

TECHNICAL SPECIFICATIONS

**CONSTRUCTION OF RESERVOIRS AND RELATED WATER
SUPPLY WORKS FOR ADWA GENERAL HOSPITAL**

ADWA, TIGRAY REGION

Abbreviations used in the tender document

mm	for millimetre
m	for meter
m ²	for square meter
m ³	for cubic meter
km	for kilometre
hr	for hour
L.S.	for a lump sum
No.	for number
E.C.	Ethiopian Calendar
PVC	for plasticised polyvinyl chloride
HDPE	High-Density Polyethylene

1. General Information

About Expertise France

Expertise France (EF) is a public agency created on 1st January 2015 under the supervision of the French Ministries of Foreign Affairs, and Economy and Finance with a robust inter-ministerial vocation. EF offers program engineering and technical assistance by developing and implementing international cooperation actions worldwide. EF operates in various fields of development and institutional cooperation including safety and security reform, public health, human rights, strengthening of institutions and NGOs and governance. Carrying out large-scale, multi-stakeholder programs, EF can ensure cooperation between individuals, teams and institutions with very different statuses, cultures, and specialties. Besides, EF has acquired sound experience in administrative and financial management of large-scale international programs.

2. Background

Two years of conflict in northern Ethiopia, with renewed fighting in mid-2022, have created high humanitarian needs across the Afar, Tigray and Amhara regions, which remain largely unaddressed. The cessation of hostilities following a peace agreement signed in early November 2022 raises hopes for lasting peace for a region devastated by conflict. To support peace efforts, and based on lessons learned in various emergency settings, Expertise France has designed a project to rapidly help resume conflict-affected communities' access to healthcare in Amhara, Afar and Tigray regions. One of the target areas for the interventions is Adwa General Hospital, located in Adwa town of Tigray regional state.

In the frame of its assistance program, Expertise France is planning to rehabilitate and improve the existing water supply system as part of rehabilitation works of Adwa Hospital. More specifically the works under this tender consists of construction of ground reservoir, construction of elevated water tower, supply and installation of fiberglass water tanks, supply and installation of pipeline and fittings, and supply and installation of pump and control system.

3. Technical specifications

SCOPE OF WORK

These specifications shall apply to the following reservoir construction, elevated water tower, and related pipeline connections to integrate to the existing water system.

The works include the following major works:

1. Supply and Installation of a 100 m³ Capacity pioneer water tank including seat construction, Supply and installation of two high-quality 15,000-liter fiberglass water tanks, supply and installation of Pipe Line and Fittings;
2. Supply and Installation of pump and control system;
3. Construction of a 15-meter high water tower.

The Contractor shall fulfill all requirements and obligations under all clauses of the Specifications. Neither the clauses in these specifications nor their descriptions or quantities shall restrict the Contractor's obligations under the Conditions of Contract. Where items are not included in the Bill of Quantities for any such requirements or obligations, the cost of such requirements or obligations shall be deemed to be spread over all the items of the Bills of Quantities.

All materials and workmanship shall be of the best quality throughout and shall comply with the relevant latest edition of EBCS standards or with equivalent ISO or British Standards. The contractor shall be responsible for providing all necessary labor, equipment, and materials required for the execution of the works. Work shall be carried out as per the approved design drawings, specifications, and instructions from the engineer. All materials to be permanently built - in shall be new and shall be accompanied by Manufacturer's Certificates, stating their compliance with these Specifications and the standards mentioned therein and the name of the inspection authority.

I. Supply and Installation of a 100 m3 Capacity Service Reservoir, Pipe Line and Fittings

1. Supply and installation of Water Tank

1.1. Supply and install a Pioneer water tank with all necessary accessories to complete the work; the work shall and price includes creating a stable foundation (reinforced concrete slab), encompassing excavation, backfilling in any soil type, caraway surplus material from the construction site to appropriate place, hard-core filling, masonry foundation construction, and placement of formwork and reinforcement bars per the manufacturer's recommendation and approved by the engineer. This also includes joining the necessary pipes and fittings of any required amounts and types that suits the pioneer and networking to pipe system. The excavation of the foundation base depends on the site condition and engineers' approval but the max excavation depth will not exceed 150cm.

