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

#### **1. General**

This specification defines the requirements for rehabilitating the Farman Khail High School, covering activities such as the removal of old Plain Cement Concrete (PCC) from the roof, the installation of new roofing systems, the preparation and pouring of M200 grade concrete for the roof and bathrooms, the application of waterproofing membranes (Isogam), and the fabrication and replacement of precast RCC slabs in designated rooms.

Additionally, the project includes the supply and installation of glass for windows and doors, the manufacture and installation of wooden doors, and the application of high-quality oil paint for windows and doors. Carpentry work for the installation of wooden planks from Kunar wood, the repair of damaged plaster with a 1:3 cement ratio, and exterior and interior painting using weather-resistant and distemper paints will also be part of the scope of work. 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 pits

**DESCRIPTION AND GENERAL REQUIREMENTS**

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 Old PCC from Roof**

**Description:**  
This activity involves the removal of existing Plain Cement Concrete (PCC) from the roof with minimal damage to the underlying surfaces. The removed debris will be transported to an approved disposal site. All safety measures must be followed, and the area cleared of debris after completion.

**Quantity: 49 m3**

**Construction Method:**

1. Identify the sections of PCC to be removed and mark boundaries.
2. Use appropriate mechanical tools (e.g., jackhammers) to remove PCC.
3. Carefully remove PCC near structural elements to avoid damage.
4. Collect and load debris into designated vehicles for disposal.
5. Inspect the roof to ensure no debris or loose material remains.

**Safety Standards:**

* Workers must wear helmets, gloves, and safety boots.
* Proper signage and barriers should be placed to restrict access to the work zone.
* Dust suppression methods, such as water spraying, should be employed.

#### **2. PCC Concrete Work on the Roof of building and toilets**

**Description:**  
This work includes laying a 7 cm thick layer of M200 grade Plain Cement Concrete (PCC) on the roof and bathrooms. Preparation of the surface and proper curing are essential to achieve desired strength and durability.

**Quantity: 23 m3**

**Construction Method:**

1. **Surface Preparation:**
   * Clean the surface to remove dust, oil, and loose material.
   * Apply a bonding agent if required.
2. **Concrete Mixing:**
   * Mix concrete using an M200 mix design, ensuring proper proportions of cement, sand, and aggregates.
3. **Placing and Leveling:**
   * Pour the concrete evenly across the prepared surface.
   * Use a screed to level the surface to 7 cm thickness.
4. **Curing:**
   * Begin curing after initial setting, maintaining moisture for at least 7-14 days.
   * Use plastic sheets or curing compounds in cold weather.

* **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:**

* Use PPE, including insulated gloves and boots in cold weather.
* Provide stable access to roof work areas to prevent falls.
* Ensure proper ventilation when using curing compounds.

#### **3. Waterproofing with Isogam on Roof, 4mm**

**Description:**  
Application of a 4 mm thick Iranian Isogam waterproofing membrane to protect the roof from water infiltration. This includes cleaning, leveling, and ensuring proper overlap for effective sealing.

**Quantity: 354 m2**

**Construction Method:**

1. Clean and prepare the roof surface to ensure proper adhesion.
2. Heat the Isogam membrane with a gas torch to bond it to the roof.
3. Ensure overlaps of at least 10 cm between adjacent sheets.
4. Check all corners and joints for complete coverage.

**Safety Standards:**

* Use flame-retardant clothing and PPE when using a gas torch.
* Ensure fire extinguishers are accessible on-site.
* Avoid application during wet or windy weather.

#### **4. Fabrication and Replacement of Precast RCC Slabs, M250**

**Description:**  
Damaged precast RCC slabs will be replaced with new ones fabricated from 250-grade concrete, matching the original dimensions and specifications.

**Quantity: 45 No**

**Construction Method:**

1. Measure and fabricate precast slabs in a controlled environment.
2. Transport and lift slabs into position using a crane or manual methods.
3. Align and level slabs properly, filling gaps with grout if necessary.
4. Conduct a final inspection for stability and alignment.

**Safety Standards:**

* Use lifting equipment inspected for safety compliance.
* Ensure workers stay clear of suspended loads.
* Provide edge protection when working at heights.

