**ANNEX D: Technical Specification for Light Rehabilitation of Norgal Girl’s Central High School**

#### **1. General**

This specification defines the requirements for rehabilitating the Norgal Girl’s Central High School, covering activities such as the demolition of the boundary wall, stone masonry for the boundary wall, and construction of brick masonry. Additionally, there is the construction of a concrete peak above the roof and plastering of the brick masonry wall. The removal of roof soil and its transportation is also part of the work, along with roof repair using pre-cast slabs. The installation of tarpaulin on the roof and the placement of PCC concrete are required, followed by the installation of Iranian Isogam for waterproofing. Roof gutter repairs, removal of old gutters, and installation of new gutters are also included. Lastly, the procurement and installation of glass for windows and doors complete 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 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. Borrow pits

**DESCRIPTION AND GENERAL REQUIREMENTS**

**1.1 Excavation**

* + 1. Excavate for structure, 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 mixer and should result in required Mark of the concrete.

Concrete structures shall be constructed in accordance with this Specification section and in 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. Demolition of Damaged Boundary Wall**

* **Description:** Demolition of a damaged boundary wall affected by the earthquake, including excavation of 11 meters in length, 80 cm in width, and 2.5 meters in depth, along with all related tasks.
* **Quantity:** 22.00 m³
* **Construction Method:**
  + Use suitable machinery or manual labor for safe demolition.
  + Excavate soil to specified dimensions while ensuring the stability of adjacent structures.
  + Remove debris and dispose of it in compliance with environmental regulations.
* **Safety Standards:**
  + Workers must wear PPE, including helmets, gloves, and steel-toed boots.
  + Ensure the work site is secured with barricades and signage.
  + Follow earthquake-damaged structure handling guidelines to avoid secondary damage.

#### **2. Stone Masonry for Boundary Wall**

* **Description:** Construction of a stone masonry wall measuring 11 meters in length, 70 cm in width, and 2.5 meters in height, using a 1:4 mortar mix, including pointing work and related tasks.
* **Quantity:** 19.25 m³
* **Construction Method:**
  + Sort and prepare stones for uniformity and strength.
  + Mix mortar at a 1:4 ratio (cement to sand) for bonding.
  + Lay stones in courses, ensuring joints are adequately filled.
  + Apply pointing to enhance strength and aesthetics.
* **Safety Standards:**
  + Handle tools carefully to prevent injuries.
  + Provide workers with dust masks during mortar preparation.
  + Maintain scaffolding stability and adherence to height safety regulations.

#### **3. First-Class Brick Masonry**

* **Description:** Construction of a brick masonry wall measuring 11 meters in length, 25 cm in width, and 75 cm in height with a 1:5 mortar mix, including all required accessories.
* **Quantity:** 2.0625 m³
* **Construction Method:**
  + Use high-quality bricks free from cracks.
  + Mix mortar to a consistent 1:5 ratio and apply evenly between bricks.
  + Lay bricks in a staggered pattern to ensure wall strength.
  + Check alignment and level periodically.
* **Safety Standards:**
  + Avoid overloading scaffolding with materials.
  + Ensure proper ventilation in enclosed areas to avoid fume buildup.

#### **4. Concrete Peak Construction Above Brick Wall**

* **Description:** Construction of a concrete peak above the roof with dimensions of 11 meters in length, 35 cm in width, and 10 cm in thickness using a 1:1.5:3 mortar mix.
* **Quantity:** 0.385 m³
* **Construction Method:**
  + Prepare and level the surface for concrete application.
  + Use formwork to shape the concrete peak.
  + Mix and pour concrete with the specified ratio (1 cement: 1.5 sand: 3 aggregates).
  + Allow curing for at least 7 days.
* **Safety Standards:**
  + Workers must use gloves and goggles while handling cement.
  + Prevent unauthorized access to the site during concrete setting.

#### **5. Plastering of Brick Masonry Wall**

* **Description:** Plastering both sides of the brick masonry wall using a 1:3 mortar mix, including necessary accessories.
* **Quantity:** 22.0 m²
* **Construction Method:**
  + Clean wall surfaces to remove dust and loose particles.
  + Mix plaster at a 1:3 ratio and apply in layers, ensuring smoothness.
  + Finish with trowels for a uniform surface.
* **Safety Standards:**
  + Ensure scaffolding is secure and workers use safety harnesses.
  + Use dust masks and goggles while mixing and applying plaster.