The Pioneer water tank includes several key components: the tank itself, made from stainless steel and customized color options. Site preparation involves ground levelling, compaction, and foundation construction. The installation covers the assembly and erection of the tank, connection of inlet and outlet pipes, and installation of overflow and drainage systems. Surface coating ensures protection, meeting safety and environmental standards

- Capacity: 100 cubic meters (100,000 liters)
- Material: 100% stainless steel for durability
- Design: stainless steel with protective capped bolt system for strength and structural integrity
- Dimensions: Customizable based on specific needs
- Installation: Easy installation with minimal infrastructure and construction personnel
- Certifications: Suitable for earthquake zones, cyclonic regions, heavy industrial environments and manufacturer warranty.

1.2. Supply and install two high-quality 15,000-liter fiberglass water tanks to be placed on the top of an elevated water tower, including all necessary pipe works, valves and fittings to connect the tanks to

the ground reservoir, pumps, and to distribution chamber as shown on the drawing to complete the work ; ensure the tanks feature 2-inch inlet, outlet, and overflow fittings, hydrostatic testing, and final inspection and commissioning for optimal functionality, subject to prior approval by the engineer. The fiberglass needs to be filled with water to check any defects for approval after the installation.

2. Supply and Installation of Pipe and Fittings

2.1. Supply, lay, test and commission outer diameter 25mm HDPE /High Density Polyethylene Pipe/ (PN16) for site sanitary water supply system, as shown on the drawing. The HDPE pipes shall be supplied complete with all the necessary accessories connecting pieces such as bends, Ts, reducers, adaptors, sockets, unions, thrust or hangers blocks & supporters. Unit price shall include the provision of thrust blocks construction at where it is necessary, excavation of trench (in-depth 60cm and up to 1 meter wide to Ordinary, soft rock, bolder and hard rock type), spreading of 100mm thick sand bed underlying the pipes, back fill with selected material, compacting, Disposal of surplus excavated material as directed by the engineer (at least beyond 3 km from the compound) and all necessary assistance to complete the installation works ...etc. including all the incidental works thereto. The installation shall be tested at a pressure of 16kg/cm². The material quality has to meet the required international standards. The product quality assurance certificate has to be submitted along with the material for approval.

2.2. Ditto Item No 01, but diameter OD 50mm Diameter HDPE pipe

2.3. Ditto Item No 01, but diameter OD 40mm Diameter HDPE pipe

These works of pipeline and fitting shall consider the integration with the old water line.

3. Distribution Chamber with RCC concrete cover

3.1. Construct 1m x 1m x 1m, C-20 Reinforced concrete distribution chamber with 20 cm wall and base slab thick. Price includes, bulk excavation of any soil formation (ordinary, soft rock and hard rock), backfill with selected material if required, 25cm thick hard core fill, 5cm lean concrete, fixing and placing reinforcement (double reinforcement of 10 vertical and horizontal with 150 center to center spacings) bar and formwork and fabrication and reinforced placement of concrete cover of 10 cm thick, as shown in the drawing.

II. Supply and Installation of Pump and Control System

1. Supply, install and commission Electrical driven centrifugal booster water pumps. Duty and Standby complete with all accessories, such as pressure gauge, non-return valve, automatic control system, bronze gate valves protection IP54 (according to ICE 60034), etc. The pump shall be made of stainless/tempered steel impeller and shaft with Bus-chrome plated steel feet. The cost shall include provision of gate valves non-return valves and all necessary accessories and assistance works there to.

- Discharge (Q) =5 l/sec Head (H) = 40m
- Efficiency (η , %) \geq 65%

2. Factory assembled and tested surface mounted control board with hot dip powder coated painting, weather proof metal enclosures with lockable doors, earthing, lead connectors labeled with labeling materials and all the necessary accessories consisting of:

- Contactors
- Over load relay

- Main Breaker
- Motor Breakers
- Timer Star/Delta
- Control Breaker
- Control Relay for tank full float switch control
- Selector Switch, 3 position Auto, OFF, Man selection
- Indicators
- Push buttons for manual operation of the pumps
- Level Relay, for dry run protection
- Phase sequence, UV, OV, Phase loss relay
- Astronomic Timer, for alternative operation of each pump
- Digital Ammeter/Voltmeter with relevant CT
- Surge protector with 3 ph 32 Amp breaker
- Busbar and Ground busbars
- Viking Terminals for motor/ level sensors