#### **5. Glass Installation for Doors and Windows, 4mm**

**Description:**  
Installation of 4 mm thick glass panels in wooden frames (Chufti) made from national wood. Includes sealing for durability and weatherproofing.

**Quantity: 28 m2**

**Construction Method:**

1. Measure and cut glass panels to fit precise dimensions.
2. Install glass into frames, securing with gaskets or putty.
3. Inspect for alignment, sealing, and smooth operation.

**Safety Standards:**

* Handle glass with gloves and use suction cups to avoid breakage.
* Provide safety goggles to workers during installation.

#### **6. Wooden Door preparation and Installation**

**Description:**  
Manufacture and installation of high-quality wooden doors (1 x 2.6 meters), complete with frames, hinges, handles, and paint finishing.

**Quantity: 2 No**

**Construction Method:**

1. Fabricate doors to match the required dimensions and design.
2. Install door frames, ensuring alignment and stability.
3. Hang the doors using durable hinges and fit accessories.
4. Sand and paint with at least two coats for durability.

**Safety Standards:**

* Use stable scaffolding for installation at elevated levels.
* Maintain a clean workspace to prevent tripping hazards.

#### **7. Window and Door oil Painting (3 Coats)**

**Description:**  
Apply three coats of high-quality oil-based paint to windows and doors, ensuring a smooth and durable finish.

**Quantity: 290 m2**

**Construction Method:**

1. Clean and sand the surfaces to remove dust and old paint.
2. Repair any cracks or damages before painting.
3. Apply each coat evenly, allowing sufficient drying time between coats.
4. The sample of the paint should be chosen by site engineer with consultation of PED technical team.

**Safety Standards:**

* Provide adequate ventilation in work areas to avoid inhalation of paint fumes.
* Use ladders or scaffolding securely when painting at heights.

#### **8. Wooden Plank Installation for Doors**

**Description:**  
Installation of high-quality Kunar wooden planks on doors to enhance durability and aesthetics.

**Quantity: 6 m2**

**Construction Method:**

1. Cut wooden planks to size and treat them with protective coatings.
2. Securely attach the planks to the door frame with nails or adhesives.
3. Sand and finish with paint or varnish.

**Safety Standards:**

* Use dust masks during sanding operations.
* Keep the work area free of clutter to avoid tripping hazards.

#### **9. Plastering of Damaged Areas of building**

**Description:**  
Repair damaged plaster areas using a 1:3 cement ratio for structural durability and aesthetic consistency.

**Quantity: 100 m2**

**Construction Method:**

1. Remove loose and damaged plaster from affected areas.
2. Clean the surface and apply a bonding agent.
3. Apply the new plaster evenly and smooth it to match the existing surfaces.
4. Cure the plaster for at least 7 days.

**Safety Standards:**

* Use PPE, including gloves and masks, to protect from dust and chemicals.
* Ensure stable access when working on elevated surfaces.

#### **10. Exterior Painting of Building**

**Description:**  
Painting of exterior walls with two coats of weather-resistant paint to protect against environmental conditions.

**Quantity: 710 m2**

**Construction Method:**

1. Clean and repair exterior surfaces, filling cracks as needed.
2. Apply a primer coat before painting.
3. Use rollers or sprayers for even coverage.
4. The paint needs to be chosen and approve by site engineer

**Safety Standards:**

* Use safety harnesses and scaffolding for high walls.
* Prevent spills and clean up paint immediately to avoid environmental contamination.

#### **11. Interior Painting of Building**

**Description:**  
Application of two coats of 75% distemper paint on interior walls for a smooth and uniform finish.

**Quantity: 1250 m2**

**Construction Method:**

1. Prepare surfaces by cleaning and filling cracks.
2. Apply the paint evenly with brushes or rollers.
3. Allow adequate drying time between coats. The paint should approve by site engineer

**Safety Standards:**

* Ensure adequate ventilation to reduce inhalation of paint fumes.
* Keep fire extinguishers nearby when working with flammable materials.

**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 approved by Provincial Education Department.