



شركة السمرات لتوليد الكهرباء
Samra Electric Power Co. [SEPCO]



Tender 76/2023

Electromechanical and Civil Works

Demin Water Storage Tank 2000 m³, Piping Network, Pumping System,
and its accessories.

December 2023

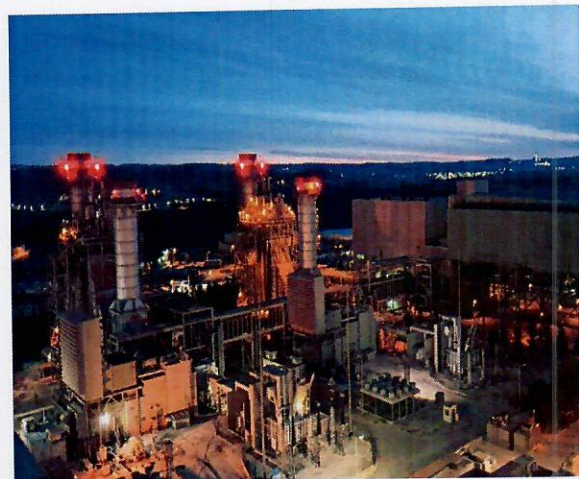
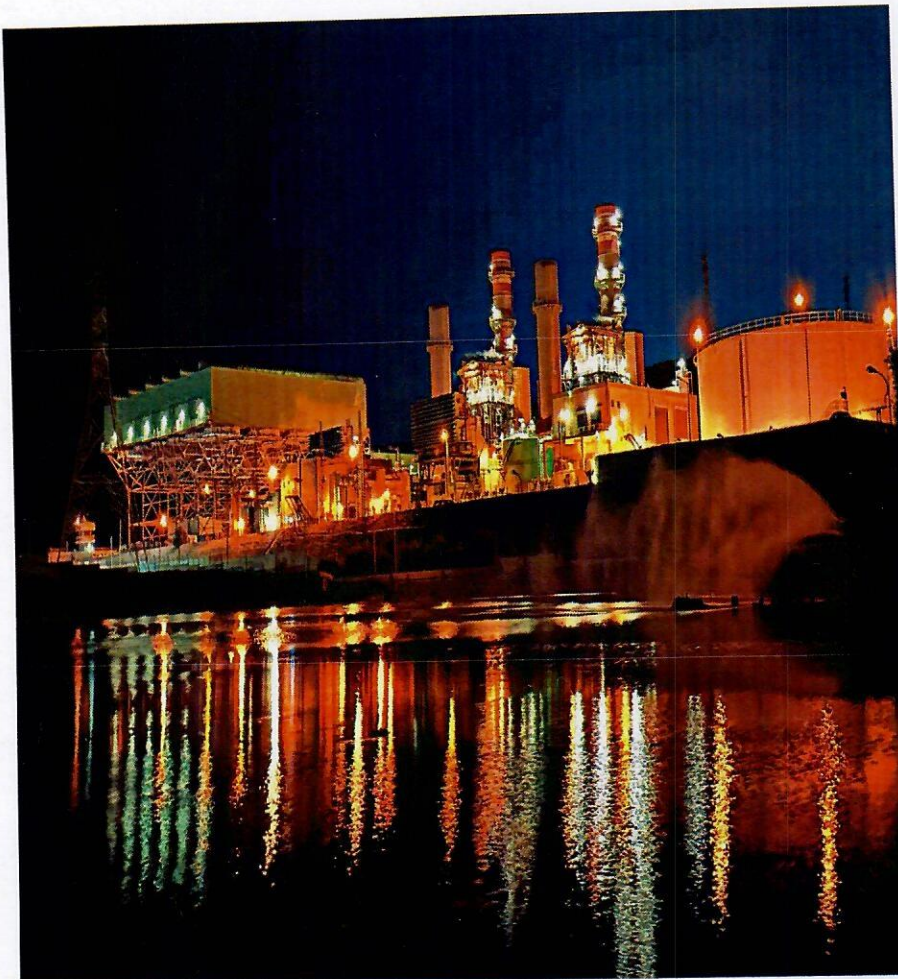


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1.1 Tender Scope

The tender is for providing a demineralized water supply system to meet the requirements of the Fogging System. The existing Phase I, II, and III demineralized water systems are interconnected. A new DM water tank with a working capacity of 2000 m³ will be installed and connected to the demineralized water system of Phase III. The new DM tank will be filled from the suction of the existing DM water tanks of Phase III (2X 500 m³) using two new filling pumps (two pumps with a capacity of 110% and will forward the DM water to the fogging system through two new pumps with a capacity of 110%. Two Isolation valves to be equipped on the main DM water forwarding pipeline to control the DM water flow either to the fogging pumps skids or return the water to the existing DM Water tanks of phase III to support the power plant operations during periods when the fogging system is not in operation.

The Project will be implemented on a turnkey basis and shall include all civil works, equipment, material, systems, and services to integrate the new DM water tank, pumping system, piping network, supports, valves, flanges, Electrical cabling, motor local panel, instruments, control and monitoring system with the existing DM water system and Fogging system and existing DCS to render the system fully complete and functional for safe, reliable, and commercial operation under all conditions and respects. The selected Bidder will be responsible for cover design, engineering, supply of material, proper packing and forwarding, shipment & delivery at site, fabrication, installation, inspection, testing & commissioning, and start-up of the required systems, equipment and material as per the technical specifications and requirements.

Bidders are invited to submit a firm fixed lump sum price to the aforementioned Tender Scope and warrant for eighteenth (18) months following completion of all Work which is the subject of this Tender. **No partial tendering will be accepted.**

1.2 Tender Process Schedule

The anticipated schedule of the Tender process activities is presented in Table 1.1. The durations shown are the maximum expected durations. During the Tender process, the Owner may issue changes to this schedule as amendments to the Tender.

All Work under this Tender will have to be completed within 120 calendar days from the Commencement Date.

Table 1.1: Estimated Project Milestone Schedule

No.	Activity	Duration (Calendar days)	Cumulative Duration (Calendar days)	Completion Date
1	The Tended is released	1	1	12/31/2023
2	Closing Tender Document Purchase	18	19	1/18/2024
3	Closing date and opening the received proposals	3	22	1/21/2024
4	Complete Clarifications & Evaluation of the submitted proposals	10	32	1/31/2024
5	Issue Letter of Award	1	33	2/1/2024
6	Sign the Contract Agreement (Commencement Date)	7	40	2/8/2024



7	Mobilization to site and start land Cutting, Filling and Leveling	3	43	2/11/2024
8	Detailed design and drawings submitted and approved	11	54	2/22/2024
9	Execute the required scope of work and complete the testing and commissioning.	105	160	6/6/2024

1.3 Applicable Documents

The documents listed herein, and the enclosed table of contents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect at the time of the order shall apply.

- a) Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.
- b) Owner shall be notified immediately by writing if a conflict between this document and laws, regulations or other documents cited herein occurs.

1.4 The Site

The work location is the Samra Power Plant / Al-Hashimiya – Zarqa.

1.5 The Contractor's Qualifications

- 1 A registered company in Jordan classified by The Government Tenders Department (GTD) not less than Third grade in the field of Electro-mechanical works.
- 2 The Contractor must provide a detailed reference list indicating specifics of similar works, date of installation and other details, the Contractor shall have completed three Projects similar in nature to the work of this tender at least.
- 3 The Contractor must have proven experience of electromechanical works including but not limited to design, supply, fabrication, installation, testing and commissioning of tanks, pumps, piping, cabling control systems. At least 5 years of experience with aforementioned works is a requirement.
- 4 Bidders may form a joint venture or consortium for the purpose of submitting a Proposal. And they must comply with the following requirements:
 - One of the partners shall be nominated as the Lead Member. This authorization shall be evidenced by submitting a power of attorney, effective for the duration of the Proposal validity, signed by legally authorized signatories of all the partners,
 - The Lead Member shall be authorized to receive instructions for and on behalf of any and all partners of the joint venture or consortium and shall be authorized to execute the Contract on behalf of the consortium; and
 - A copy of the agreement entered into by the joint venture or consortium partners shall be submitted with the Proposal.

The Bidder shall enclose the followings with his proposal:

- Copy of the Certificate of registration and Vocational License.
- A copy of Classification Certificates from GTD.
- Completion Certificate of the required contracts in point no. 2 of this clause.



- The Contractor's Reference List.
- In case of the proposal submitted by a joint venture or consortium, the followings shall be submitted for all the joint venture or consortium members:
 - Copy of the Certificate of registration and Vocational License.
 - A copy of Classification Certificates from GTD.
 - The Contractor's Reference List.
 - The agreement entered into by the joint venture or consortium partners.

1.6 Clarification Process

Any Bidder requiring clarification of this Tender must notify the Owner in writing in accordance with Section 2.3 at the following addresses:

Samra Electric Power Company (SEPCO)
 P.O. Box 1885 Amman 111821
 Jordan
 Attn: Mohammad Khreasat
 Fax: (962)-6-5506520
 Email: mkhreasat@sepco.com.jo
 With a copy to: mmadani@sepco.com.jo,
morawashdeh@sepco.com.jo
murad-omari@nepco.com.jo

1.7 Site Survey

- The contractor shall visit the work site and review all conditions surrounding the work and shall bear any damage to the company's existing properties and infrastructure.
- Any additional equipment, material, services etc., which are not specifically mentioned in the technical specification, but required to make the scope of this Tender complete in all respects, in accordance with the intent of the technical specification, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of the technical specification.

The site visits will be conducted as follows:

1. **Sunday 7th Jan 2024 (9:30 - 15:00).**
2. **Sunday 14th Jan 2024 (9:30 - 15:00).**

The Bidder is required to present the bank deposit receipt for the purchase of Tender documents in order to be allowed for the site visit.

1.8 Proprietary Documents

All documents and drawings furnished by the Owner shall be treated as proprietary information and shall not be used for other than their original purpose without written permission from the Owner. Similarly, all documentation provided by the bidder will be treated as proprietary information and only used for bid evaluation purposes.



1.9 Taxes, Duties, and Regulations

The Contractor shall be responsible for investigating and conforming with all requirements of Jordanian laws and regulations, which will affect or apply to the Contractor or the Project.

