

TECHNICAL SPECIFICATIONS

Project Title:

Improve education infrastructure and sustainable facilities for children in Yemen, Habel Al-Sweeda area - Al Musaymir District- Lahj Governorate. Construction of Four (4) New Classrooms and Rehabilitation of Four (4) Existing Classrooms at Habel Al-Sweeda Area, Al-Musaymir District, Lahj Governorate, 1925.

1. GENERAL REQUIREMENTS

1.1 Scope of Works

The works include the construction of four new classrooms, rehabilitation of four existing classrooms, associated external works, electrical installations, accessibility facilities, school furniture, and all related works necessary for complete and operational facilities.

1.2 Applicable Standards

All works shall comply with:

- Relevant Yemeni Building Codes.
- ASTM Standards.
- BS (British Standards).
- ACI 318 for reinforced concrete works.
- IEC Standards for electrical installations.
- Manufacturer recommendations.
- Instructions of the Supervising Engineer.

1.3 Contractor Responsibilities

The Contractor shall:

- Visit the site before bidding.
- Verify all dimensions and levels.
- Submit material samples for approval before procurement.
- Provide shop drawings where required.
- Ensure compliance with occupational health and safety requirements.
- Remove debris and maintain a clean site throughout implementation.
- Conduct all required testing and inspections.

2. SITE CLEARANCE AND EARTHWORKS

2.1 Site Preparation

The Contractor shall clear the site of vegetation, debris, unsuitable materials, and obstructions before commencing works.

2.2 Excavation

- Excavation shall be carried out to the dimensions and levels shown on drawings.

- Excavations shall remain stable and protected against collapse.
- Dewatering shall be carried out whenever required.
- Excavated unsuitable material shall be removed from site.

2.3 Anti-Termite Treatment

- Approved anti-termite chemical treatment shall be applied beneath floors and around foundations.
- Treatment shall be carried out strictly according to the manufacturer's recommendations.

2.4 Backfilling

- Backfill material shall be approved imported base-course material.
- Filling shall be placed in layers not exceeding 250 mm.
- Each layer shall be watered and compacted to not less than 95% Modified Proctor Density.

3. CONCRETE WORKS

3.1 Cement

- Sulfate-resistant Portland Cement (SRPC) shall be used for all structural and substructure works.
- Cement shall comply with ASTM C150 or equivalent.

3.2 Aggregates

Aggregates shall be clean, hard, durable, and free from organic matter and harmful substances.

3.3 Plain Concrete

- Foundation blinding concrete: minimum compressive strength 20 MPa (200 kg/cm²).
- Mixing ratio shall not be less than 1:2:4 unless otherwise specified.

3.4 Reinforced Concrete

- Structural concrete strength shall not be less than 35 MPa (350 kg/cm²).
- Concrete shall be machine mixed whenever possible.
- Mechanical vibrators shall be used during casting.
- Concrete shall be cured continuously for a minimum of 14 days.

3.5 Reinforcement Steel

- High yield deformed steel bars complying with ASTM A615 Grade 60.
- Reinforcement shall be clean and free from rust, oil, or scale.
- Minimum concrete cover shall comply with structural drawings.

4. MASONRY WORKS

4.1 Basalt Stone Foundations

- Basalt stone shall be hard, durable, and free from defects.
- Mortar shall consist of cement and sand mixed at a ratio of 1:3.
- Stonework shall be properly bonded and cured.

4.2 Cement Block Walls

- Hollow or solid machine-made cement blocks shall have minimum crushing strength of 4 MPa (40 kg/cm²).
- Wall thickness shall be 200 mm.
- Mortar mix shall be 1:3 cement:sand.
- Walls shall be plumb, aligned, and properly bonded.

5. PLASTERING WORKS

5.1 Internal Plaster

- Cement plaster thickness: 15 mm.
- Mortar ratio: 1:3.
- Plaster mesh shall be installed at all concrete-block interfaces.
- Surface shall be smooth and ready for painting.

5.2 External Plaster

- Cement plaster thickness: 15 mm.
- Mortar ratio: 1:3.
- Finish shall be weather-resistant and free from cracks.

6. WATERPROOFING WORKS

6.1 Roof Waterproofing

- Roof slopes shall be formed with plain concrete.
- Two layers of approved bituminous membrane (felt) shall be installed.
- Membranes shall overlap according to manufacturer instructions.
- Waterproofing shall extend vertically up parapet walls.

