

**ANNEX 1 : SCHEDULE OF REQUIREMENTS (TECHNICAL SPECIFICATION  
FOR SECTION A)**

ANNEX 1-SECTION A			
Item No.	Item Details	Quantity	Unit of Measure
<b>1.0</b>	<b>Solar PV Module</b>		
	<p>Total Wattage Capacity: Should be at least 1.5 of submersible pump capacity.</p> <p>Mono or Poly Crystalline Silicon.</p> <p>Class A.</p> <p>Panel capacity should be <math>\geq 400\text{Wp}</math> under STC.</p> <p>Positive power tolerance +3% or 0-5 Watt.</p> <p>More than 19 % conversion efficiency under STC.</p> <p>Data sheet of PV module that contains the P-V &amp; I-V Curves, all electrical and mechanical Data, Dimensions, Module area must be provided by bidder.</p> <p>40°C to 85°C operating temperature range.</p> <p>Temperature Characteristics: "Pmax: <math>\leq -0.40\% / ^\circ\text{C}</math>, VOC: <math>\leq -0.31\% / ^\circ\text{C}</math>"</p> <p>Nominal operating cell temperature (NOCT): <math>45 \pm 2^\circ\text{C}</math>.</p> <p>The operating voltage of proposed modules should not be less than 1000 VDC.</p> <p>Junction box of IP 67 and heat-resistance bypass diodes.</p> <p>High transparency and transmittance, tempered glass of 3 – 4 mm thickness.</p> <p>Must conform to CE, IEC 61215/ 61730/ 61701/62716, TUV, ISO, UL certificates or equivalent standards.</p> <p>Linear performance: Nominal power output not less than 90% after 10 years, 80% after 25 years and Product warranty for 10 years.</p> <p>Annual linear degradation rate should be less than 0.9%.</p> <p>The solar modules shall be provided with RF identification label. This should include following essential information:</p> <ol style="list-style-type: none"> <li>Name of the PV module manufacturer.</li> <li>Type or model number.</li> <li>Batch/serial number.</li> <li>Country of solar cells/module origin.</li> <li>Year of solar module manufacture.</li> </ol>	1	L.S
<b>2.0</b>	<b>Mounting Structure</b>		
	<p>The PV modules shall be mounted on fixed metallic structures having adequate strength and appropriate design, which can withstand the load of the modules and high wind velocities.</p> <p>The support structure shall be hot dip galvanized steel or corrosion resistant aluminum.</p> <p>The structure should be capable of withstanding a wind load of 120 km/hr.</p> <p>The module alignment and tilt angle shall be calculated to provide maximum annual energy output wherever possible.</p> <p>Hot dip galvanized MS mounting structures should be used for mounting the modules / arrays. Minimum thickness of galvanization should be at least 80-120 microns as per ASTM A123 or ASTM A153 and ASTM A385.</p> <p>There should be adequate clearance between module and roofing material to prevent excessive heat being transferred to panels.</p> <p>The elevated structure must be Securely and directly anchored to the concrete rooftop using appropriate size nickel coated steel anchor bolts. Reinforced concrete of appropriate weight should be used for anchoring the structure feet's to keep their resistance for wind load.</p> <p>anti-theft bolts, nuts, fasteners, panel mounting clamps should be Stainless steel.</p> <p>Installation: The structures shall be designed for simple mechanical on-site installation. Access for panel cleaning and maintenance All solar panels must be accessible from the top for cleaning and from the bottom for access to the module-junction box.</p> <p>The Installer shall specify installation details of the solar PV modules and the support structures with lay-out drawings and array connection diagrams. Such details shall include, but not limited to, the following: Array tilt angle to the horizontal, Details with drawings for fixing the modules, Structure installation details and drawings, electrical grounding (Earthing). The work shall be carried out as per the designs approved by the EPC Contractor.</p>	1	L.S
<b>3.0</b>	<b>Combiner Box</b>		
	<p>The PV combiner box shall be used to combine the multiple DC input to one output, and it shall comply with the following specifications as minimum.</p> <p>Enclosure materials: Coated metal with lockable door.</p> <p>Enclosure protection: IP65.</p> <p>Number of input circuit: total number of strings + 2 strings spare ,inputs. at least 4</p> <p>DC fuse rating for each string:1000V, 15 A.</p> <p>DC output circuit: not less than 40 A, 1000 VDC breaker;</p> <p>Built in surge protection device;</p> <p>Anti-backflow diodes.</p>	1	PCS
<b>4.0</b>	<b>Solar Pumping inverter VFD</b>		

	<p>solar pumping drive with in-built MPPT, VFD (Variable Frequency drive).  The drive rating should be 1.5 X AC pump capacity.  Three phase output, voltage range 380-420 V;  Efficiency: Not less than 95%;  Output Frequency: 50Hz±3%;  Enclosure class should be not less than IP55.  Maximum input voltage Voc: not less than 800 VDC;  Operating temperature: up to 50 °C;  The device shall allow hybrid operation with external power source, where solar power should be configured as the primary power source;  soft start, V/F stable speed control during solar radiation changes, adjustable auto/ manual start in early morning, auto wakeup after adjustable hibernation time in cloudy days, o inputs for pressure switch and water level sensor to protect the pump against dry running and tank full water or closed pipeline (high pressure)  Display: LCD Screen display with Cover + LED status indicator;  Protection: Over-Voltage, pump Over-Current, pump Over-Load, Over-Temperature, pump Phase Loss, pump Short-Circuit, ground fault, solar low power, DC Input Anti-reverse, AC output unbalance (3Phase);</p>	1	PCS
5.0	<b>Submersible Pump and Motor</b>		
	<p>Required Capacity:  <b>Q = 18 m³/hr , TDH: 85 m</b>  Pump  Submersible pump Mixed flow multi -stage separate type, AC 3Ph motor type, the motor pump Sets should be used for the solar PV, Starting compatible with AC VFD operation, bidders shall indicate manufacture, country of origin and model. It shall follow below features as minimum:  Cooling sleeve suitable for borehole well internal diameter  Pump Efficiency at Duty Point: Not less than 70%;  Casing (Pump Bowl ) , Impeller , Wear Rings, Pump delivery and Housing , Check valve (None Return Valve) , Inlet strainer should be comply with: (AISI 304 or equivalent) or higher specification materials.  Shaft and coupling, Shaft sleeve, Bearing bush, Guide bearing, Screw, stud, nut, washer.. etc should be comply with: (AISI 304 or equivalent) or higher specification materials.  Maximum allowable sand: 100gr/m3.  Coupling: according to NEMA.  <b>Salt Water :TDDS 2700 mg/L.</b>  <b>Motor</b>  The motors shall be Rewindable frame, insulation rating is compatible with AC VFD operation  Rated Voltage:380/400VAC  Insulation Material and Class, PE2+PA, F or H  Ambient water temp:50 C°  IP: not less than 68  Motor Efficiency: Not less than 80%  Shaft, Motor Sleeve, Motor Housing, Diaphragm cover, bolts, Nuts, Studs, screws Washers etc. should be comply with: (AISI 304 or equivalent) or higher specification materials.  Shaft Seal (Mechanical Seal) Tungsten carbide/ceramic- Diaphragm Nitrile Rubber Radial Bearing (Guide Bearing) Graphite or superior Axial Bearing (Thrust Bearing) Graphite/ S.S Pads superior, Rubber Parts NBR or equivalent</p>	1	PCS
6.0	<b>System Cables (including cable pipes)</b>		
	<p>Cables should be sized in accordance to IEC 60364-5-52 standard, bidders should indicate cable sizing, and voltage drop calculations considering the following:  The total voltage drop on the cable segments from the solar PV modules to the system inverter shall not exceed 3.0%.  The total voltage drop on the cable segments from the solar grid inverter to the pump shall not exceed 3.0%.  Shall meet IEC 60227, EN 60228, IEC 60502 standards or equivalent.  Temp. Range: -10°C to +80°C.  Voltage rating: up to 1000V.  <b>DC Cables:</b>  conductors shall flexible tinned copper, Multi-stranded,Insulated and Sheathed.  Soft annealed tin-coated flexible stranded copper. Halogen-free, thermoset polyolefin specifically designed for maximum flexibility.  low smoke non-halogenated, flame retardant, oil, abrasion, chemical and sunlight resistant cross-linked compound meeting UL 44 and TUV.  Cable ends connections are to be made through suitable lugs or terminals, crimped properly &amp; with use of cable glands.  <b>AC Cables:</b>  Type of Conductor: copper, flexible, finely multi stranded, Insulation: black poly chloroprene, HO7RN -F or equivalent material.  All cable/wires are to be routed in PVC PIPE SCH 40 and high quality Trunking and suitably tagged and marked with cross markers so that the cable can be identified.</p>		
6.1	PV Array to Combiner Box: not less than 1*6 sqr.mm,1 KV (Red& Black)	120	M
6.2	Cable between combiner box and inverter: not less than 1*35 sqr.mm, 1 KV (Red& Black)	100	M
6.3	AC Submersible Pump Cable: not less than 3*16 sqr.mm, 450/750 V	100	M
6.4	Level Sensor Cable with probe :not less than 1*1.5 sqr.mm	100	M
6.5	Excavation for PVC PIPE (in all types of soil) and backfill of cable trench and PVC PIPE trench with cross section size of 0.8 meter depth and 0.6 meter width including shoring and shuttering works (If Required).	30	M