3. SDB Pump House:

Supply & installation of sheet steel fabricated dust and vermin proof, cubical type, bottom /top entry, compartmentalized (sectioned)

The panel must be fabricated with 14/16 gauge MS sheet having two coats of powder paint

The panel must include:

- Bus bar/Distribution compact busbar/phase bar for balanced distribution of phases
- COMPLETE WITH DIN RAIL, NEUTRAL AND EARTH TERMINALS, with 25% free space

Cabinet Dimension (can propose appropriate dimension) and should contain:

- 1X MCB 40A 6 KA 3 Ph (Incoming)
- 1X MCB 32A 6KA 3 Ph(for pump control board)
- 1X MCB 16A 6KA 1 Ph(for socket)
- 1X MCB 10A 6KA 1 Ph(for Light)
- 1X MCB 10A 6KA 1 Ph(Spare)

4. 1X MCB 40A 6 KA 3 ph (for supplying power to SDB pump House)

5. Power Cable

5.1. From Source to SDB Pump House: 4x6 ,Cu/PVC/PVC ,0.6/1KV

5.2. From SDB Pump house to Motor control board: 4x4 ,Cu/PVC/PVC ,0.6/1KV

5.3. From Motor control board to Pumps: 4x4 ,Cu/PVC/PVC ,0.6/1KV

5.4. 1x6 mmsq cable(yellow/green) for earthing

5.5. Earthing Rod 16mmsq , 1500 mt

5.6. Light points feed through PVC insulated cooper conductor of 2*2.5mm² inside PVC conduit of 13 mm diameter for recessed installation, including junction boxes with cover & insulating type screw cap connectors for complete installation (wire to be of ethioplastic or approved equivalent).

5.7. Flush mounted socket terminal points feed through PVC insulated cooper conductor of 3x2.5mm² and through PVC conduit of 16 mm diameter for flush installation, including junction boxes with covers &

insulating type screw cap connectors and complete with all accessories (wire to be of ethioplastic or approved equivalents).

6. Type of Light Fitting With lamp and socket outlet (Specified type or approved equivalent)

6.1. MODULUS 014253 - 2x36w T8/G13 PRM

6.2. Flush mounted socket outlet LEGRAND, SUNO, or approved equivalent with appropriate cover plate & scattola

7. Surface Pump Seat and shade

7.1. Construct 1.50 x 1.50m C-20 Reinforced concrete Pump Seat as shown in the detail drawing. Price includes, lean concrete, fixing and casting C-25 reinforcement bar and formwork and fabrication and Reinforced placement as shown in the drawing.

7.2. Construct C-20 concrete manholes for electrical with reinforced concrete wall and bottom slab 15 cm thick and reinforcement bar (diameter 10 Center to Center 200mm both ways horizontal and vertical) complete with 10 cm thick concrete manhole cover and all assistance civil works to complete the work. Price shall include all excavation and earth work including cart away surplus material from site, Size :- 50x50x50cm "

Note :- All materials specified on the drawing and specification is subjected to the engineer approval prior to production and installation work.

III. **Elevated Water tower construction**

A) **Sub Structure**

1. EXCAVATION AND EARTH WORK

1.1. Clear of the site to remove top soil and vegetation or small bushes or materials to an average depth of 30cm.

1.2. Bulk excavation in ordinary or soft rock soil (medium stiff to stiff, reddish brown high plastic clayey silt) to an average depth not more than 150 cm from stripped level.

1.3. Ditto to item 1.2 but to an average depth not more than 400 cm

1.4. Pit excavation in ordinary or soft rock soil (medium stiff to stiff, reddish brown high plastic clayey silt) to an average depth not more than 150 cm from stripped level.

1.5. Ditto to item 1.4 but to an average depth not more than 400 cm

1.6. Bulk excavation in hard rock to an average depth not more than 150 cm from stripped level.

1.7. Ditto to item 1.4 but to an average depth not more than 400 cm

1.8. Provide, back fill and compact selected granular material under excavated area and around masonry. Selected material shall be non-expansive granular selected material fill with maximum PI value of 12, well compacted in layers of 20 cm by sprinkling water to ensure a proctor density of 95%.

1.9. Cart away surplus excavated material and deposit at a suitable place outside the compound.

1.10. 25 cm thick basaltic or equivalent stone hard-core well rolled, consolidated and blinded with crushed stone.