1.9.1 Stamps and Award Fees

The Contractor is responsible for the costs applicable for the payment to the Ministry of Finance of revenue stamps and award fees in proportion to the total Contract Price. Penalties are to be paid by the Contractor for noncompliance or delay.

1.9.2 Custom Duties

Materials, equipment and supplies which are required for the installation portion of the Tender Scope of Work and which will become the property of the Owner are exempted from customs duties and import license fees, and other taxes according to Custom Law Number 20 for the year 1998 and its amendments, provided that those materials, equipment and supplies are not having a substitute available from local products, especially if such products have been adopted by the Jordanian government. In this case, the Contractor shall be responsible for payment of all customs duties and other related charges for materials, equipment and supplies that are not exempted as above. The Owner will provide any necessary assistance to obtain the required permits or licenses.

1.9.3 Custom Clearance

The Contractor shall, at its own expense, handle all imported materials at the point(s) of import and shall handle any formalities for customs clearance, provided that if applicable laws or regulations require any application or act to be made by or in the name of the Owner, then the Owner will take all necessary steps to comply with such laws or regulations. The Contractor shall not be entitled to an extension of the Required Tender Completion Date due to the customs clearance process and any delays in achieving the required completion date in connection therewith shall be the contractor's responsibility. The Contractor shall provide a copy of the shipping documents or any other documents required for the Owner at least seven (7) days prior to the shipment's arrival at the port to provide the necessary support for customs clearance.

The owner remains responsible for providing at the time of customs clearance of materials, equipment and supplies, the Council of Minister's Resolution or other appropriate documentation which includes exemption for custom duty and import license fees.

Upon completion of the equipment, material, and system design, the Contractor shall submit the Contract Annex of the bill of materials, which includes the equipment, material, and systems supplied aboard and within Jordan, separately for the Owner's review and approval. This submission is intended to enable the Owner to provide the necessary support for customs clearance. The bill of materials shall reflect the original Contract Price, which shall not be affected in any case.

The Contractor shall submit to the Owner the shipping documents as follows:

- Bill of Lading/ Airway Bill.
- Invoice.
- Packing List.
- Certificate of Origin.
- Certificate of Conformity issued by the Contractor which confirms compliance with the technical specifications, applicable standards, and scope of Work in the Contract Agreement.



According to the regulations, the Contractor shall furnish to the Ministry of Finance and Customs, Bank Guarantee for securing the customs duties and charges. This requirement may be enforced for each and every shipment and must be in force from the time the goods leave the port of entry until the Owner certifies the expiry of their use on Site. As soon as the goods arrive on Site, installed, tested and commissioned, such certification must be issued and released by the Owner.

1.9.4 Release of liens and Clearances

After completing the project and fulfilling all the necessary Tender Scope of Work requirements, the Contractor shall furnish the Release of Liens/Clearances from the customs department in connection with this Tender.

1.10 Project Time Schedule

1.10.1 General

The Contractor shall prepare and submit for approval by the Owner the project time Schedule covering all Work to be carried out under the Tender. The Tender Completion date shall be observed for the planning of all Work to be carried out by the Contractor. The time Schedule will fully reflect the sequence and timing of the activities by which the Contractor proposes to carry out the Tender scope of work.

1.10.2 Scheduling

1. The Contractor shall complete the Works of the Tender within the time specified.
2. Modifications to the Schedule required by the Owner shall be incorporated by the Contractor and submitted with his next weekly update of the Schedule.
3. The schedule shall indicate when interface works with the Owner or others must be completed so as not to delay the Contractor's work.
4. The Contractor shall arrange his work to conform to the requirements of the Tender Dates specified herein and shall complete the scope of work within the time specified. There will be no compensation for extra work which the Contractor must perform due to his failure to coordinate his work with the Owner's or others work.
5. The Time Schedule shall contain full details of procurement, manufacturing, shipment, transport, installation, and commissioning activities.
6. Approval by the Owner of the time Schedule shall not relieve the Contractor of any of his obligations under the Tender.

1.11 Time Schedule and Liquidated Damages

The duration of the project is one hundred twenty (120) calendar days from Commencement Date (The Date of signing the Contract Agreement).

If the Contractor fails to attain the required completion date for reasons attributable to the Contractor, the Contractor shall pay to the Owner liquidated damages in the amount of 0.2% of the Total Contract Price per day of delay or fraction thereof. The total amount of paid liquidated damages by the Contractor herewith shall not exceed 10% of the Contract Price.

However, the payment of liquidated damages shall not in any way relieve the Contractor from any of its obligations to complete the tender scope of work or otherwise comply with its obligations under the Contract Agreement.



1.12 Performance Bond

The Contractor shall, upon receiving the Letter of Award, provide a Performance Bond to the extent of ten percent (10%) of the Contract Price as a guarantee for the due and faithful performance of the Contract. Such guarantee shall be binding notwithstanding any variations, alterations or extensions of time that may be given or be agreed upon.

The Performance Bond shall be drawn on a Bank in Jordan approved by the Owner and shall be payable to the order of the Owner at his first request.

1.13 Maintenance Bond

The Contractor shall submit a duly executed Maintenance Bond (Warranty Bond) in the amount of five percent (5%) of the final Contract Value valid for (18) months from the Certificate of Completion of Work date.

The Maintenance Bond shall be drawn on a Bank in Jordan approved by the Owner and shall be payable to the order of the Owner at his first request.

1.14 Payment Terms and Condition

The quantities mentioned in the table are approximate quantities, the quantities that will be implemented on site will be charged.

The Contract Price will be paid to the contractor according to the work progress and achieved milestones as follows:

- **20%** Advanced payment and shall be secured by advance payment bond drawn on a Bank in Jordan approved by the Owner and shall be payable to the order of the Owner at his first request.
- **15%** after the completion of the civil works and approved by the Owner.
- **15%** after the Filling and Forwarding pumps arrival to site and inspected and approved by the Owner.
- **15%** after the completion of the erection, testing of the Demin Water New Tank 2000 m³ and approved by the Owner.
- **20%** after the completion of the works of piping network installation, and testing and approved by the Owner.
- **15%** after the completion of all the required works under the Scope of Work of this tender and approved by the Owner, and the Maintenance Bond is submitted and approved by the Owner.

1.15 Surplus Material

The Contractor shall hand over the surplus construction materials, supplies, and remaining items at the Site to the Owner at no cost upon Final Operational Acceptance, excluding the Contractor's Construction Equipment and Tools.

1.16 Progress of The Work

The Work shall be started promptly and shall be performed with such progress as may be required to ensure the completion of the Work in accordance with the Key Contract Date referred to herein or any extension thereof granted by the Owner. The Work shall be executed at such time and with such forces, materials and equipment as may be required or requested by the Owner to attain the above requirement.



1.16.1 Progress Report and Meetings

Progress Report and Meeting at Weekly intervals after approval of the Project Schedule, the contractor is to submit to the Owner written detailed progress reports in an approved form, indicating the stage reached in the ordering of material, manufacture, and delivery of all components of the material, Construction, Commissioning. The reports should include details of any delays and the remedial action proposed. These reports are to be forwarded promptly so that on receipt by the Owner the information contained therein is not more than three days out of date.

A daily site progress meeting shall be conducted with the Owner, these meetings shall take place at a mutually agreed-upon time and location, with the purpose of discussing and reviewing the daily progress of the project, addressing any concerns or challenges, and ensuring effective communication between all parties involved. The Contractor shall provide updates on work completed, milestones achieved, and any potential issues that may impact the project schedule.

1.17 Subcontracting

In the event that subcontracting becomes necessary:

1.17.1 Approval and Notification

The Contractor shall not subcontract any portion of the work under this contract without the prior written approval of the Owner.

If subcontracting is deemed necessary, the Contractor shall submit a written request for approval to the Owner detailing the scope of the subcontracted work, the identity of the proposed subcontractor, and the qualifications of the subcontractor.

The subcontractor shall be registered company in Jordan classified by The Government Tenders Department (GTD) not less than third grade in the required subcontracting field.

1.17.2 Right to Reject Subcontractors

The Owner reserves the right to reject any proposed subcontractor for any reason.

1.17.3 Responsibility of Subcontractors

The Contractor shall remain fully responsible for the performance of all subcontractors and their compliance with the terms and conditions of this Tender. The subcontractors shall follow the Contractors procedures and quality plan.

Any breach or default by a subcontractor shall be deemed a breach or default by the Contractor.

1.17.4 Financial Responsibility

The Contractor shall be financially responsible for all payments due to subcontractors. The Owner shall have no direct financial obligations to subcontractors.

1.17.5 Notification of Changes

The Contractor shall promptly notify the Owner in writing of any proposed changes to subcontractors during the term of this Tender.

Changes to subcontractors require prior written approval of the Owner.

1.17.6 Compliance with Laws

All subcontracting activities must comply with applicable laws and regulations.



1.17.7 Termination of Subcontractors

The Owner may, at its sole discretion, require the Contractor to terminate a subcontractor if the subcontractor's performance is unsatisfactory or if there is a violation of the terms of this Tender conditions and terms.

The Owner may also terminate the contract in whole or in part if the Contractor fails to comply with the subcontracting provisions.

1.18 Site Regulations

The Contractor and his employees shall be subject to rules and regulations for the conduct of the Work at the Site as the Owner may establish. The Contractor shall be responsible for the enforcement among his employees of the Owner's instructions regarding signs, advertisements, the prevention of fires and accidents and other general regulations.

1.18.1 Site Supervisors

The Contractor shall provide the services of competent specialists to supervise the construction of the Works and erection / installation of equipment and equipment at the Site.

The Contractor Construction Manager shall be given full responsibility and authority to negotiate and agree regarding points arising out of the erection, in order that the work may proceed with a minimum of delay. Directions and instruction given by the Owner to the Construction Manager shall be interpreted as having been given to the Contractor.

1.18.2 The Contractor's Site Representative and Personnel

The Owner will be at liberty to object and to require the Contractor to remove from the site any representative or person employed by the Contractor who shall misconduct himself or is incompetent or negligent in the proper performance of his duties. The Contractor shall remove any person objected to upon receipt of the Owner written request for him to do so and shall provide in his place a competent representative at the Contractor expense.