<b>7.0</b>	<b>Earthing System and Lightening Protection System</b>		
	<p>Earthing System and Lightening Protection System as per technical specifications and drawings including cabling, cable lugs, Earthing rods and all required accessories AC and DC Earthing</p> <p><b>Earthing System</b></p> <ul style="list-style-type: none"> <li>- All PV modules shall be grounded in accordance to the manufacturer instruction</li> <li>- Each array structure of the PV modules should be grounded properly.</li> <li>- All metal casing/shielding of the system and its components should be thoroughly grounded.</li> <li>- Earthing System shall be comply with IEC/BS EN 62305-3.</li> <li>- Earthing System clamps shall be used.</li> <li>- Earthing System equipment shall include SPD, Earth pits and Rods.</li> <li>- Earthing System resistance should be not more than 5 ohm.</li> </ul> <p><b>Lightning System</b></p> <ul style="list-style-type: none"> <li>- Lightning arrester should be provided.</li> <li>- Lightning arrester shall be installed with height to protect all PV arrays.</li> <li>- Lightning System shall be comply with IEC/BS EN 62305-3.</li> <li>- Minimum height of lightning arrester is 3 m.</li> <li>- Number of lightning arrester as the system required.</li> <li>- Lightning protection equipment shall include lightening protection pits and rods.</li> <li>- System resistance should be not more than 5 ohm.</li> </ul>	1	L.S
<b>8.0</b>	<b>Raiser Pipes</b>		
	<p>Materials: UPVC "high pressure pipes"</p> <p>Joint Type: Square Type Threaded Couplings.</p> <p>Pipes package shall include the following:</p> <p>Top and bottom Adaptors, SS AISI 304 or equivalent</p> <p>Pump guard set and all other accessories</p> <p>Diameter: 2.5 Inch, 3 m, 25 bar.</p>	20	PCS
<b>9.0</b>	<b>Stainless Steel Non-return Valves</b>		
	<p>Nominal Diameter (DN): 2.5 inch</p> <p>Nominal Pressure (PN): 25 bar.</p> <p>Connection Type: Flanged.</p> <p>BS Standard or Equivalent</p> <p>Material: Stainless steel</p> <p>Including all required accessories</p>	1	PCS
<b>10.0</b>	<b>Stainless Steel Gate Valves</b>		
	<p>Nominal Diameter (DN): 2.5 inch.</p> <p>Nominal Pressure (PN): 25.</p> <p>Connection Type: Flanged.</p> <p>BS standard or Equivalent.</p> <p>Operator: Hand Wheel</p> <p>Resilient Seated.</p> <p>Material: Stainless Steel</p> <p>Including all required accessories</p>	1	PCS

<b>11.0</b>	<b>Mechanical Water Flow Meter</b>		
	<p>Inline, Flanged, Magnetic type, Dray dial, turbine flow meter with all needed accessories such as threaded flanges, gaskets and bolts.</p> <p>Nominal Pressure (PN): 25.</p> <p>Body: Cast Iron</p> <p>EN14154, ISO4064 or equivalent</p> <p>Transient Flow Qt : Shall be less than 50% of Pump flow rate.</p> <p>Accuracy: <math>\pm 2\%</math> of Nominal flow</p> <p>Maximum dial indication: 999999</p> <p>Measuring Units: cubic meter m3</p> <p>Including all required accessories</p>	1	PCS
<b>12.0</b>	<b>Analog Pressure Gage</b>		
	<p>Reading range: Shall be specified according to the pressure on the installation point.</p> <p>Process connection: NPT connection 1/2" or 1/4".</p> <p>Pressure gauge should be equipped with isolation Stainless steel 1/2 inch Ball valve of the same pressure rating.</p> <p>Casing: Stainless steel</p>	1	PCS
<b>13.0</b>	<b>Valve Chamber</b>		
	<p>C.S cover, Min. plate thickness 3mm, angle of the frame 50x50x5mm, shall be painted with at least two layers, anti corrosion and enamel, cover shall be sloped to avoid water contain.</p> <p>15cm solid concrete block Wall shall be plastered and painted from internal and external surfaces.</p>	1	PCS
<b>14.0</b>	<b>Well Cap / cover and carrying clamps (Support bracket):</b>		
	<p>Material: made from A36 or equivalent CS plate</p> <p>Min. thickness: 18 mm for borehole wells caps</p> <p>Painted by Anti-corrosion Paint</p> <p>Diameter: as per well diameter (12 inches)</p> <p>Fabricated with stiffeners and holes for pump and sensor cables</p> <p>Including all required accessories</p>	1	PCS
<b>15.0</b>	<b>Security Fence (Chain Link Fabric)</b>		
	<p>Security Fence : Should be at least 120 Meter , fence mesh protection 50*50mm, 3.15mm thickness fence, excellent quality iron, height of 2 meters, thickness of not less than 3 mm, plus 0.5m of barbed wire (3 layers) protection around solar panels with everything necessary, and installing it in lists of galvanized pipes, diameter of 1.5 inches every 3 meters, with fixing of rolls in regular concrete 40 x 40 cm and depth not Less than 50 cm under the ground, fixing the bottom of the grille with a concrete block size 20 x 10 cm, and providing the fence with a door of the grate with grates and all that is needed 1 x 2 meters, with the work of reinforcing the fence with galvanized iron pipes with a diameter of 1.5 inches between each two pipes at the top The grille to install it, weld a 40 x 60 cm plate with the UNDP logo on it and do whatever the work shall be carried out as per as per drawing and the designs approved by the UNDP Project engineer.</p> <p><b>Security Fence should be for all Solar Panels, Mounting Structures, Caravan Room and Tanks as required the system</b></p>	1	L.S
<b>16.0</b>	<b>Warranty</b>		
	2 years product and performance warranty	1	L.S
<b>17.0</b>	<b>Others</b>		
17.1	Project board that contain the project information written in Arabic and English	1	PCS
17.2	End user training on operation and maintenance	1	L.S
17.3	Existing System Removing	1	L.S

