + Ensure workers wear helmets and steel-toed boots during the handling of slabs.
  + Use lifting equipment where necessary to prevent injury during the installation of heavy slabs.
  + Ensure that scaffolding and other equipment are stable and secure.

**7. Installation of 6" Locks on Classroom Doors**

* **Description:** Installation of high-quality 6" locks on classroom doors to ensure security and functionality.
* **Quantity:** 5 units
* **Construction Method:**
  + Mark the installation points on the door and frame.
  + Drill holes and install the lock hardware securely.
  + Test the locks to ensure proper functioning.
* **Safety Standards:**
  + Use proper tools to avoid injury.
  + Ensure workers follow safe practices while using drilling equipment.

**8. Installation of 4" Locks on Doors and Windows**

* **Description:** Installation of 4" locks on doors and windows throughout the building for security.
* **Quantity:** 50 units
* **Construction Method:**
  + Mark and drill appropriate holes on doors and window frames.
  + Install locks securely and ensure proper alignment.
  + Test for smooth operation.
* **Safety Standards:**
  + Ensure PPE is used, including safety gloves and goggles.
  + Follow correct procedures when handling power tools.

**9. Fabrication and Installation of Wooden Frames from Kunar Wood**

* **Description:** Fabrication and installation of wooden frames for windows and doors, using Kunar wood for durability and aesthetic appeal.
* **Quantity:** 12 meters
* **Construction Method:**
  + Measure and cut Kunar wood to the required dimensions.
  + Assemble the frames with appropriate fasteners.
  + Install the frames securely on the windows and doors.
* **Safety Standards:**
  + Use safety equipment such as goggles and gloves when cutting and handling wood.
  + Ensure work areas are free of debris to prevent slips and trips.

**10. Installation of 4 mm Glass for Doors and Windows**

* **Description:** Installation of 4 mm thick glass for doors and windows, with all necessary accessories for secure fitting.
* **Quantity:** 7 m²
* **Construction Method:**
  + Measure and cut glass to the required dimensions.
  + Install the glass into the frames using suitable glazing techniques and accessories.
  + Ensure that the glass is securely fixed and properly sealed.
* **Safety Standards:**
  + Workers must wear protective gloves and eye protection to handle glass safely.
  + Proper lifting techniques should be used to prevent injury.

**11. Plaster Work on Corners, Windows, and Other Areas**

* **Description:** Plastering of corners, windows, doors, and other specified areas using a 1:3 cement-sand mix to provide smooth, durable surfaces.
* **Quantity:** 40 m²
* **Construction Method:**
  + Clean and prepare the surface before applying plaster.
  + Mix cement and sand in a 1:3 ratios.
  + Apply plaster evenly on the surfaces using trowels and smoothing tools.
  + Allow plaster to cure properly to ensure durability.
* **Safety Standards:**
  + Ensure workers wear appropriate protective clothing and gear to avoid skin contact with chemicals.
  + Follow proper lifting techniques when handling materials and equipment.

**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.