1.18.3 Working hours

No work shall be carried out on the site outside of the normal working hours stated in the labor laws, or on the locally recognized days of rest, unless the work is unavoidable, or necessary for the saving of life or property or for the safety of the works, in which case the Contractor shall immediately advise the employee of the situation.

The Contractor is responsible for obtaining any required permits or approvals from the Owner in written related to extended working hours or outside the standard normal working hours and ensuring compliance with company's regulations governing such activities.

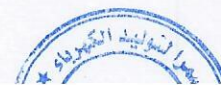
1.18.4 Site Entry Permits

The Contractor shall adhere to entry, exit instructions and working hours in accordance with the Owner's instructions.

1.18.5 HSE Instructions

1.18.5.1 Health and Safety (HSE) Management at Site

The Contractor shall appoint a qualified HSE officer at site to be responsible for maintaining the safety and protection against accidents of personnel on the site. The HSE specialist shall be qualified and experienced with a proven track record and shall have the authority to issue instructions and take protective measures to prevent accidents.



The Contractor shall adhere to the health, safety and environmental regulations and instructions followed in the Site and preserve the Owner's public property.

1.18.5.2 Precautions Against Fire

The Contractor shall take all reasonable precautions to avoid outbreaks of fire on the Works, Temporary Works, offices, stores and other places and things connected therewith, especially with respect to the safe storage of dangerous and hazardous goods.

1.18.5.3 Health and Safety Responsibility

The Contractor shall be responsible for any damage to the health of his staff, laborers or any project persons engaged on the project site.

The Contractor shall comply with all the relevant labor laws of the Government of Jordan and also international labor rules where applicable and shall apply them to his employees. The Contractor shall duly pay and afford these employees all their legal rights. The Contractor shall require all such employees to obey all applicable laws and regulations concerning safety at work and on the site.

The Contractor shall indemnify and hold the Owner harmless from any claims, damages, or liabilities arising out of or related to injuries, illness, or death of the Contractor's workers occurring on the construction site. The Contractor assumes full responsibility for the safety and well-being of its employees and shall ensure adequate workers' insurance to cover any work-related injuries or illnesses.

1.18.5.4 Craneage and Scaffolding

The Contractor shall ensure that the craneage and handling of all plant and equipment is carried out in a safe and workmanlike manner. The manufacturer's lifting instructions shall be adhered to, including the use of all proper lifting and jacking points.

The Contractor shall assess and provide for the Contractor's own use such craneage and lifting equipment as is necessary to complete the Work.

The Contractor shall assess and provide for the Contractor's own use such scaffolding as is required to safely complete the installation and testing of the Work. All scaffolding shall be erected in accordance with Occupational Safety and Health Administration (OSHA) safety orders and Jordan regulations, whichever provides the greater degree of safety.

All scaffolding shall be installed using safe trade practices and maintained in a safe condition.

1.18.6 Temporary Construction Offices

The Contractor shall provide, if required, furnish, and maintain temporary construction offices and provide /obtain safe services and infrastructure using mobile caravans.

1.18.7 Housekeeping

The Contractor shall maintain housekeeping practices to ensure a safe working environment for the workers where waste generation and environmental damage will be minimized.

1.19 Liability for Equipment, Material, and Systems Damages

The Contractor shall be responsible for loss or damage to the existing equipment, material and system in the work execution area until the work is being completed and commercial operation is achieved.



1.20 Coordination / Interface

1.20.1 General

The Contractor shall be responsible for coordinating his Work and equipment with the Work and equipment of the Owner at the Site. In all instances where his Work is affected by the existing equipment, he shall take the initiative in obtaining or giving information required for proper coordination for his work or equipment. The CONTRACTOR shall ask the Owner in writing, for all data and information needed from him for the execution of the Work under this Contract. Such requirements shall be itemized.

The Contractor shall perform all coordination directly with the Owner and shall check all physical interference's, clearances, and interfaces with the existing equipment or which under construction.

1.20.2 Interface Requirements

The interface points identified in the Technical Specification shall be made by the Contractor with the existing equipment and installations. It is not the intent of the Tender Documents to identify every interface point and, consequently, the lack of such identification shall not relieve the Contractor from the responsibility of ascertaining the location of all interface points.

The Contractor shall also be responsible for composite drawings within his scope of work for the purpose of interference check. The Contractor shall bring to the attention of the Owner any interference affecting the design or safety of components or systems.



2 Scope of Work

2.1 General

Samra Electric Power Company (SEPCO) is a company established by the Ministry of Energy under the Government of the Hashemite Kingdom of Jordan (GOJ). SEPCO currently owns and operates the Samra Power Plant located at the Samra Site. Samra Power Plant is an operating power generating complex set up through successive stages of installation since the year 2004 under EPC turn-key type contracts.

The Site of the Samra Power Plant is located approximately 35 km to the north of Amman on the outskirts of Al Hashimiyah.

The Samra Electric Power Company (SEPCO) plant consists of four phases:

- Phase 1 is a combined cycle facility in 2 x 1 configuration using GE 9E gas turbines,
- Phase 2 is a combined cycle facility in 2 x 1 configuration using GE 9E gas turbines,
- Phase 3 is a combined cycle facility in 2 x 1 configuration using Alstom/GE 13E2 gas turbines,
- Phase 4 is a combined cycle facility in 1 x 1 configuration using Alstom/GE 13E2 gas turbine.

All Combustion Turbines are designed and installed as dual fuel units capable of operating on light fuel oil or natural gas. Light distillate fuel unloading and 14-day storage facilities are located at the site. All gas turbines are designed to be capable of automatic changeover between the fuels.

Power generated by the Phases I and II combined cycle units is evacuated to NEPCO grid at 400kV via a 400 kV switchyard. The Phase III and Phase IV gas turbine units are connected to NEPCO grid at 132 kV.

2.2 Tender Scope

The tender is for providing a demineralized water supply system to meet the requirements of the Fogging System. The existing Phase I, II, and III demineralized water systems are interconnected. A new DM water tank with a working capacity of 2000 m³ will be installed and connected to the demineralized water system of Phase III. The new DM tank will be filled from the suction of the existing DM water tanks of Phase III (2X 500 m³) using two new filling pumps (two pumps with a capacity of 110% and will forward the DM water to the fogging system through two new pumps with a capacity of 110%. Two Isolation valves to be equipped on the main DM water forwarding pipeline to control the DM water flow either to the fogging pumps skids or return the water to the existing DM Water tanks of phase III to support the power plant operations during periods when the fogging system is not in operation.

The Project will be implemented on a turnkey basis and shall include all civil works, equipment, material, systems, and services to integrate the new DM water tank, pumping system, piping network, supports ,valves ,flanges ,Electrical cabling, motor local panel, instruments, control and monitoring system with the existing DM water system and Fogging system and existing DCS to render the system fully complete and functional for safe, reliable, and commercial operation under all conditions and respects. The selected Bidder will be responsible for cover design, engineering, supply of material, proper packing and forwarding, shipment & delivery at site, fabrication, installation, inspection, testing & commissioning, and start-up of the required systems, equipment and material as per the technical specifications and requirements.



2.3 Applicable Documents

The documents listed herein, and the enclosed table of contents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect at the time of the order shall apply.

- a) Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.
- b) The Owner shall be notified immediately by writing if a conflict between this document and laws, regulations or other documents cited herein occurs.

2.4 Scope of Supply and Services

The scope of supply and services includes all necessary activities and items to meet the intent of this specification to achieve highest availability and economic operation. The scope of supply and services includes design, procure, furnish, transport, construct, installation supervision, test, start-up, and commission, quality assurance, scheduling, follow-up, all design documentation, and O&M manuals.

2.4.1 Scope of Services

Table 2.1: Scope of Services Matrix

No.	Item	Bidder	Owner
1	Engineering and Design	X	
2	Detailed Engineering	X	
3	Procurement	X	
4	Manufacture and Fabrication	X	
5	Painting, coating of the Equipment	X	
6	Packing, Shipping, Delivery to Site	X	
7	Construction and Erection	X	
8	Construction and Erection Supervision	X	
9	Protection and Preservation	X	
10	Cables Laying, Termination, Testing, and Commissioning	X	
11	Instruments installation, Calibration, Testing, and Commissioning	X	
12	Panels Installation, Testing, and Commissioning	X	
13	Cable Raceways Installation	X	
14	Testing and Pre-Commissioning	X	
15	Commissioning and Testing	X	
16	Cathodic Protection	X	
17	NDT Inspections and Radiography	X	
18	Hydrostatic Test	X	
19	Factory Testing	X	
20	Land Cutting, Filling, Leveling and Concrete Work	X	
21	Craneage and Scaffolding	X	



No.	Item	Bidder	Owner
22	Connect the control and instruments to the existing DCS system	X	X
23	Other Services as specified or necessary to complete Project	X	
24	18 Months Warranty	Required	

Note 1: 'X' denotes in scope.

2.4.2 Scope of Supply

- 1 One (1) Demin Water Storage Tank 2000 m³, with all necessary valves, water filters, piping, drain equipment, inspection manholes, inlet flanges, outlet flanges, recirculating flanges, stair, handrail, vents, cathodic protection system, interconnection cabling, and instruments as described in the tender technical specifications.
- 2 Two (2) filling pumps (2 X 110%) for the New Demin Water Tank 2000 m³ will be connected to the suction of the existing 500 m³ Demin Tank of Phase III, with all necessary valves, valves and check valves, water filters, piping, drain equipment, pressure differential indicator and switches, local control panel, interconnection cabling and any other requirements as described in the tender technical specifications.
- 3 Two (2) forwarding pumps (2 X 110%) to the fogging pump skids and return the water to the existing 500 m³ Demin Tank with all necessary valves, check valves, water filters, piping, drain equipment, pressure differential indicator and switches, local control panel, control valves, interconnection cabling any other requirements as described in the tender technical specifications.
- 4 Piping Network of the new Demin Water Tank and Fogging System, with all necessary valves, water filters, piping, expansion, drain equipment as described in the tender technical specifications.