**ANNEX 1: SCHEDULE OF REQUIREMENTS (TECHNICAL SPECIFICATION  
FOR SECTION B)**

**ANNEX 1 SECTION B**

Item No.	Item Details	Quantity	Unit of Measurement
<b>1.0</b>	<b>Solar PV Module:</b>		
	<p>Wattage Capacity of solar panels for each pump in the system should be at least 1.5 of pump capacity. Total Wattage Capacity: Should be at least 52KWp. Mono or Poly Crystalline Silicon. Class A. Panel capacity should be <math>\geq 400\text{Wp}</math> under STC. Positive power tolerance +3% or 0-5 Watt. More than 19 % conversion efficiency under STC. Data sheet of PV module that contains the P-V &amp; I-V Curves, all electrical and mechanical Data, Dimensions, Module area must be provided by bidder. 40°C to 85°C operating temperature range. Temperature Characteristics: "Pmax: <math>\leq -0.40\% / ^\circ\text{C}</math> , VOC: <math>\leq -0.31\% / ^\circ\text{C}</math>" Nominal operating cell temperature (NOCT): <math>45 \pm 2^\circ\text{C}</math>. The operating voltage of proposed modules should not be less than 1000 VDC. Junction box of IP 67 and heat-resistance bypass diodes. High transparency and transmittance, tempered glass of 3 – 4 mm thickness. Must conform to CE, IEC 61215/ 61730/ 61701/62716, TUV, ISO, UL certificates or equivalent standards. Linear performance: Nominal power output not less than 90% after 10 years, 80% after 25 years and Product warranty for 10 years. Annual linear degradation rate should be less than 0.9%. The solar modules shall be provided with RF identification label. This should include following essential information: a. Name of the PV module manufacturer. b. Type or model number. c. Batch/serial number. d. Country of solar cells/module origin.</p>	1	L.S
<b>2.0</b>	<b>Mounting Structure:</b>		
	<p>The PV modules shall be mounted on fixed metallic structures having adequate strength and appropriate design, which can withstand the load of the modules and high wind velocities. The support structure shall be hot dip galvanized steel or corrosion resistant aluminum. The structure should be capable of withstanding a wind load of 120 km/hr. The module alignment and tilt angle shall be calculated to provide maximum annual energy output wherever possible. Hot dip galvanized MS mounting structures should be used for mounting the modules / arrays. Minimum thickness of galvanization should be at least 80-120 microns as per ASTM A123 or ASTM A153 and ASTM A385. There should be adequate clearance between module and roofing material to prevent excessive heat being transferred to panels. The elevated structure must be Securely and directly anchored to the concrete rooftop using appropriate size nickel coated steel anchor bolts. Reinforced concrete of appropriate weight should be used for anchoring the structure feet's to keep their resistance for wind load. anti-theft bolts, nuts, fasteners, panel mounting clamps should be Stainless steel. Installation: The structures shall be designed for simple mechanical on-site installation. Access for panel cleaning and maintenance All solar panels must be accessible from the top for cleaning and from the bottom for access to the module-junction box. The Installer shall specify installation details of the solar PV modules and the support structures with lay-out drawings and array connection diagrams. Such details shall include, but not limited to, the following: Array tilt angle to the horizontal, Details with drawings for fixing the modules, Structure installation details and drawings, electrical grounding (Earthing). The work shall be carried out as per the designs approved by the UNBS.</p>	1	L.S
<b>3.0</b>	<b>Combiner Box</b>		
	<p>The PV combiner box shall be used to combine the multiple DC input to one output, and it shall comply with the following specifications as minimum. Enclosure materials: Coated metal with lockable door. Enclosure protection: IP65. Number of input circuit: total number of strings of the system + 2 spare strings ,inputs. at least 5 DC fuse rating for each string:1000V, 15 A. DC output circuit: not less than 63 A, 1000 VDC breaker; Built in surge protection device; Anti-backflow diodes. Operational Environment Temperature: <math>-30^\circ\text{C}</math> ~ <math>+70^\circ\text{C}</math></p>	2	PCS
<b>4.0</b>	<b>System Cables (including cable pipes)</b>		

	<p>Cables should be sized in accordance to IEC 60364-5-52 standard, bidders should indicate cable sizing, and voltage drop calculations considering the following:</p> <p>The total voltage drop on the cable segments from the solar PV modules to the system inverter shall not exceed 3.0%.</p> <p>The total voltage drop on the cable segments from the solar grid inverter to the pump shall not exceed 3.0%.</p> <p>Shall meet IEC 60227, EN 60228, IEC 60502 standards or equivalent.</p> <p>Temp. Range: -10°C to +80°C.</p> <p>Voltage rating: up to 1000V.</p> <p>DC Cables:</p> <p>Conductors shall flexible tinned copper, Multi-stranded, Insulated and Sheathed.</p> <p>Soft annealed tin-coated flexible stranded copper. Halogen-free, thermoset polyolefin specifically designed for maximum flexibility.</p> <p>Low smoke non-halogenated, flame retardant, oil, abrasion, chemical and sunlight resistant cross-linked compound meeting UL 44 and TUV.</p> <p>Cable ends connections are to be made through suitable lugs or terminals, crimped properly &amp; with use of cable glands.</p> <p>AC Cables:</p> <p>Type of Conductor: copper, flexible, finely multi stranded, Insulation: black poly chloroprene.</p> <p>All cable/wires are to be routed in PVC PIPE SCH 40 and high quality Trunking and suitably tagged and</p>		
4.1	PV Array to Combiner Box: not less than 1*6 sqr.mm, 1 KV (Red& Black)	750	M
4.2	Cable between combiner box and inverter: not less than 1*35 sqr.mm, 1 KV (Red& Black)	150	M
4.3	Cable between combiner box and inverter VFD: not less than 1*50 sqr.mm, 1 KV (Red& Black)	120	M
4.5	Sensor Cable with probe :not less than 2*2.5 sqr.mm	100	M
4.5	AC Cable: not less than 4*16 sqr.mm, 450/750 V	60	M
4.6	Excavation for PVC PIPE (in all types of soil) and backfill of cable trench and PVC PIPE trench with cross section size of 0.8 meter depth and 0.6 meter width including shoring and shuttering works (If Required).	80	M
<b>5.0 Earthing System and Lightening Protection System</b>			
	<p>Earthing System and Lightening Protection System as per technical specifications and drawings including cabling, cable lugs, Earthing rods and all required accessories AC and DC Earthing</p> <p><b>Earthing System</b></p> <ul style="list-style-type: none"> <li>- All PV modules shall be grounded in accordance to the manufacturer instruction</li> <li>- Each array structure of the PV modules should be grounded properly.</li> <li>- All metal casing/shielding of the system and its components should be thoroughly grounded.</li> <li>- Earthing System shall be comply with IEC/BS EN 62305-3.</li> <li>- Earthing System clamps shall be used.</li> <li>- Earthing System equipment shall include SPD, Earth pits and Rods.</li> <li>- Earthing System resistance should be not more than 5 ohm.</li> </ul> <p><b>Lightning System</b></p> <ul style="list-style-type: none"> <li>- Lightning arrester should be provided.</li> <li>- Lightning arrester shall be installed with height to protect all PV arrays.</li> <li>- Lightning System shall be comply with IEC/BS EN 62305-3.</li> <li>- Minimum height of lightning arrester is 3 m.</li> <li>- Number of lightning arrester as the system required.</li> <li>- Lightning protection equipment shall include lightening protection pits and rods.</li> <li>- System resistance should be not more than 5 ohm.</li> </ul>	1	L.S