6.2 Epoxy Roof Protection (Rehabilitation Works)

- Epoxy coating shall be UV-resistant and waterproof.
- Surface preparation shall include cleaning, repair, and priming before application.

7. FLOORING WORKS

7.1 Mosaic Floor Tiles

- Tiles shall be 250 x 250 mm mosaic tiles with marble chips.
- Thickness shall be 25 mm minimum.
- Tiles shall be laid on cement mortar bed 1:3.
- Joints shall be filled with white cement grout.

7.2 Skirting

- Skirting shall match floor tiles.
- Height: 100 mm.
- Thickness: 25 mm.

8. PAINTING WORKS

8.1 Internal Paint

- Surface preparation shall include cleaning, filling cracks, sanding, and priming.
- One primer coat and three finishing coats.
- Approved high-quality semi-gloss paint.

8.2 External Paint

- Exterior acrylic textured paint resistant to UV radiation and moisture.
- One primer coat and three finishing coats.

8.3 Logos and Signage

The Contractor shall paint all donor, implementing agency, and project identification logos at locations directed by the Engineer.

9. DOORS, WINDOWS AND METAL WORKS

9.1 Aluminum Windows

- Aluminum thickness: minimum 1.25 mm.
- Glass thickness: 6 mm reinforced glass.
- Insect screens shall be provided.
- Silicone sealing shall be applied around frames.

9.2 Iron Doors

- Fabricated from steel sections 40x20 mm minimum.
- Anti-rust primer plus three finishing coats.
- Complete with locks, hinges, handles, and accessories.

9.3 Window Protection Grills

- Fabricated from mild steel sections.
- Anti-corrosion treatment plus three coats of paint.

10. EXTERNAL WORKS

10.1 Sidewalks

- Minimum width as shown on drawings.
- Concrete base thickness: 150 mm.
- Interlocking paving blocks strength: minimum 300 kg/cm².
- Concrete curbs strength: minimum 300 kg/cm².

10.2 Stairs

- Constructed using mosaic finish.
- Dimensions shall comply with approved drawings.

10.3 Artificial Grass

- High-quality UV-resistant synthetic grass.
- Minimum pile height: 25 mm.
- Installed on compacted and leveled surface.

11. ACCESSIBILITY WORKS

11.1 Concrete Ramp

- Minimum width: 1.50 m.
- Non-slip surface finish.
- Stainless steel handrails on both sides.
- Maximum slope shall comply with accessibility standards.

12. ELECTRICAL WORKS

12.1 General

All electrical works shall comply with IEC Standards and local regulations.

12.2 Wiring

- Copper conductors only.
- Lighting circuits: minimum 1.5 mm².
- Power circuits: minimum 2.5 mm².
- All wiring shall be installed in concealed PVC conduits.

12.3 Distribution Board

- Metal enclosure.
- Main circuit breaker and outgoing breakers.
- Proper labeling of all circuits.

12.4 Lighting

- LED fixtures, minimum 20W.
- Indoor and outdoor fixtures shall be approved quality products.

12.5 Socket Outlets

- 13A switched sockets.
- Complete with grounding connection.

12.6 Ceiling Fans

- Energy-efficient AC/DC ceiling fans.
- Complete with switches and accessories.

13. SOLAR ENERGY SYSTEM

13.1 Hybrid Inverter

- Capacity and technical parameters as indicated in the BoQ.
- MPPT charge controller integrated.
- Complete protection functions against overload, short circuit, overvoltage, and reverse polarity.

13.2 Testing and Commissioning

The contractor shall test and commission the complete electrical and solar system and provide operation training to the beneficiary.

14. SCHOOL FURNITURE

14.1 Student Desks

- Swedish wood double desks with attached seating.
- Steel frame thickness not less than 1.2 mm.
- Wood thickness: minimum 30 mm.
- Smooth edges and durable varnish finish.
- Donor and organization logos engraved or printed as approved.

15. PROJECT SIGNAGE

15.1 Project Signboard

- Galvanized steel structure.
- Anti-corrosion treatment.
- Arabic and English texts.
- Dimensions as approved by the Engineer.

15.2 Marble Plaque

- Size: 40 cm × 40 cm.
- Engraved project information and donor logos.

16. TESTING, COMPLETION AND HANDOVER

- Concrete testing may be requested by the Engineer.
- All installations shall be tested before acceptance.
- Defects identified during inspection shall be rectified at the Contractor's expense.
- Final payment shall only be made after successful completion and handover of all works.