Two Isolation valves to be equipped on the main DM water forwarding pipeline to control the DM water flow either to the fogging pumps skids or return the water to the existing DM Water tanks of phase III to support the power plant operations during periods when the fogging system is not in operation.
- 5 Power cables, Distribution panels, grounding system and cables, and all necessary accessories to supply the power to the filling, Forwarding pumps, and Fogging Pumps Skids, Lighting System, and CCTV System as described in the tender technical specifications.
- 6 Control and Instruments and its cables and all necessary accessories to connect the control and instruments to the existing DCS system according to the required technical specifications includes but not limited to Level transmitters, Pressure transmitters, Pressure Switches, Temperature transmitters, Gauges and indicators, Control valves as described in the tender technical specifications.
- 7 Civil and structural including, but not limited to:
 - Cutting, Filling and leveling.
 - Road.
 - Retaining Wall.
 - Sidewalks within the site boundaries.
 - Electrical trenches, duct bank, manholes and handholes
 - DM water tank foundation.



- Pumps and equipment foundations
 - Fogging pump skids foundations (7 in total).
 - Lightning system.
- 8 Closed Circuit Television (CCTV) System in the Power Plant Expanded Area.
- 9 Special Tools, as required.

The Contractor shall be deemed to have included in his Proposal any additional material and/ or equipment necessary to meet the design, performance, operation, and environmental criteria, but which are not specifically identified above, required to complete the required scope of works which is fit in all respects for its intended purpose and use.

2.4.3 Bidder Documentation

- Drawings – General Arrangements, P&IDs with instrument description, Electrical Schematics, Control Logic Diagrams, and any additional relevant engineering documentation,
- Erection and Commissioning Documentation,
- Equipment, Parts, systems Catalogues and datasheet.
- Quality Documentation.



3 Codes, Standards, Rules, and Regulations

3.1 Codes, Standards, Rules, and Regulations

3.1.1 General

- 1 All components, systems, and equipment shall be designed, manufactured, assembled, and tested at manufacturers' works, installed and, after installation at the Site, shall be tested and commissioned, in accordance with applicable internationally recognized Western standards, and statutory codes and regulations, including those specifically listed in this specification. If the Bidder proposes alternate codes or standards to those listed below, it must demonstrate that the alternate is of equal or superior stringency than the comparable code or standard system listed in this specification.
- 2 The most stringent requirements shall apply where addressed by more than one code, standard or regulation.
- 3 The latest edition at the Contract Agreement Date, with related revisions and addenda of the following regulations shall apply.
- 4 The design, equipment and materials forming part of the contract shall comply in all respects with applicable laws and applicable permits currently in force in Jordan.
- 5 The following list of codes, standards and regulations is not comprehensive of all potentially applicable codes and does not relieve the Bidder from complying with any other requirements and regulations applicable to this equipment. These codes and standards are a minimum requirement for the project specifications.

3.1.2 Tanks, Structural Steel, and Piping

- i) American Institute of Steel Construction (AISC)
- ii) American Welding Society (AWS)
- iii) American National Standards Institute (ANSI)
- iv) American Society for Testing and Materials (ASTM)
- v) American Society of Mechanical Engineers (ASME)
- vi) National Association of Corrosion Engineers (NACE)
- vii) British Standards (BS)
- viii) National Fire Protection Association (NFPA)
- ix) American Petroleum Institute (API)

3.1.3 Electrical Equipment

- i) Institute for Electronic Engineers (IEEE)
- ii) International Electrical Code (IEC)
- iii) National Electrical Code (NEC)
- iv) Underwriters Laboratories (UL)
- v) British Standards (BS)
- vi) National Fire Protection Association (NFPA)



3.1.4 Civil Works

- i) 1997 Uniform Building Code
- ii) American Association of Highway and Transportation Officials (AASHTO)
- iii) American Society for Testing and Materials (ASTM)
- iv) American Concrete Institute (ACI)

3.2 Language and Units

- 1 All correspondence, drawings, catalogues, illustrations, specifications, and other documentation related to the project shall be in the English Language.
- 2 Metric units shall be used on all drawings, specifications, descriptions, etc., including erection manual, operation manual, and maintenance manual and parts catalogue. Dual units (Metric and United States Customary Units (USCU)) are permitted.
- 3 The use of [mbar] and [bar] instead of [Pa] is allowed for fluid and gas pressure.

3.3 Design Data

The plant site is located 32°08'39.5"N, 36°08'36.3"E in Al Hashemiya, Jordan. The Site is easily accessible and is connected by roadways to the National Highway.

3.3.1 Site Climatic Conditions

The equipment and systems shall be designed based on the following site conditions:

- **Ambient Temperature:** -5°C to 46°C
- **Relative Humidity:** 3.5% to 98%
- **Rainfall:** 80 mm in 24 hours
- **Wind Velocity:** 36 m/ sec
- **Site Elevation:** 570 m Above Sea Level (A.S.L)
- **Seismic:** The Facility shall be designed for Zone 2B, as determined from UBC 1997.

3.3.2 Water Quality

The water quality in the Power Plant as follows:

Table 3.1: Demin Water Quality

Parameter	Value
Conductivity	< 0.2 $\mu\text{s}/\text{cm}$
Silica (SiO ₂)	< 7 ppb
Sodium (Na)	< 7 ppb

3.3.3 Estimated System Parameters

Table 3.2: Estimated System Parameters/ Fogging Pump Skids

Phase	Generating Unit	DM Water Demand	Pressure at the Fogging pump skid inlet
Phase I	GT1	12 m ³ /hr.	4 bars
	GT2	12 m ³ /hr.	



Phase	Generating Unit	DM Water Demand	Pressure at the Fogging pump skid inlet
Phase II	GT3	12 m ³ /hr.	
	GT4	12 m ³ /hr.	
Phase III	GT5	15 m ³ /hr.	
	GT6	15 m ³ /hr.	
Phase IV	GT7	15 m ³ /hr.	

Note: the parameters will be confirmed by the Owner in the design stage.

Table 3.3: Estimated System Parameters/ New DM Storage Water Tank

System	Parameter	Value
New DM Storage Water Tank	Filling Rate	45 m ³ /hr.
New DM Storage Water Tank	Discharge Rate	93 m ³ /hr.
New DM Storage Water Tank and Fogging Pumps Systems	Pressure at the Fogging Pump Skids Inlet	4 Bars

Note: the parameters will be confirmed by the Owner in the design stage.

Table 3.4: Estimated Fogging System Power Consumption

Phase	Generating Unit	Fogging Pump Skid Power Consumption
Phase I	GT1	140 KW
	GT2	140 KW
Phase II	GT3	140 KW
	GT4	140 KW
Phase III	GT5	165 KW
	GT6	165 KW
Phase IV	GT7	165 KW

Note: the parameters will be confirmed by the Owner in the design stage.



4 Technical Specifications

4.1 New 2000 m³ Demin Water Tank

4.1.1 General Requirements

The tank shall be designed in accordance with the requirements of the latest issues in force (including the latest published addenda, interpretations, and case rulings) at the date of the Tender submittal of the Codes and Standard API650.

4.1.2 Identification, Drawings and Specifications

1. A tabulation of field erected tank shall be furnished to the Owner and shall include tank name by function, item number, tank standards, class and reference drawing numbers. Reference drawings shall include tank location, dimensions, (including capacity), description and locations of appurtenances and fittings and a description of the foundation structure.
2. A tank specification shall be completed for the tank which shall include design conditions, mechanical data, material specifications and any special comments pertaining to the tank. The above item shall be submitted to the Owner for review before the Contractor requests the material for the tank.
3. The tank must be designed in accordance with the referenced Codes and Standards or as modified by approved Contractor drawings. Nominal diameter shall be taken as inside diameter for shell plates and must be the same for each course. The proposed diameter is 15.2 m, and the proposed height is 12 m, Alternate tank sizing may be offered if a cost saving to the owner can be demonstrated, Nominal tank capacity must be maintained. The owner must approve any alternate.
4. Design shall consider the various loads of equipment, platforms, ladders, personnel, linings, insulation, wind and earthquake loads as specified herein and shown on final construction drawings. All walking and working surfaces shall comply with applicable standards.
5. Wind pressure and earthquake loading shall be determined by the Contractor based on the site climatic condition provided in section 3.3.1. Earthquake and wind forces shall not be combined.
6. Foundation design, wind and earthquake loading calculations shall be submitted to the Owner for review and comment.

4.1.3 Detail Design Requirements

4.1.3.1 Tank Roof

The roof shall be designed as a self-supporting structure in accordance with the appropriate Codes and Standards plus live loading, the tank roof and supporting structure shall be designed to support dead load plus a uniform live load as per the codes and standards and wind load as specified. Flat heads, side plates etc. shall be adequately stiffened to support the loads as specified.

4.1.3.2 Tank Reinforcement

Tank reinforcing shall be made of carbon steel unless otherwise noted. No internal structural reinforcement for roofs and walls of any tank will be permitted except as specifically shown in final construction drawings.

4.1.3.3 Plate Thickness

Shell plate thickness shall be calculated in accordance with the appropriate Codes and Standards.

The minimum plate thickness for the shell, bottom and roof shall not be less than 7 mm for carbon steel tank.

NOTE: These thicknesses do not include corrosion allowances. Corrosion allowances shall be noted on the drawings and shall be a minimum of 1.5 mm.

4.1.3.4 Welding

All tank walls shall be butt welded with full penetration welds using the fusion arc process. Roofs may be lap welded construction, if consistent with design requirements. Bottoms of lined tank shall be butt welded. Bottoms of unlined tank may be lap welded.

The Contractor shall locate longitudinal and girth weld seams so they do not interfere with weld attachments, such as nozzles, manways, pipe supports, legs, etc Location of all weld seams shall be indicated on the fabrication drawings. Certified welding procedures, complete with qualifications and test records in accordance with ASME Boiler and Pressure Vessel Code Section IX shall be submitted to THE OWNER for review and approval.

4.1.3.5 Tank Appurtenances and Fittings

1. The Contractor shall provide tank connections and appurtenances such as shell and roof manholes, gauge hatches, roof and shell nozzles, clean-out fittings, shell connections, bolted access doors, water draw-off sumps, scaffold cable supports, threaded connections, platforms, walkways and stairs.
2. The tank shall have connections for level instrumentation for local and remote reading.
3. Roof vacuum and overpressure vents for the tank shall be sized to allow a withdrawal rate of 130% of maximum withdrawal of all pumps operating and a fill filling rate of 200% of maximum filling with all pumps operating.
4. The vent to atmosphere shall be through carbon-di-oxide absorber vessel suitably mounted on the tank. CO2 absorber tank shall be provided with the initial fill of chemicals as per the codes and standards.
5. The overflow and drain from tank shall be combined and shall be led to nearest drain (at zero level) by a seal-trough so as not to come directly in contact with atmosphere.
6. Platforms, walkways and stairs, including handrailing, shall conform to the requirements of the code and standards.