6.0	Reverse Osmosis (RO) Unit		
	<p><b>Performance Data:</b>  Design Permeate Flow: <math>\geq 30 \text{ m}^3/\text{hr}</math>  Feed Flow: <math>\geq 40.00 \text{ m}^3/\text{hr}</math>  Concentrate Flow Rate: <math>\geq 10.00 \text{ m}^3/\text{hr}</math>  Internal Recycle Flow Rate: <math>\geq 7.04 \text{ m}^3/\text{hr}</math>  Recovery: <math>\geq 75 \%</math>  Design Temperature: <math>\geq 30.00 \text{ }^\circ\text{C}</math>  Design pH: 5.5 - 8.5  System Inlet Pressure: <math>\geq 3.4 \text{ bar}</math>  System Operating Pressure 8 bar  Power Frequency: 50hz</p> <p><b>Main Components:</b>  <b>Cartridge Filtration</b>  Housing Quantity: <math>\geq 2</math>, Rating: <math>\geq 1\text{-micron}</math> nominal, Length: <math>\geq 40\text{-inches}</math>, Filter Quantity: <math>\geq 2</math>, TIES of Filter: <math>\geq 54</math>  <b>Membrane Element Housings</b>  Number of Housings: <math>\geq 8</math>, Housing length: <math>\geq 4</math>, Housing Diameter: <math>\geq 8</math>, Banking Arrangements: <math>\geq 5\text{-}3</math>  <b>High-Pressure Pump</b>  Motor HP <math>\geq 30 \text{ HP}</math>, Type: TEFC, Motor Starter and inverter VFD: VFD Skid Mounted, Danfoss or equal  <b>Membrane Elements</b>  Quantity: <math>\geq 32</math>, Membrane Type: FRP Wrapped, PA  <b>CIP System</b>  Pump Power: <math>\geq 10 \text{ HP}</math>, Motor Type TEFC, CIP Tank Volume: 500 gal, Included Motor Starter</p> <p><b>Material of Constructions:</b>  Filter Housing: FRP, White  Feedwater Piping: Schedule 80, PVC  High-Pressure Piping: 316 Stainless Steel, Sch. 10  Permeate Piping: Schedule 80, PVC  Frame: Carbon steel  Membrane Element Housings: FRP  With all Installation and Utility Requirements: Flanges, Control Circuit, and Skid.....etc.</p> <p><b>Controls / Electrical Systems:</b>  Processor: Horner X4 with additional 8 analog inputs  Enclosure: NEMA 4, RO Skid Mounted  Operator Interface: Horner X4 4" Color touchscreen Display  Communications: Ethernet (Modbus TCP/IP, Ethernet/IP, SMTP, more) + CAN-RTU/Serial Modbus Master/Slave</p> <p><b>Instrumentation:</b>  Permeate Conductivity, Flow Meters, Inlet Pressure Switch, Pressure Gauge, Inlet Conductivity, Inlet Temperature RTD, and Inlet ORP Transmitter....etc.</p> <p><b>Membrane System Alarms:</b>  Motor Overload, Low Permeate Flow, Low Concentrate Flow, Low Inlet Pressure, High Inlet Temperature, High Permeate Conductivity, Low Membrane Rejection, High ORP</p> <p><b>Features Included :</b></p> <ul style="list-style-type: none"> <li>• Automatic inlet shutoff valve</li> <li>• Permeate and concentrate flow meters</li> <li>• Remote machine on/off capability</li> <li>• Thermal motor protection</li> <li>• Pre-filter, post-filter, primary, and final pressure gauges</li> <li>• Low voltage control panel mounted on RO skid</li> <li>• Includes external run command; pretreatment lockout; and on/off control of feed pump.</li> <li>• O&amp;M Manual, Electrical, General Dimensional, and Process and Instrumentation Drawings included.</li> <li>• Mill Finish</li> <li>• Electric actuated inlet valve</li> <li>• Includes CIP pump mounted to RO skid. Adds separate CIP cone bottom tank shipped separately from RO skid.</li> </ul> <p>The system should be have solar inverters to work (RO) Unit from the solar panels and all material and accessories ( cables,lugs, glands,circuit breakers,control panels.... etc.)  The system should be have Feeding Pump and all material and accessories to work from solar panels.  The system should be have all material and accessories to work (RO) Unit perfectly.</p>	1	L.S
7.0	(RO) Unit Accessories		
7.1	Tank Capacity of 30,000 Liters and implementation base using Solid Cement Block for tank with all accessories as required the system to work perfectly.	4	PCS
7.2	Multi-Media Filters, with distribution & collection systems and sand & carbon bags with all accessories as required the system to work perfectly.	2	PCS
7.3	Dosing Pumps for Chlorine, Acid & Anit-Scalant with all accessories as required the system to work perfectly.	3	PCS
7.4	Control panel to make the pumps operate in a coordinated way with system alarms. The feeding pump works as long as there is water in the feeding tanks and stops when there is no water in the feeding tanks or fresh water tanks be full. Also, the up pump to the tower tank works as long as there is water in the fresh water tanks and stops when there is no water available in the fresh water tanks. The control panel must contain (four electrical floating switch, contactors, relays, timers, circuit breakers, alarm bells, Metal box...etc.) as required the system to work perfectly.	1	PCS
7.5	Water Network PVC 3" Pipes,Schedule 80. The network PVC connect plastic tanks and (RO) Unit with all accessories as (Valves, flange...etc.)as required the system to work perfectly.	1	L.S
7.6	Caravan Room for (RO) Unit, inverters and electrical panels, size of the room as required the system to work perfectly and as per drawing. Should be below Caravan Room implementation base using concrete cement.	1	PCS

VERTICAL MULTISTAGE ELECTRIC PUMP "pump for raise up water to the tower tank"			
8.0			
8.1	<p>Required Capacity: Q = 20 m³/hr , TDH: 70 m Pump will connect with pipes 4 inch Diameter. Pump: non-self-priming vertical multistage pump coupled to a standard motor. Short-circuit squirrel-cage motor, enclosed construction with external ventilation (TEFC) ,IP55 protection degree, Insulation class 155 (F),Electrical performances according to EN 60034-1. The motor pump Sets should be used for the solar PV, Starting compatible with AC VFD operation, bidders shall indicate manufacture, country of origin and model. Pump Efficiency at Duty Point: Not less than 70%; Impeller, Wear Rings, Pump delivery and Housing, Check valve (None Return Valve) , Inlet strainer should be comply with: (AISI 304 or equivalent) or higher specification materials. Shaft and coupling, Shaft sleeve, Bearing bush, Guide bearing, Screw, stud, nut, washer.. etc should be comply with: (AISI 304 or equivalent) or higher specification materials. Maximum allowable sand: 100gr/m3. Ambient water temp:50 C° Coupling: according to NEMA. The motors shall be Rewindable frame, insulation rating is compatible with AC VFD operation, with all accessories as required the system to work perfectly.</p>	1	PCS
8.2	<p>solar pumping drive with in-built MPPT, VFD (Variable Frequency drive). The drive rating should be 1.5 X AC pump capacity. Efficiency: Not less than 95%; Output Frequency: 50Hz±3%; Enclosure class should be not less than IP55. Maximum input voltage Voc: not less than 800 VDC; Operating temperature: up to 50 °C; The device shall allow hybrid operation with external power source, where solar power should be configured as the primary power source; soft start, V/F stable speed control during solar radiation changes, adjustable auto/ manual start in early morning, auto wakeup after adjustable hibernation time in cloudy days, o inputs for pressure switch and water level sensor to protect the pump against dry running and tank full water or closed pipeline (high pressure) Display: LCD Screen display with Cover + LED status indicator; Protection: Over-Voltage, pump Over-Current, pump Over-Load, Over-Temperature, pump Phase Loss, pump Short-Circuit, ground fault, solar low power, DC Input Anti-reverse, Display content: PV status (Current, Voltage, Power, Energy), AC input voltage, AC output voltage, Load, Running Status, RPM, Load</p>	2	PCS
9.0	Warranty		
	2 years product and performance warranty	1	LS
10.0	Others		
10.1	Project board that contain the project information written in Arabic and English	1	PCS
10.2	End user training on operation and maintenance	1	LS