1.11. Demolish the existing masonry water tanker seat, including the removal of its concrete base and the masonry below ground level. The price should cover all demolition activities and handover the masonry stones to the hospital as directed by the engineer. Existing average external size of the masonry seat is 6x5x2.5 meter "

- 1.12. Demolish the existing concrete water tanker seat, including the removal of its concrete base and the structure below ground level. The price should cover all demolition activities and cart away the demolished materials away from the site to an average distance of 5 km.

2. CONCRETE WORK

- 2.1. 5cm thick lean concrete in C-5, 150kg of cement/m³ of concrete under: Underground slab, Foundation Pads
- 2.2. Concrete in C-25 with OPC of grade 42.5N or above (with minimum 28-days 15cm cube compressive strength of 25MPa), 360kg of cement /m³ of concrete & filled in to formwork and vibrated around reinforcements. Formwork and reinforcements shall be measured separately. This concrete is to be used in foundation pads and column, in ground floor beams.
- 2.3. Concrete in C-20, 320kg of cement /m³ of concrete & filled in to formwork and vibrated around reinforcements. Formwork and reinforcements shall be measured separately. This concrete is to be used in 15 cm thick RC slab.
- 2.4. Provide, cut and fix in position sawn wooden formwork or equivalent to get fair face concrete to foundation pads and column, to ground floor beams.
- 2.5. Steel reinforcements bar with minimum yield strength of 450MPa for dia. >6mm according to the drawing, price shall include cutting, bending, placing in position, using tying wires and spacers. The steel type to be used are: Ø8 mm deformed bar, Ø14 mm deformed bar, and Ø16 mm deformed bar.

3. MASONRY WORKS

- 3.1. 50cm thick basaltic or equivalent stone masonry foundation below NGL, bedded and jointed in cement and sand mortar, 1:4.
- 3.2. Ditto as item no. 3.1 but above NGL
- 3.3. Supply, cut and fix in position 100x10mm chip wood or Styrofoam as joint separator between basement beam and basement floor slab.

B) SUPER-STRUCTURE

1. CONCRETE WORK

- 1.1. Concrete in C-25 with OPC of grade 42.5N or above (with minimum 28-days 15cm cube compressive strength of 25MPa), 360kg of cement /m³ of concrete filled in to formwork and vibrated around reinforcements. Formwork and reinforcements shall be measured separately. The concrete grade is to be used in elevation columns, in ring beams and top tie beams, and in suspended slabs.
- 1.2. Provide, cut and fix in position sawn wooden formwork or equivalent to get fair face concrete in elevation columns, in ring beams and top tie beams, and in suspended slabs and parapet walls.
- 1.3. Steel reinforcements bar with minimum yield strength of 450MPa for dia. >6mm according to the drawing, price shall include cutting, bending, placing in position, using tying wires and spacers. Ø 8 mm deformed bar, Ø10 mm deformed bar, Ø12 mm deformed bar, Ø14 mm deformed bar, Ø 16 mm deformed bar, Ø 20 mm deformed bar.

2. ROOF SLAB WORK

- 2.1. Sika or equivalent water proofing material to suspended floor slab, parapet wall and Roof slab. Sample must be approved by the engineer.
- 2.2. Apply minimum 50.0mm thick cement screening of C-25 concrete of fine aggregate to the top slab and

suspended slab. The minimum slope of the top slab screening shall be 1.0% for storm water drainage.

3. METAL AND STEEL STRUCTURE WORK

Supply and fix steel structure as shown on the drawing. Joints shall be well welded. Price shall include two coats of anti-rust and two coats of metallic paint. Price shall also include all the necessary material, labor and any incidental civil work required to secure installation and make all the system complete. All materials specified on the drawing is subjected to the engineer approval prior to production and installation work.

- 3.1. Supply and install 15-meter height 40X40X3mm RHS steel ladder for elevated water tower, safety cage and with all necessary materials and accessories to complete the work as shown on the details of the working drawing. Price shall include two coat of antirust and metal paint as per the engineers' direction.

4. PLASTERING Work

- 4.1. Apply two coats of plaster in cement sand mortar 1:3 to concrete parapet internal and external wall surfaces.

- 4.2. Supply and lay 30 cm wide and 2 mm thick marble copping to the top parapet wall. The marble shall be prepared drip in both direction as per the standard.

Note : All materials specified on the drawing and specification is subjected to the engineer approval prior to production and installation work.