4.1.3.6 Nozzles

- One (1) roof manhole 750 mm diameter (with handling facility for cover).
- One (1) shell manhole 750 mm diameter (with handling facility for cover).
- One (1) flanged inlet connection.
- One (1) flanged outlet connection.
- One (1) flanged return connection.
- Two (2) spare flanged connection.
- One (1) overflow.
- One (1) roof vent.
- One (1) gauge hatch.
- One (1) flange drain connection.

Nozzles subject to freezing shall project into the tank by a distance sufficient to permit continued operation with an ice layer on the inside of the tank wall.



4.1.3.7 DM Water Tank Cathodic Protection

Deteriorating effects of galvanic corrosion on vital metallic structures shall be mitigated using the distributed galvanic anode system and impressed current anode system. Cathodic protection systems shall be designed to meet the protection criteria on structure and materials as required in the latest versions of National Association of Corrosion Engineers (NACE) International standards.

4.1.3.8 Miscellaneous Requirements

The following requirements shall be adhered to:

1. No aluminum shall be used.
2. Treads and platforms must be made of grating; material of construction shall be galvanized steel.
3. Ladders and stairs shall have two (2) handrails. Ladders where used shall be provided with safety cages starting at 2.5m above grade.
4. The free width of platforms and stairs shall be 1,000 mm independent of any insulation.
5. Risers of stairs shall be 200 mm.
6. All instruments, valves and nozzles must have easy access from fixed platforms.
7. The tank shall be earthed in accordance with the provisions of the applicable code and standards. A minimum of two (2) electrical earthing pads shall be provided for the tank. The pads shall be carbon steel plates 50 x 75 x 15 mm. Each pad shall have two (2) holes drilled and tapped for M12 threads.
8. Handrails shall be provided around the perimeter of the roof and the stair platform at the roof level.
9. The Tanks shall be provided with level gauge indicators.

4.1.4 Materials Of Construction

1. Carbon Steel Plate material shall be new open hearth full weight grade as specified, free from laminations or other imperfections. All plates shall be flat, with no appreciable buckle or warpage. All sharp edges of sheared plates must be removed, especially on the inside of tank. The thickness gauges and weights shall be to approval but no less than listed below:

Table 4.1: Plates thickness gauges and weights

Thickness/ mm	Weight/ kg/m ²
5	39
6	46.8
8	62.4
10	78

2. Shell plates, bottom plates, roof plates and structural steel shall be ASTM A-36 material or better.
3. Bottom plates shall be of the same thickness as the lower shell sections.
4. Rolled and welded plate nozzle necks, as well as tube stiffeners, shall be made of steel of the same grade as the plate onto which these fittings are connected.
5. The pipe stubs shall be made of seamless drawn tube API 5L, Grade A or B. or better.
6. All bolts shall be threaded to ISO pitch.
7. Gaskets used for seals on piping and fittings shall be made of hydrocarbon resisting compressed not including asbestos, or equivalent type, 2.0 mm thick up to 450 mm diameter and 3 mm thick above 450 mm diameter.
8. The tank shall be of suitable material to meet the Demin water quality outlined in Section 3.3.2.



4.1.5 Fabrication

4.1.5.1 Plate and Sheet

The fabrication shall be developed to obtain the finished dimensions with a minimum number of welds. Plates must be rolled and welded in place to within 1.0% of true radius. Shapes must be bent on a power brake to avoid wrinkling or excessive drawing. A generous radius of corners is desirable. Edges that must be joined by welding shall be brought accurately to line with waves or shoulders eliminated before final welding. The finished fabrication must be clean in appearance, free from discoloration, weld spatters and obvious imperfections.

4.1.5.2 Reinforcement

Unless otherwise noted on the final construction drawings, all reinforcing plates shall be flame cut with mechanical guide equipment. The extent of reinforcement will be designed in accordance with the appropriate Codes and Standards and subject to the approval of the Owner.

4.1.5.3 Welding

All welders employed in the work shall be qualified in accordance with approved applicable Standards. Qualification of welders using radiographs is not acceptable. Welder qualification must be by samples for mechanical testing in accordance with the specified Code.

4.1.5.4 Welding Carbon Steel

All welding shall conform to the requirements of approved applicable Codes and Standards, upgraded by the details on the final construction drawings. Welds shall not project in excess of 1.5 mm above the surface of the adjacent plates.

A minimum of 10% of welds shall be inspected by x-ray techniques. Any defects shall be repaired in accordance with the Code and with procedures approved by The Owner.

All sharp corners must be ground to a 3 mm radius as a minimum or to paint/lining manufacturers recommendations where applicable.

4.1.5.5 Appurtenances

1. The Contractor shall, so far as practical, and in order to reduce erection time, fabricate in the shop all manholes, nozzles and such other appurtenances which will become a permanent part of the tank. These items shall then be shop welded to the individual plates of which they will become a part.
2. The Contractor shall submit a welding procedure for approval by the Owner. Approval with changes noted (if any) shall be submitted to the Contractor in writing before fabrication is started.
3. The Contractor shall provide anchoring brackets on tank where required.
4. All nuts, bolts, gaskets and blind flanges must be furnished with the tank unless noted to be furnished from other sources.
5. Shell joints shall be double butt welds with full penetration and complete fusion.
6. Base rings shall have continuous fillet welds on both the inside and outside surfaces of the shell to base ring junction.
7. Roof joints shall be double butt welds with full penetration and complete fusion. If lap joints are used full fillet welds on each side (inside and outside) shall be employed.
8. All bolting shall conform to ASTM Standards. External bolting for manways, flanges and connections shall be stud bolts with hex nuts. Material grade for piping nozzle bolting shall not be less than ASTM-A193, grade B7 for bolts and ASTM - A193 grade 2H for nuts Material grade for manway bolting shall not be less than ASTM-A-307 grade B for bolts and nuts. Thread lubricant shall be used for all thread make-up.



9. One complete set of test gaskets shall be provided for the tank. Material and thickness to approval.

4.1.6 Erection

4.1.6.1 Setting of Bottom Tank Plates

1. The Contractor shall be responsible for the positive and complete bearing of flat bottom tank plates on the foundations. The following methods shall be followed for setting tank bottoms:
2. A level 50 mm layer of sand or better, saturated with petroleum base 120-180 Baume gravity oil, or approved equal will be installed on the foundation for bedding of plates by the Civil Works Contractor. The Contractor shall be responsible for the inspection and approval of this work and shall provide representation accordingly.
3. Where butt welding is not required for special linings, Bottom plates shall be lap joint fillet welded. The lap joints shall have a 25 mm lap as a minimum with full fillet welds. Welds shall be checked for leaks as described in Section 7.1.4.
4. Sand shall be removed from under the bottom plates around the periphery of the tank for a distance of 450 mm. This void shall then be pressure grouted with sand-cement grout consisting of one (1) part Portland cement, 1-1/2 parts sand and water as required for grout flow. See Section 3D of these Specifications. In addition, The Tank shall be caulked to its concrete foundation with non-hardening butyl rubber type caulk.

4.1.6.2 Wind Protection

The Contractor shall protect the shell against damage by wind during its erection and prior to the complete installation of the roof.

4.1.7 Testing

4.1.7.1 General

All field inspections and field tests shall be performed in accordance with the appropriate Codes and Standards and shall be carried out in the presence of The Owner. The inspection and test results are subject to acceptance by The Owner.

Tank bottom welds shall be inspected for leakage by the vacuum box testing method.

Tank shell welds shall be inspected for leaks by the hydrostatic test method in accordance with the requirements of the Codes and Standards.

4.1.7.2 Hydrostatic Test

1. Upon completion of the steel tank fabrication and prior to the application of any interior lining or exterior coating or insulation, the tank shall be given a hydrostatic test. The Owner shall be given two (1) week advance notice thereof so that the Owner may have a representative present during the test. The Contractor shall supply all necessary flanges, gaskets, bolting parts, piping, hose, pumps and other equipment necessary to accomplish the test. In the event that leaks develop at a welded joint, the joint shall not be repaired by additional welding, but the weld shall be completely removed in the area of the defect and replaced with new weld and examined by radiography. The tank will be retested as described above.
2. The filling rate shall not exceed 150mm per hour. After filling a load stabilizing period of at least 24 hours shall be observed. The contractor shall provide an appropriate tracer in the test water to facilitate ease of location of any leaks.
3. A tabulation of settlement data shall be provided to The Owner (twice per day minimum) for the evaluation of settlement rates. An alteration of the fill rate based upon the evaluation may be requested.



4. Any material or parts of work which are otherwise found to be defective, in the opinion of the Owner shall be replaced by new parts or materials.
5. The Tank roof and nozzle reinforcing plate shall be pneumatically tested in accordance with the appropriate Codes and Standards. It is suggested the roof be tested whilst the tank is filled with water i.e. after the hydrostatic test.
6. Upon completion of testing, the Contractor shall dispose of the water by discharging it in a controlled manner e.g. 150mm per hour, into storm sewers or ditches or any area Suggested by the Owner, to avoid damage to the Site grading. Where appropriate the Contractor shall investigate the possibility of transferring water from tank to tank to conserve water.
7. The tank shall be thoroughly cleaned and dried out by the Contractor after the test water is removed. The paint/ lining manufacturer's representative shall inspect the tank prior to application of any coating materials to satisfy himself that the tank is clean, dry and ready to accept coating.

4.1.7.3 Factory Tests

The Contractor shall submit mill certificates for the shell, roof and base plates. Mill certificates shall include, but not be limited to, chemical analysis, ultimate strength, and yield point.

4.1.8 Shop Drawings

1. The Contractor shall prepare design calculations, shop, and erection drawings of the tank for review by the Owner.
2. Fabrication and/or procurement shall not proceed prior to review of the calculations and shop drawings by The Owner. Such review shall not relieve the Contractor of responsibility for accurate detailing and fabrication.
3. The Contractor shall advise the Owner when calculations and shop drawings are ready for review. The Owner will then advise the Contractor if review can be waived prior to release for material procurement and fabrication.
4. Shop drawings shall show details of connections. Welding shall be indicated by standard welding symbols in accordance with the requirements of the appropriate Codes. Shop and erection drawings shall show the size, location, length, and type of each weld.