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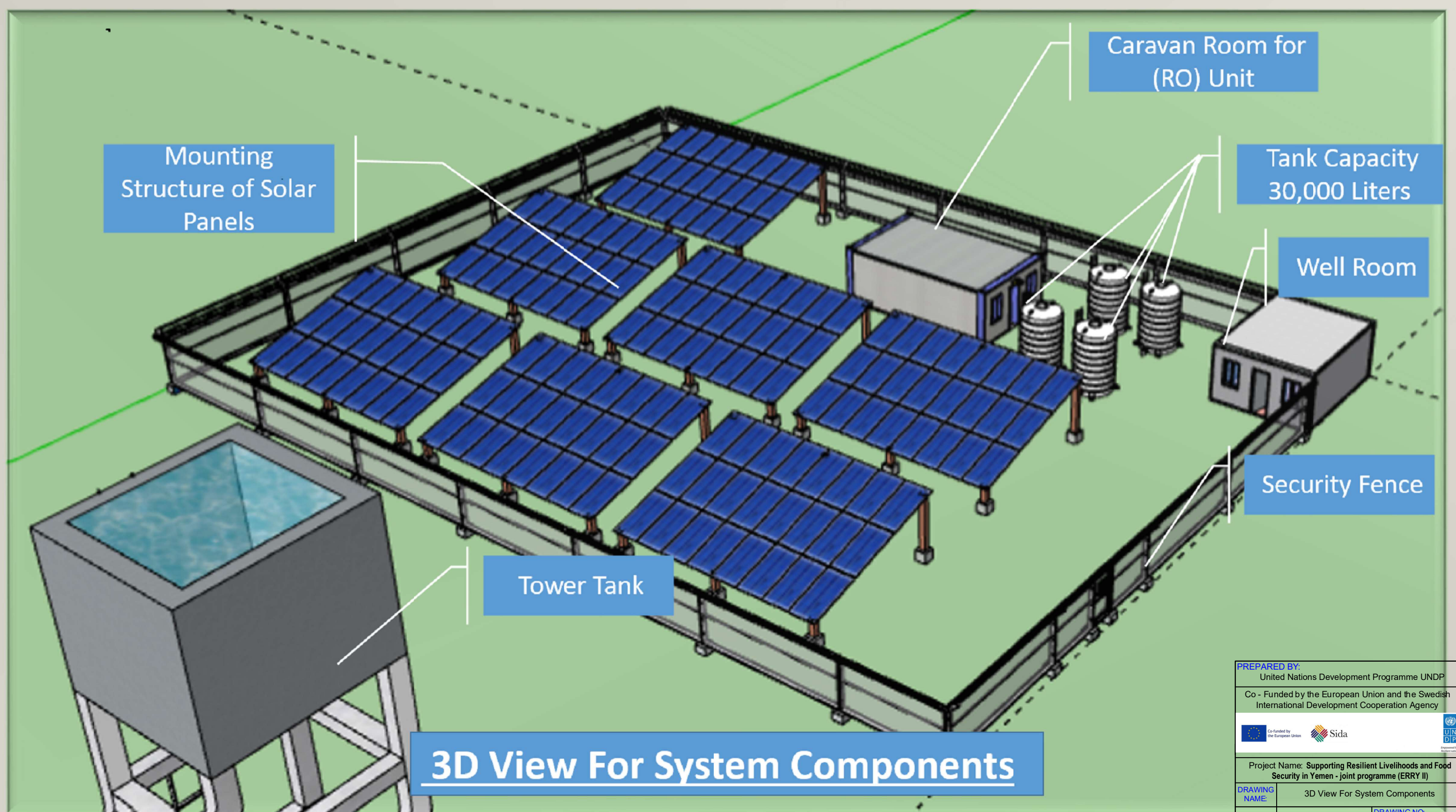


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# Az Zuhrah Solar Pump & RO Unit Drawing

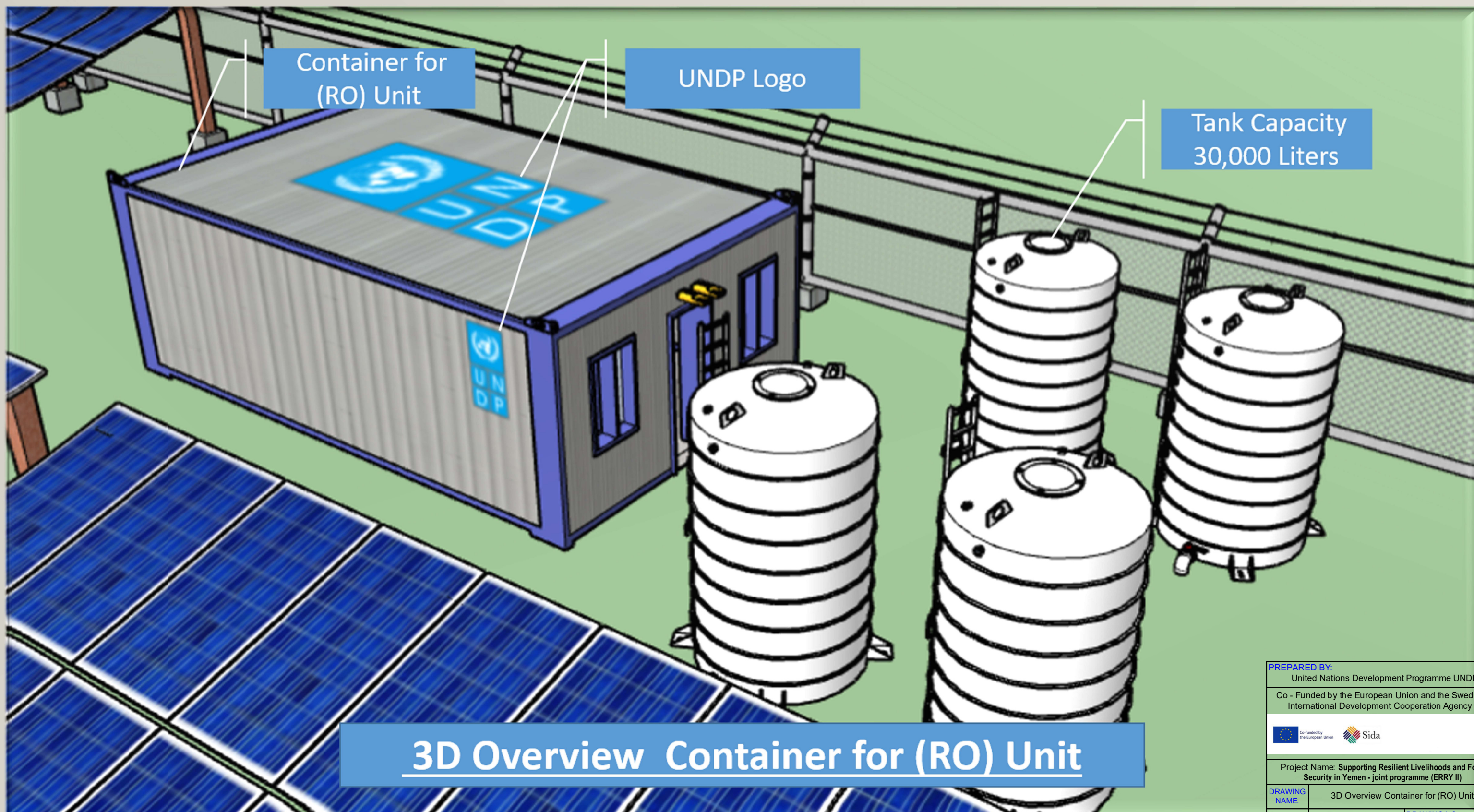
## DRAWING LIST :

D1	3D View For System Components
D2	3D Overview Container for (RO) Unit
D3	3D View Fence Details
D4	WATER PUMP AND PIPING EQUIPMENT
D5	EARTHING PIT, LIGHTING PROTECTION AND BUS BAR DETAILS
D6	EARTHING SYSTEM AND LIGHTNING PROTECTION SYSTEM
D7	STRUCTURAL DESIGN
D8	PROJECT SIGN BOARD



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DRAWING NAME:	3D View For System Components
Contractor Ref.	DRAWING NO: D1