#### **6. Removal of Soil from Roof**

* **Description:** Removal of soil from the building roof and transport to an appropriate location, including necessary accessories.
* **Quantity:** 683.0 m²
* **Construction Method:**
  + Use manual labor or light machinery to remove soil.
  + Load soil into trucks for transportation.
  + Dispose of soil in designated areas per local regulations.
* **Safety Standards:**
  + Prevent spillage during transport by securing loads.
  + Workers should wear gloves and masks during removal.

#### **7. Repair of Classroom Roofs with Pre-Cast Slabs**

* **Description:** Removal of damaged slabs and installation of 152 new pre-cast slabs (1m x 0.5m x 0.07m), including all necessary accessories.
* **Quantity:** 152 units
* **Construction Method:**
  + Dismantle damaged slabs carefully without harming adjacent areas.
  + Install pre-cast slabs and secure them with mortar.
  + Inspect and adjust for proper alignment.
* **Safety Standards:**
  + Secure working areas and use fall prevention systems.
  + Ensure proper lifting techniques for heavy slabs.

#### **8. Installation of High-Quality Tarpaulin on the Roof**

* **Description:** Installation of high-quality tarpaulin across a 683 m² roof area, including required accessories.
* **Quantity:** 683 m²
* **Construction Method:**
  + Spread tarpaulin evenly over the roof.
  + Secure edges using fasteners and ensure it is waterproof.
* **Safety Standards:**
  + Avoid work during strong winds or rain.
  + Inspect tarpaulin for defects before installation.

#### **9. PCC Concrete Placement on Roof**

* **Description:** Placement of PCC concrete (M150 mix) with 7 cm thickness over a 683 m² roof area, including required accessories.
* **Quantity:** 47.81 m³
* **Construction Method:**
  + Prepare the roof surface by cleaning and leveling.
  + Mix and pour PCC concrete at M150 grade (1:2:4).
  + Level the surface and allow curing for 7–14 days.
* **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 when handling concrete materials.
  + Implement fall protection measures.

#### **10. Installation of 4mm Iranian Isogam on the Roof**

* **Description:** Procurement and installation of 4mm Iranian Isogam across the 683 m² roof, including all related tasks.
* **Quantity:** 683 m²
* **Construction Method:**
  + Ensure the roof surface is clean, dry, and level.
  + Heat the Isogam with a gas torch for proper adhesion.
  + Overlap sheets by at least 10 cm to ensure waterproofing.
  + Seal edges and inspect for gaps or imperfections.
* **Safety Standards:**
  + Use flame-resistant gloves and goggles during the heating process.
  + Maintain fire extinguishers nearby during installation.
  + Avoid working in windy conditions to prevent fire hazards.

#### **11. Repair of Existing Roof Gutter**

* **Description:** Repair of the existing roof gutter, including technical modifications and proper installation.
* **Quantity:** 1.0 linear meter
* **Construction Method:**
  + Remove damaged sections of the gutter and inspect for structural defects.
  + Modify and repair using appropriate materials (e.g., metal sheets or PVC).
  + Secure the repaired gutter to the roof with fasteners.
  + Test water flow to ensure functionality.
* **Safety Standards:**
  + Use ladders or scaffolding with proper anchoring.
  + Ensure gutters are handled with care to avoid sharp edges.

#### **12. Replacement of Damaged Roof Gutters**

* **Description:** Removal of damaged gutters and installation of new gutters made from 24-gauge iron sheets, matching the existing design, including all necessary accessories.
* **Quantity:** 9.0 meters
* **Construction Method:**
  + Carefully dismantle the damaged gutters without disturbing adjacent structures.
  + Fabricate and install new gutters with a 24-gauge iron sheet to match the design.
  + Use corrosion-resistant fasteners and sealants for secure installation.
  + Test gutter performance with water flow after installation.
* **Safety Standards:**
  + Provide fall protection for workers.
  + Ensure tools and materials are securely handled to prevent accidents.

#### **13. Procurement and Installation of 4mm Glass for Windows and Doors**

* **Description:** Installation of 4mm glass for windows and doors, including Chufti (putty) and necessary accessories.
* **Quantity:** 9.0 m²
* **Construction Method:**
  + Measure and cut glass panels to fit window and door frames accurately.
  + Apply Chufti (putty) evenly along the edges to secure the glass.
  + Install the glass carefully, ensuring a tight and secure fit.
  + Clean the glass after installation to remove smudges or debris.
* **Safety Standards:**
  + Use protective gloves and goggles while handling glass.
  + Dispose of broken or leftover glass safely in designated containers.

**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.