4.1.9 Painting

All surface preparation, base coats, intermediate coats, and finish coats including touch-up, whether shop applied, or field applied, shall be in accordance with code and standards.

Epoxy-coating shall be provided on the inside of tank in three coats (minimum) resulting in total thickness of not less than 150 microns.



4.2 Piping

4.2.1 Material of Construction

Piping material: Stainless Steel 316L.

4.2.2 Piping Network Configuration

The Piping Network Configuration as follows:

- The Demin Water filling piping between the existing Demin Storage Tank of Phase III (500 m³) and the new Demin Tank (2000 m³).
- The Demin Water Forwarding pipeline from the new Demin Water Tank (2000 m³) equipped with Two Isolation valves to control the DM water flow either to the fogging pumps skids or return the water to the existing DM Water tanks of phase III to support the power plant operations during periods when the fogging system is not in operation.
- Distribution pipes and reducers including expansion parts and supports where required to distribute the DM Water to the Fogging Pump Skids:
 - The Fogging System skids of Phase I (GT1 and GT2)
 - The fogging system skids of Phase II (GT3 and GT4)
 - The fogging system skids of Phase III (GT 5 and GT6).
 - The fogging system skid of Phase IV (GT 7).
- Install one future extension flange at the filling line near the new tank to connect with future new RO Plant.

See the enclosed piping network general layout (Appendix A).

4.2.3 General Requirements

4.2.4 Design

1. Pipe work sizing shall be based on pressure drop calculations to suit equipment requirements, available fluid pressures and to minimize pumping costs. Pipe work and equipment shall be sized for the maximum transient flow rates that can occur in the pipeline.
2. All pipe work shall be designed for applicable ambient conditions, seismic loads, discharge reactions, dynamic time-force reactions, effect of supports, anchors and terminal movements/loads.
3. Pipe wall thickness shall be calculated as per the procedures and formulas given in ANSI B31 standard. In any case, the thickness shall not be less than the minimum specified in ANSI B36.10.
4. A corrosion allowance of 1.6 mm shall be added to the calculated thickness as per ANSI B31 standards. Additional allowance for bend thinning/manufacturing tolerance shall be considered if required.
5. The pipes shall be of suitable material to meet the Demin water quality outlined in Section 3.3.2.
6. The velocity of flow in pipes is not to exceed 2.4 m/s unless otherwise specifically.
7. The Contractor shall use adequate materials, processes, and equipment to ensure that the workmanship is of a standard equal to or better as specified and suitable for the intended purpose.
8. The Contractor shall design and supply and install all special and standard supports, anchors and guides for pipes, fittings, valves and other pipeline equipment. This shall include the civil and structural steel work required. Supports can be cast into the foundations.
9. The contractor shall submit support study for the piping networks.
10. The Contractor shall supply the connection flanges to the Fogging Pumps skids (7 in total), the design and specifications of the flanges will be provided to the Contractor by the Fogging System through the Owner.



4.2.5 Layout

1. Piping shall be arranged so that full access is provided for the maintenance of equipment and so that removal or replacement of the plant can be achieved with the minimum dismantling of piping.
2. All valves, strainers, instruments, and items requiring operation or maintenance shall be easily accessible from permanent safe working platforms.
3. All pipe work shall be carefully set out and installed to ensure that clear access is maintained to valves, strainers, vents, instruments, plants and through all access ways.
4. All pipework shall have, as appropriate, automatic or manual vents and drains. All horizontal pipework shall be graded to provide draining and/or venting as appropriate. Relief valves and vents shall be piped to discharge in safe locations. Overflows and drains shall be piped to discharge to the nearest convenient drain.

4.2.6 Installation

1. Vertical and horizontal snubbers and/or restraints shall be provided to limit movement due to machine operation and seismic forces.
2. Piping flexibility shall be obtained through pipe routing or expansion loops unless limitations of space or economics dictate the use of flexible connectors. Expansion loops, when installed in a horizontal plane, may be offset vertically to clear adjacent piping. Flexible connectors are to be used only when it is not feasible to provide flexibility by other means.
3. Pipe Supports, Anchors and Guides All supports shall comply with the relevant structural steelwork specification. Pipe work shall be supported to prevent any excessive sagging, bowing, or bending of the pipe work under normal loading conditions according to the codes and standards, the contractor shall review the existing piping structure and reinforce the supports if required.
4. The contractor shall Provide all piping materials and fittings and installation works for piping systems, pipes supporting and hanger material.
5. The Contractor shall supply all materials including welding rods and equipment necessary for the completion of the Work as documented and specified. Allow for all items necessary for the performance of the obligations under the contract including items not expressly mentioned in these specifications, but necessary for completion and performance of the Works.
6. Unless otherwise specified all material incorporated into the Work shall be new of high quality, free from defects and of proven acceptability for the purpose intended.
7. Samples of bulk products/materials delivered to the site shall be submitted for review by the Owner as and when required. Material test certifications, in the English language may be submitted in lieu of the physical product. The Contractor shall not confirm orders requiring Owner' review until such review is complete. Retain approved samples on site for comparison with products/materials used in the Work and remove when no longer required.
8. The spacing between supports on pipe work shall follow guidelines given in ANSI B31.1 where applicable and shall not exceed the following limits: Pipe work shall be supported immediately adjacent to all valves and equipment items which are not directly and separately supported.
9. Pipe supports shall be carefully located to minimize and maintain within permitted limits pipe work stresses and deflections resulting from gravity, thermal, wind, seismic and other loads likely to be imposed on the pipe work. Special care shall be exercised with the location of supports near bends and branches in pipework subject to significant temperature variations to ensure that the pipe work is not subject to excessive stress.
10. The use of springs, constant force supports, and other adjustable supports shall be minimized. If provided, the adjustment shall be capable of being locked.
11. All pipe support components in direct contact with the pipe shall be of materials compatible with the pipe material. Where clips, sliders, rollers, U-bolts or overstraps are not available in, or cannot be made of materials compatible with the pipe, an intermediate material compatible



with the pipe and the support clip, slider, roller, U-bolt or overstraps shall be installed to separate the incompatible materials.

12. The Contractor shall ensure that structural steel is primed and fully painted in the fabricator's shop to the maximum extent possible.
13. Those areas of steel work which require field welding shall be suitably cleaned and primed before painting. These areas and any unpainted steel surface shall be painted with the appropriate paint system in accordance with the paint specifications after welding is complete and within one day from cleaning.
14. All supports with base plates shall be bolted down on concrete pads or plinths using either approved chemical anchor bolts or bolt pockets formed in the concrete as shown on the drawings. The supports shall be subsequently grouted, and the bolts tightened after the grout has cured.

4.2.7 Welding Stainless Steel

Where stainless steel is to be welded it shall be of the "L" grade. Mild steel attachments and mild steel tack welding shall not be permitted.

Crevices in corrosive environments shall be avoided, or seal welded.

Care shall be exercised to avoid problems due to high thermal expansion and low conductivity of stainless steel, such as:

- Tack welds not re-melted into the weld pool.
- Welding heavy and light sections.

Contamination by salt (e.g. perspiration), carbon (e.g. pencil markings) and iron (e.g. filings, wire brushing, grindings) shall be avoided.

4.2.8 Inspection and Testing

All piping shall be inspected in accordance with the requirements of ANSI B31.1. Acceptance shall be in accordance with the requirements of the above code, except where modified or extended by the Owner specifications.

The Contractor shall be responsible and comply with the specification requirements for radiographic and other non-destructive inspection. The Contractor shall be responsible, at no additional cost to the Owner, for the repair of welds, re-inspection of welds and any retraining or re-qualification of welders or welding operators.

The Owner reserves the right to inspect the piping to the extent necessary to satisfy itself that the Work conforms to the drawings and specifications and to verify that all the required testing and examinations have been completed to the satisfaction of the Owner.

The Owner may use any or all recognized testing methods which are deemed necessary to assist in the accurate determination of weld quality. The Owner may appoint an inspection agency to carry out inspection services and to witness and verify tests. The Contractor shall liaise and coordinate fully with the inspector and take all necessary measures to facilitate testing and verification.

Prior to the commencement of welding, it is imperative that both pipes intended for connection undergo a thorough internal inspection and cleaning process. The internal surfaces of the pipes must be confirmed to be free from any dust, rust, scale, or solid debris that could compromise the quality of the weld and the system's operation. This cleaning procedure is crucial to ensure optimal welding conditions and the integrity of the joint. Any contaminants identified during the inspection must be promptly removed, and the cleanliness of the internal surfaces verified before initiating the welding process.



4.3 Pumps

4.3.1 Design and Selection

1. Particular attention shall be paid to the selection of pumps and their materials of construction. Reliability, ease of replacement of worn parts and maintenance-free bearings are essential requirements. The pumps shall have a well-proven service record. The bearings shall be maintenance free during their lifetime.
2. All pumps shall be capable of meeting their required duty continuously without requiring replacement of impeller or wear rings. They shall be capable of continuous operation without overheating, cavitation, excessive noise, or vibration, surging or instability when working singly or in parallel with other pumps. The wear rings and the impeller will shall not require replacement within their expected lifetime.
3. The pumps shall be of suitable material to meet the Demin water quality outlined in Section 3.3.2.
4. Pumps shall be designed and selected considering the followings:
 - The operating condition falls within the recommended allowable and preferred operating regions for maximum efficiency.
 - The head-capacity (H-Q) curve shall rise steadily from rated flow to shut-off, considering the design operating parameters outlined in Section 3.3 of the tender document.
 - Pump sizing shall account for the required NPSH (Net Positive Suction Head) to avoid cavitation at the specified design flow.
 - Minimum flow rate for stable operation as required by the pump curve/hydraulics shall be ensured.
 - Shut-off head rating shall match or exceed the maximum static design head.Pump characteristics such as efficiency, NPSH, design flow rate, shut-off head etc. shall be computed based on standards ASME, Hydraulic Institute, or applicable national codes.