Container for  
(RO) Unit

UNDP Logo

Tank Capacity  
30,000 Liters

## 3D Overview Container for (RO) Unit

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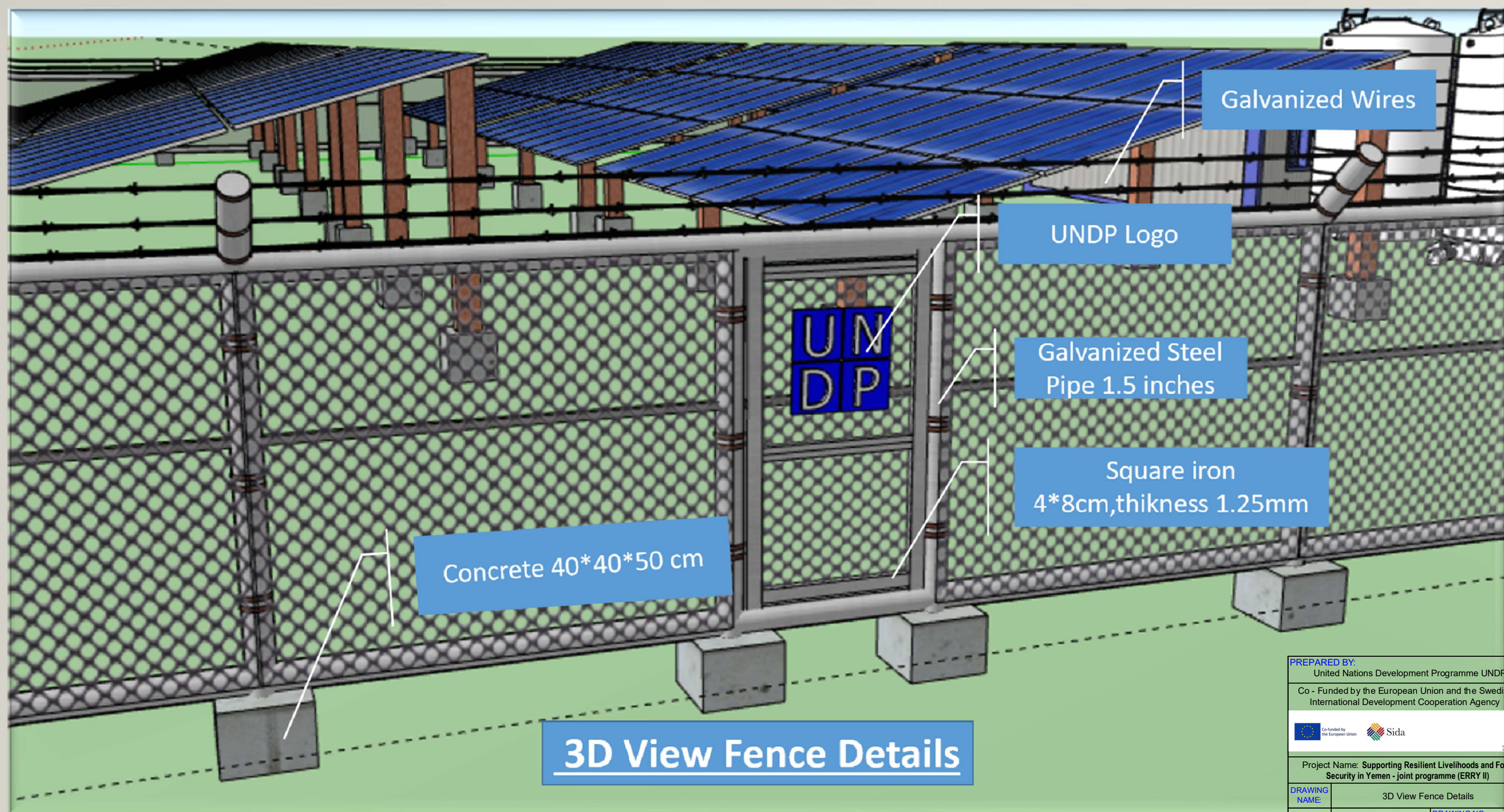


Project Name: Supporting Resilient Livelihoods and Food  
Security in Yemen - joint programme (ERRY II)

DRAWING NAME: 3D Overview Container for (RO) Unit

Contractor Ref. DRAWING NO.  
D2





Galvanized Wires

UNDP Logo

Galvanized Steel  
Pipe 1.5 inches

Square iron  
4\*8cm,thickness 1.25mm

Concrete 40\*40\*50 cm

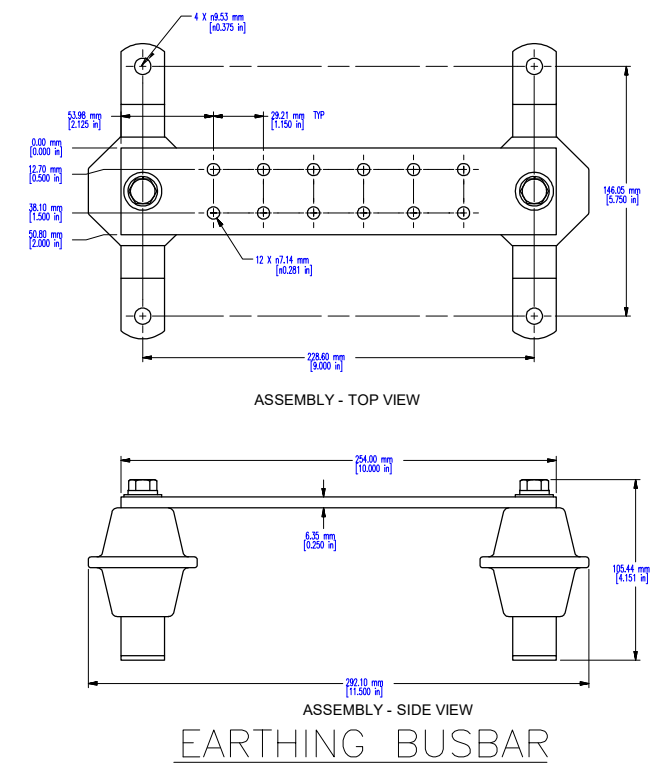
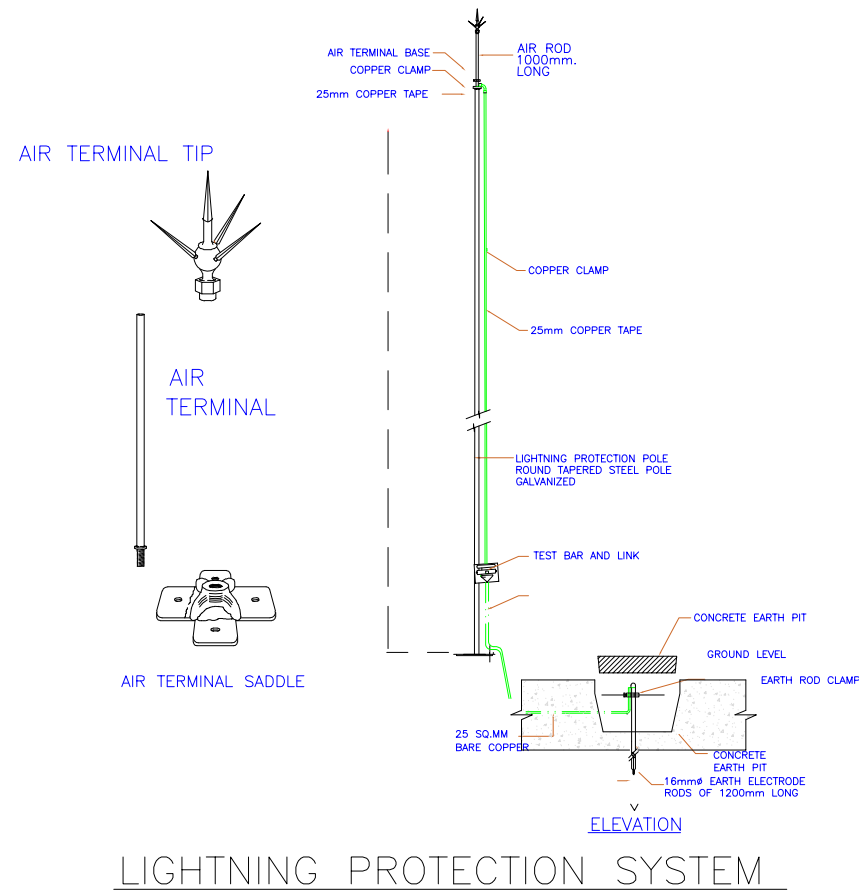
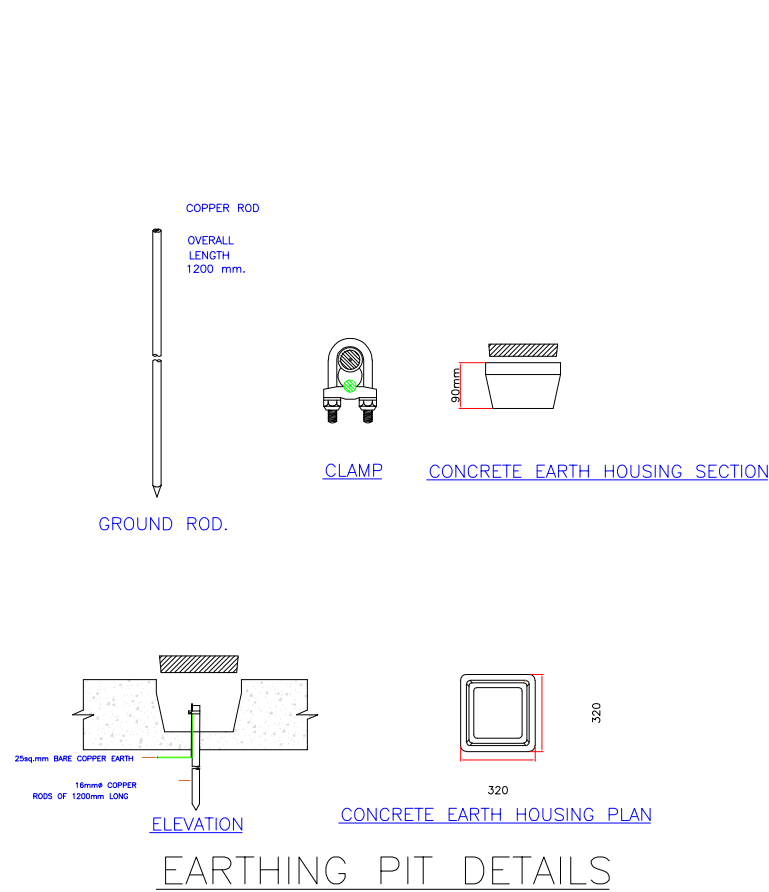
### 3D View Fence Details