Selection shall follow the best pumping industry practices to assure process requirements are satisfactorily met over the design life of the system.
5. Pumps shall be designed to have adequate margins available in the head and capacity to compensate for any normal slow rate of wear anticipated or build-up of deposits in piping. Care shall be taken to ensure that the higher flow rates that may result from such margins do not increase velocities in the associated system to erosion levels, considering the design data stipulated in section 3.3.2 of this Tender Documents.
6. Pressure drop for pump filter has been estimated 0.3 bar. If pressure drop is higher shall be considered in the pump TDH and NPSHa.
7. Suction pressure will vary in the indicated range based on the level of the corresponding tank.
8. All the materials in contact with the fluid being pumped shall be compatible and selected to minimize electrolytic corrosion.
9. Pump material: Pressure casing, Inner case parts, Impeller, Shaft, Bushings, Case and gland studs, Case gasket are AISI 316 or equivalent, for wear ring is Hard faced AISI 316 or equivalent.
10. Pumping systems shall have a recirculation line for pump protection. The recirculation line shall normally be routed to the source from which the system takes suction. Modulating or two-position automatic recirculation valves and bypass orifices shall be used as applicable.
11. Strainers (start-up or permanent) shall be installed in the suction piping of horizontal pumps or sets of pumps. The driver shall be mounted on an extension of the pump bedplate and shall drive the pump through a flexible coupling with OSHA coupling guard.
12. Vent and drain valve with plug shall be fitted, where necessary, at suitable points on the pump casing.
13. The process piping or valves. Horizontal end-suction pumps shall allow the impeller to be withdrawn from the motor end without disturbing the motor or discharge piping.
14. All pumps shall have the required direction of rotation shown on the pump.



15. The pump and motor shall be coupled by a flexible coupling incorporating a spacer of sufficient length to allow dismantling of the pump bearings and shaft seals without disturbing the motor or piping.
16. The electric motor used for driving each item of equipment during factory testing shall, where possible, be the motor to be installed with that item. Performance certificates for the motors used in testing shall be available for checking by the Owner and shall be included in the certification for the equipment tested.
17. All electric motors shall have a 1.15 service factor with class F insulation and a class B temperature rise. They shall be totally enclosed fan cooled (TEFC) and shall have an enclosure rating of IP65 for outdoor use. Motors shall be designed to operate for at least 2 years continuously without major maintenance.
18. The rated starting current should not exceed 5.5 times rated current.
19. The pumps shall be equipped with local control panel operation, and capable for local and remote operation.
20. Control valves to be equipped at Fogging Pump Skids inlets if required to help achieve the desired process pressure control in a more efficient and ensuring steady flow when more Fogging Pumps Skids are put into service simultaneously.

4.3.2 Installation

Alignment and leveling procedures and results shall be fully documented.

The Contractor shall ensure that the final coupling clearances are in accordance with the Manufacturer's tolerances. Contractor shall submit detailed alignment records for each item for Owner's.

After the rotating equipment has been tested and operated, and its alignment is shown to be correct, Contractor shall dowel the equipment in accordance with the manufacturer's instructions.

Each electric motor shall be examined for damage and the insulation tested before energizing.

All motors shall be checked for proper rotation before connection to the driven equipment. A record shall be kept of all motor rotation checks.

Stainless steel shims, cut to the same size as the motor foot, shall be installed beneath each motor wherever practicable when aligning shafts so that future realignment may be performed without grinding the motor base plate.

4.4 Valves

4.4.1 Access

All valves shall be arranged so that the hand wheel moves in a clockwise direction to close the valve. The face of each hand wheel shall be clearly marked with words "open" and "close" and shall be provided with an arrow to indicate direction for opening and closing. Valves shall not be fitted with the stems below the horizontal. An indicator shall be fitted to clearly show the position of each valve from the hand wheel operating position.

All valves shall be readily accessible for both operating and maintenance.

4.4.2 Nameplates

All valves shall be provided with name plates showing valve tag number and service.

4.4.3 Requirements

1. Certification stamps shall be provided on all equipment as per the relevant code or standard.



2. As far as practicable, maintenance or replacement of wearing parts shall be able to be accomplished with the valves in situ. All valves of similar size, duty and type shall be directly interchangeable. The internal diameter of all valves and the ends of connecting pipes shall be of the same internal diameter.
3. In the case of all welded-in valves, the stub ends of the valves shall project from the valve body a sufficient length to ensure that the welding process will not affect the valve seats.
4. Gate, parallel slide and globe valves shall be of external screw rising spindle type. Gate valves shall not be used for throttling. Welded end valves shall not be used for control valves.
5. Valve packing shall be graphite free as appropriate. A grease nipple shall be provided for valves of 200 mm bore and above. Packing shall be capable of being replaced without removal of the operators and/or without removing the valve from the line. Seals shall be provided, if required, to retain grease and keep dirt and moisture out of bearings. Lubricating fittings shall be provided to lubricate bearings, yoke nuts, bushings etc.
6. Valve selection and materials shall be appropriate to the piping material and fluid (shall be of suitable material to meet the Demin water quality outlined in Section 3.3.2) and operating conditions to ensure long life, maintainability and, where applicable, minimum pressure drop. They shall be well proven in similar service considering:
 - The valve body and disc material for DM water shall be stainless Steel (SS).
 - Valve sizes 65mm (2 1/2") and above shall have flanged or butt-welded ends. Smaller sizes shall have flanged, or socket welded ends.
 - The end connections shall comply with the following: Socket welding (SW) - ANSI B 16.11, Butt Welding (BW) - ANSI B 16.25, Threaded (SC) - ANSI B 2.1, Flanged (FL) - ANSI B 16.5.
 - Flanged ends of valves shall conform to the dimensions in ANSI B16.10 for the respective class and shall have end flanges integral with the valve body. Welds on flanges is not acceptable.
7. Material of Construction (Gate/Globe/Check valve):
 - Body & Bonnet: ASTM A 351 Gr. CF 8M/ ASTM A 182 Gr.304
 - Disc: ASTM A 351 Gr. CF 8M/ ASTM A 182 Gr.304
 - Trim: ASTM 182 Gr. F. 316
8. The valves shall have the following characteristics for each type maybe will be used:
 - Gate Valves:
 - Full bore, solid/elastic or articulated wedge disc and rising stem.
 - Globe Valves:
 - Straight flow.
 - Preferably have vertical stem with radiused or spherical seating and discs shall be free to revolve on the spindle.
 - For the regulating valves, valves with regulating plug & parabolic outline disc type is preferred.
 - Check Valves:
 - Swing or dual plate for bore >2"; Piston type for bore ≤2"
 - In the case of swing check valves, the body seat should be inclined at an angle that facilitates closing and prevents chatter.
 - Check valves should not be located close to upstream flow disturbances such as control valves, elbows, and tees, check valve be located 5D downstream from elbow, and 10D downstream from tees and control valves.



9. Flanged ends of valves shall conform to the dimensions in ANSI B16.10 for the respective class and shall have end flanges integral with the valve body. Welding on flanges is not acceptable.
10. The preferred direction of flow shall be cast or stamped on the body of the valve.
11. Hand wheels shall be provided with a corrosion resistant shear pin for over-torque protection.

4.5 Electrical Works

4.5.1 General Requirements

The Contractor shall install all electrical equipment in accordance with equipment manufacturers and supplier's guidelines and requirements. Special care shall be taken to avoid damage during storage and installation. Equipment shall be properly leveled, aligned, and held down. Any damage shall be made good by the Contractor to at least the manufacturer's standard. The Contractor shall maintain the site in a safe, clean, and tidy state at all times.

The Work shall be carried out by qualified electrical and instrumentation personnel, specializing in industrial electrical and instrumentation installations.

Electrical connections shall be carefully made with proper cleaning, greasing and Belleville washers as appropriate. All connections shall be made using torque wrenches and then rechecked and marked.

The Contractor shall supply, install, and test the three distribution panels to supply the fogging pump skids of GT1 and GT2, supply the fogging pump skids of GT3 and GT4, Supply the fogging pump skids of GT5 and GT6 and two Filling and two Forwarding Pumps, including the required busbars, earthing, circuit breaker, and measurement instruments and indication, and connect the distribution panel to the existing LV switchgear in Phase III and configure the protection setting to ensure safe and reliable pumps operation.

The AC distribution panel shall be rated to carry actual connected load plus 20%.

All the installed raceways by the Contractor (duct banks, manholes, cable tray, conduits, etc.) shall have spare space for future purposes.

4.5.2 Power Cable Selection and design

Cable sizing procedures should ensure that a short-circuit fault shall not result in damage to the cable prior to normal operation of interrupting devices. The fault duration rating of the cables shall be determined by the total operating time of the complete protection system and an additional safety margin of 0.25 sec. The maximum current carrying capacity for any cable shall consider the worst case on where the cable shall be routed (tray, conduit, duct, or direct buried). Voltage drop and factors related to ambient and ground temperature should also be considered in sizing of cable. All cables shall be rated in accordance with IEC 60287. Contractor shall perform calculations for Owner showing effects and compensation for ambient and ground temperatures.

All cables shall be capable of withstanding the normal mechanical and electrical stresses expected during installation and service without mechanical deformation or damage.

All cable materials shall be of high quality and be able to withstand the corrosive effects of soil, underground water, chemicals, heat, moisture, ozone, rodents, termites etc. to which the cables may be exposed. Cables shall be provided with water-blocking material to prevent radial and longitudinal migration of water.



All cables shall be suitable for indoor or outdoor installation in cable tray, embedded ducts, direct burial, and conduit. For outdoor installation, the cable may be exposed to direct sunlight, rain, and blowing dust.

All medium and low voltage power and control cable shall be armored with galvanized steel round wire armor for multicore and aluminum for single core.

Low voltage cable shall be 0.6/1.0 kV grade as per IEC.

Conductors shall be stranded, annealed copper for all power and control cables and extra flexible stranded copper for all instrument cables.

Conductors shall be compact round and Class 2 stranded for power cables in accordance with IEC 60228.

Low voltage 400V power and control cable insulation 600 V/1 kV, high grade, low loss, extruded XLPE rated 90°C. Three-core power cables shall be designed with individually colored cores of red-yellow-blue.

The insulation shall be based on a design voltage stress which has been proven to be completely satisfactory in service. As maximum freedom from the possibility of failure is essential, highly stressed insulation which has not been fully proven in service shall not be used even if it has satisfactorily passed the type test.