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Project Name: Supporting Resilient Livelihoods and Food Security in Yemen - joint programme (ERRY II)	
DRAWING NAME:	3D View Fence Details
Contractor Ref.	DRAWING NO: D3



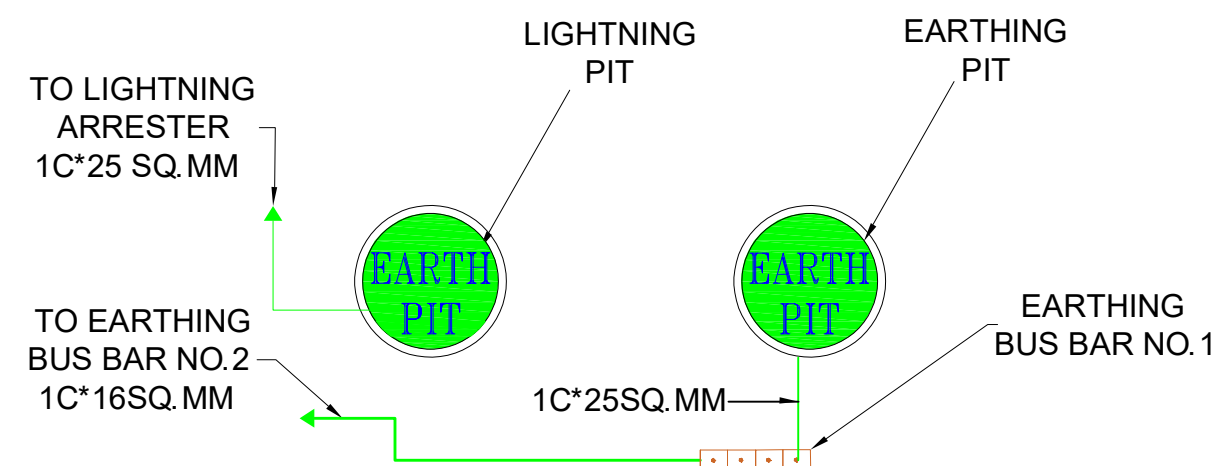
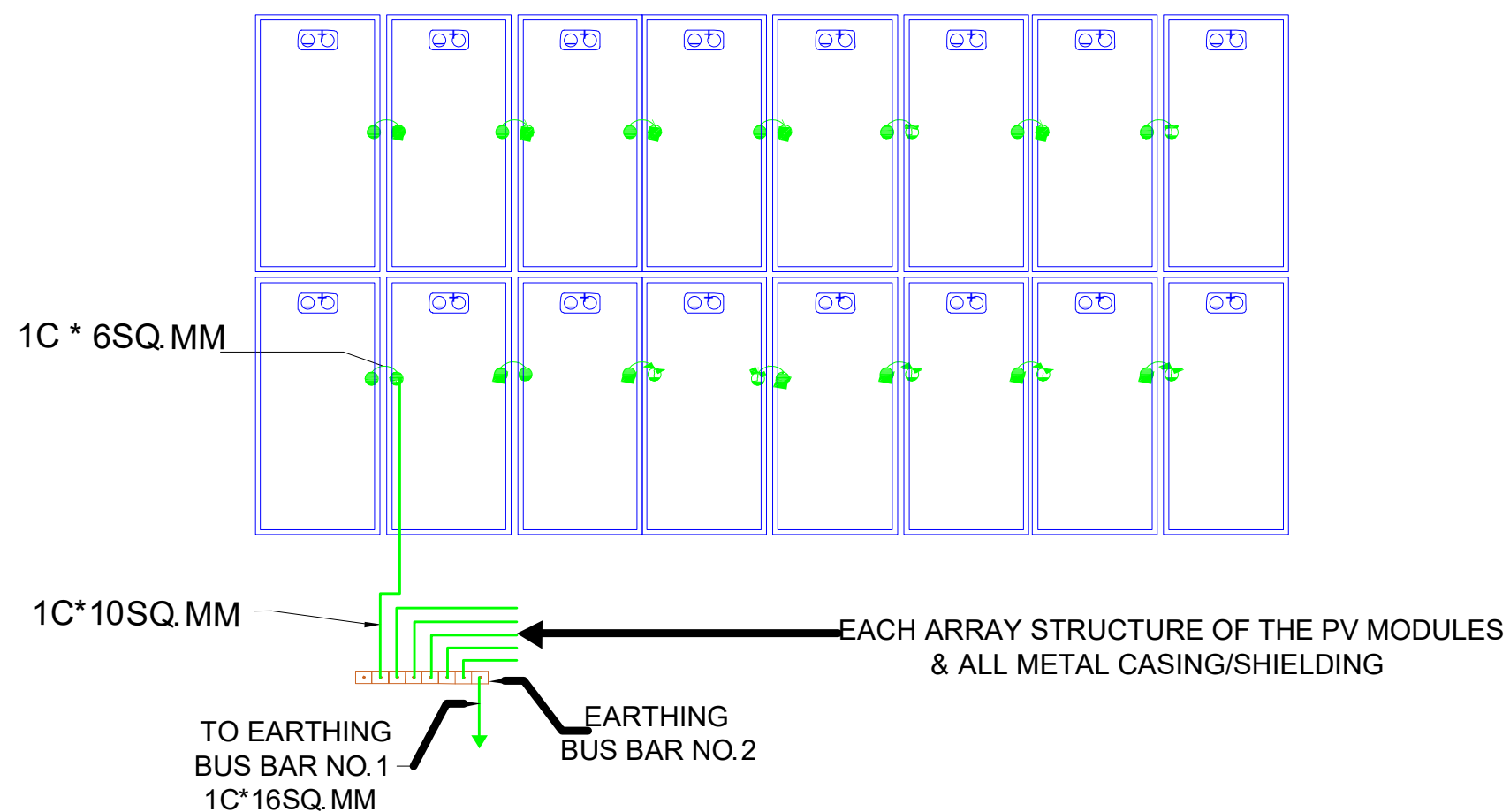


<p><b>PREPARED BY:</b> United Nations Development Programme UNDP</p> <p>Co - Funded by the European Union and the Swedish International Development Cooperation Agency</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Co-funded by the European Union</p> </div> <div style="text-align: center;">  <p>Sida</p> </div> <div style="text-align: center;">  <p>Empowered lives. Resilient nations.</p> </div> </div>		
<p>Project Name: <b>Supporting Resilient Livelihoods and Food Security in Yemen - joint programme (ERRY II)</b></p>		
<p><b>DRAWING NAME:</b></p>	<p><b>WATER PUMP AND PIPING EQUIPMENT</b></p>	
<p>Contractor Ref.</p>		<p><b>DRAWING NO:</b> <b>D4</b></p>



# EARTHING PIT, LIGHTNING PROTECTION AND BUS BAR DETAILS

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Project Name: <b>Supporting Resilient Livelihoods and Food Security in Yemen - joint programme (ERRY II)</b>	
<b>DRAWING NAME:</b>	EARTHING PIT, LIGHTING PROTECTION AND BUS BAR DETAILS
Contractor Ref.	<b>DRAWING NO:</b> <b>D5</b>



# EARTHING SYSTEM AND LIGHTNING PROTECTION SYSTEM

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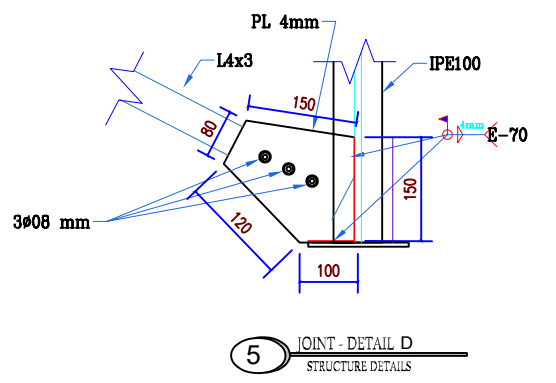
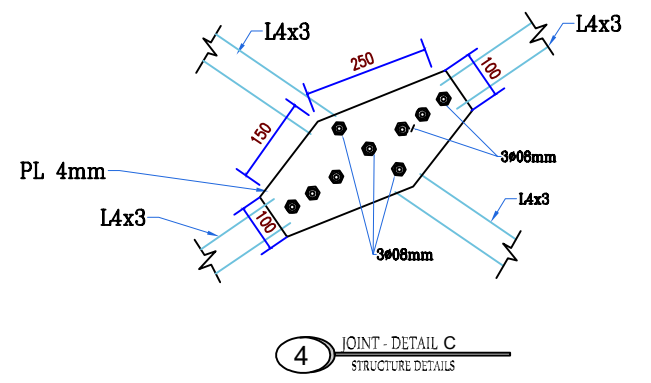
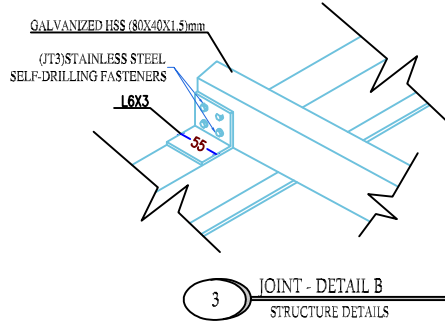
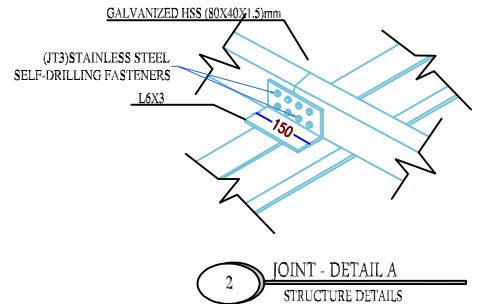
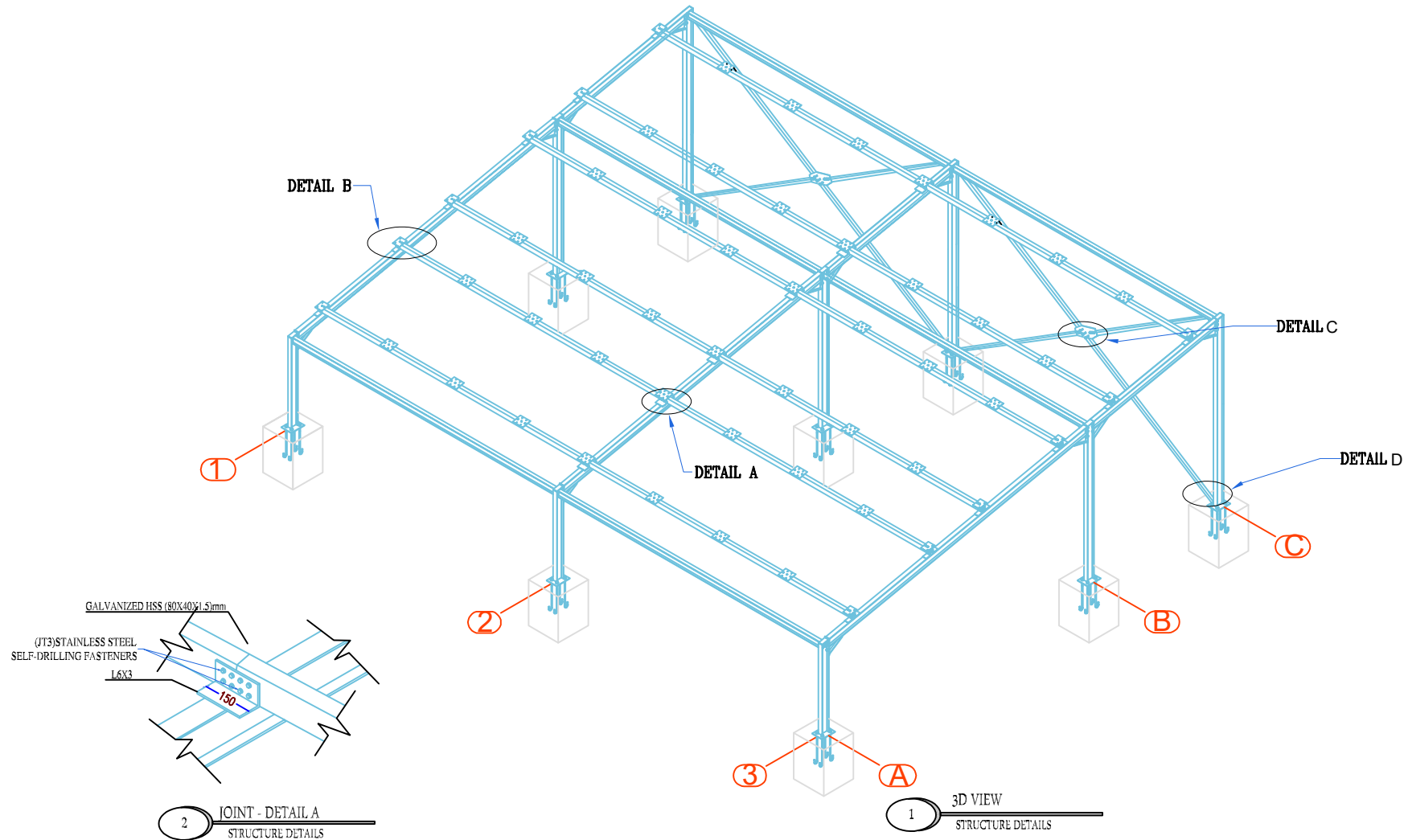


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Project Name: **Supporting Resilient Livelihoods and Food  
Security in Yemen - joint programme (ERRY II)**

DRAWING  
NAME: EARTHING SYSTEM AND LIGHTNING  
PROTECTION SYSTEM

Contractor Ref. DRAWING NO:  
D6



# STRUCTURAL DESIGN

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Project Name: Supporting Resilient Livelihoods and Food Security in Yemen - joint programme (ERRY II)		
DRAWING NAME:	STRUCTURAL DESIGN	
Contractor Ref.		DRAWING NO: D7





PROJECT SIGN BOARD

PREPARED BY: United Nations Development Programme UNDP		
Co - Funded by the European Union and the Swedish International Development Cooperation Agency		
Project Name: Supporting Resilient Livelihoods and Food Security in Yemen - joint programme (ERRY II)		
DRAWING NAME:	PROJECT SIGN BOARD	
Contractor Ref.		DRAWING NO: D8