The average thickness of insulation shall be in accordance with IEC 60502. Minimum insulation thickness at any point shall not be less than the nominal values specified in Table III of IEC 60502. The thickness of any separator or screen on the conductor or over the insulation shall not be included in the thickness of the insulation.

Flame retardant and moisture resistant fillers shall be used in the interstices of the multiconductor cable to give the completed cable a circular cross-sectional shape.

A suitable inner jacket shall be extruded over the completed circular multi-conductor cable to keep the fillers in place.

The material used for inner coverings and fillers shall be suitable for the operating temperature of the cable and compatible with the insulating material.

The over-sheath shall be tough PVC or high-density polyethylene (HDPE), termite resistant and suitably prepared against cracking and decomposition under the prevailing service conditions at site. The outer sheath shall be covered with a black semi-conductive layer. Preference is given to an extruded semi-conductive layer rather than graphite coating. Cable sheath shall be fire-retardant complying with IEC 60332, Part 3, Category A.

The over-sheath shall be permanently identified to clearly show the following:

- a) Manufacturer's name
- b) Rated circuit voltage
- c) Conductor size
- d) Number of conductors
- e) Insulation material
- f) Outer jacket material
- g) Year of manufacture
- h) Sequential footage marks in meters.



4.5.3 Cable route

4.5.3.1 Cable Trays

The cable tray system shall be designed, fabricated, and installed in accordance with the latest edition of NEMA Standard Publication No. VE-1 - Cable Tray Systems, load/span class designation NEMA Class 12C. Cable tray and cover material shall be galvanized steel.

Cable trays and supports shall be manufactured by a specialized manufacturer and shall be made of galvanized steel. Installed cable trays shall, when fully loaded, be able to support the weight of a person climbing on the racking, without failure or permanent distortion. Cable tray and conduit shall not be supported off or fixed to any process piping. The accessories shall include but not be limited to hanger systems, brackets, holding down clamps, couplers, covers together with all fixings necessary to complete the work. The accessories supplied shall be of the cable tray manufacturer's proprietary manufacture.

All changes in direction both in the horizontal and vertical planes shall be installed using adjustable couplers, risers, bends etc. and in such a manner that cabling using the tray route shall not be bent beyond the cable manufacturer's minimum bending radius for the type of cable being installed. No tray fittings other than the manufacturer's shall be used.

Adequate separation and segregation shall be provided between power, control, instrumentation, and communications cables, and to other facilities such as pipes and bus ducts, to avoid interference and consequential damage. Duplicated trip circuits and power supplies shall have route segregation except at the common termination points such as circuit breaker mechanisms.

All cable trays shall be bonded to earth over its entire length. Where tray runs are not continuous, minimum 16 mm² bonding jumpers shall be run between each run to ensure electrical continuity. The finned, stranded copper conductor shall be used for the bonding jumper. Adjustable couplers between cable tray sections shall be bolted tightly in accordance with manufacturer's instruction to provide for proper electrical continuity. Manufacturer's variable angle splices shall be bonded with minimum 16 mm² bonding jumpers.

Each cable shall be neatly laid on the tray and firmly secured using proprietary cable ties.

All runs of cable tray shall be fitted with the manufacturer's proprietary covers when all cabling has been installed, secured, inspected, tested and commissioned by the Contractor.

4.5.3.2 Cable Conduits and Accessories

Conduit, accessories and supports etc. shall be rigid hot dip galvanized steel, purpose made by one manufacturer who specializes in the design and manufacture of conduit and accessories. All conduit and accessories shall be in accordance with their manufacturer's requirements and recommendations. The minimum size conduit allowed is 19 mm.

Above-grade conduit shall be run on overhead structures and shall be grouped and supported on appropriate conduit supports. Exposed conduit runs shall be installed in a neat and workmanlike manner, parallel or perpendicular to structural members. Conduit routings shall be located as far away as practicable from heat sources or possible fire hazards, such as pumps and control valve manifolds, sample stations, etc. All above-grade conduits shall be adequately supported in accordance with applicable codes and manufacturer's requirements and recommendations.

All conduits shall be installed with a minimum number of bends and offsets. Generally, conduit runs shall be limited to about 50 m between pull points. Where bends or offsets are required, they shall be made with the manufacturer's proprietary conduit bending equipment. Uniform circular cross-section of the conduit shall be maintained at all bends. No single bend shall be greater than 90 deg.



All conduits shall be terminated in threaded hubs or bushings designed to prevent damage to wire. Grounding-type connections shall be provided on all conduit runs which in turn shall be bonded to earth.

On steel pipe ways and structures, supplementary supports, racks brackets and clips shall be installed as required. Conduit shall be attached using standard conduit clamps. Scissors clamps or other friction-type holding devices are not acceptable. Conduit or fittings shall not be welded to any structure. Arrangements shall not obstruct space assigned to pipes or other equipment including personal access.

Conduit ends shall be cut square, properly reamed and threaded to engage not less than five threads. Joints shall be made up tight. Threads shall be coated with approved conductive thread protective compounds. Thread compound shall not interfere with grounding continuity of conduit system.

Conduit fittings shall be installed as required to provide a neat workmanlike job. Expansion fittings, with bonding jumpers, shall be installed every 65 m in straight continuous runs. Pull fittings, including bends, shall be of adequate size so that the cable can be installed without bending it on a radius less than the cable manufacturer's requirements. Conduit fittings shall be Crouse-Hinds or equal with cast covers.

Conduit saddles shall be provided at intervals not exceeding 1000 mm and shall be screw fixed using stainless steel fixings.

All elbows, bends, tees etc. shall be of the inspection type, positioned so that their covers can be readily removed. All covers shall be secured in place with suitable fittings.

4.5.4 Junction and Cable through Boxes

They shall be manufactured from 316L stainless steel sheet of sufficient thickness to prevent buckling and have a minimum degree of protection to IP65. The junction boxes shall be designed to avoid condensation inside the boxes.

Boxes shall be provided with full size hinged doors on the front which shall be secured with proprietary locking mechanism. All junction boxes and cable through boxes shall have the same locking mechanism with common keys. The Contractor shall provide the Owner ten of the proprietary keys suitable for these locks.

Assemble terminal boxes complete with backplate, terminal mounting rails, terminals, ducting, ducting covers, labels and all other equipment required. Where mounted on platforms, fix cabinets to platform handrails with 316L stainless steel "U" bolts, nuts and spring washers to provide as a minimum two points of fixing. Seal fixing penetrations to maintain the specified IP rating.

Where boxes are to be free-standing, provide and install the support frame and securely bolt to the concrete foundation.

Digital and analogue terminal blocks shall be fully segregated and mounted on separate terminal rails.

4.5.5 Distribution Panel

400 V Distribution panel shall be supplied and installed in:

1. Electrical Building in Phase I (GT1 Switchgear) to supply and control fogging pumps skids of GT1 and GT2 (The Contractor shall review the site and confirm the installation location (Indoor/ Outdoor).



2. Electrical Building in Phase II (GT3 Switchgear) to supply and control fogging pumps skids of GT3 and GT4.
3. Electrical Building in Phase III to supply and control the filling pumps, forwarding pumps, and fogging pumps skids of GT5 and GT6.

See the enclosed layout of power supply for the Filling and Forwarding Pumps and Fogging Pumps Skids (Appendix A).

4.5.5.1 Distribution Panel General Requirements

The distribution panel shall be equipped with an Incoming breaker and loads circuit breaker (Molded Case Circuit Breakers MCCB) as aforementioned plus two spare breakers. The distribution panel shall be equipped with all necessary busbars, earthing busbar, power meter, three phase ammeter and voltmeter, and all necessary lamp indicators. All indicator lamps shall be of the LED type. No incandescent types are allowed.

The Incoming circuit breakers shall have overcurrent and earth fault protection against overloading,

short circuits and multi-phase and single-phase earth faults.

The circuit breakers shall be capable of withstanding the thermal stresses caused by overloads and short circuits. The maximum tripping time under the short circuit shall not exceed 20 ms.

The circuit breakers terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.

The ON, OFF & TRIP positions of the circuit breaker shall be clearly indicated to be visible to the operator when mounted as in service.

The distribution panel shall be IP65 and mounted on proper base frame made of angle or channel, all fixing nuts, and bolts together with grounding bolts shall be provided.

System connections shall be in accordance with the requirements for a multiple earthed neutral (MEN) system. Earth busbar shall be connected to the nearest earth grid conductor.

The Distribution panel shall be designed to prevent contact with live parts both within the modules and in the cable alley.

All equipment shall be constructed of non-hygroscopic and non-inflammable.

All components mounted in the distribution panel shall be accessible and shall not impede access to wiring or terminals.

4.5.6 Cabling

Cabling from switchgears to loads shall be combination of duct banks, trenches, cable trays and conduits. The selection of cabling methods shall be decided as soon as equipment location and pipe layouts are confirmed, and an optimized cable routing solution can be drawn out. To achieve a substantial level of redundancy for critical equipment, cables shall be laid as far as possible into separate routes.

The Contractor shall install and connect up all cabling required to complete the Work.

The Contractor shall provide the detailed connection schedules giving the connections for power, control and instrumentation cabling required to be made between items of plant and equipment. The Contractor shall determine the correct phasing and terminations for all power cabling.



Cables shall not be bent beyond the cable manufacturer's minimum bending recommendations. Bending the wire sharply over the edge of fittings shall be avoided. Cable lubricants, such as "Wireze" shall not be used without the express approval of the Owner.

All circular cabling shall be glanded at their point of entry into equipment, switchgear, etc. Moisture proof and corrosion resistant glands shall be used outdoors.

Soldered connections or terminations are not permitted.

All wire and cable shall be kept in boxes or on reels at the feeding end of a wire pull. Wire and cable spread out on the ground at intermediate pull boxes shall be safeguarded against damage and dirt through the use of tarps, plywood panels or other adequate protection.

The Contractor shall provide all cable glands and compression lugs which shall be selected and installed to the cable manufacturer's recommendations. Lugs shall be tinned copper. Lugs shall be installed using the manufacturer's proprietary compression tools. Ratchet compression tools shall be used for all cables up to and including 16 mm². Hydraulic compression tools shall be used for all other cable sizes.

All cables shall be tested for continuity, identification and insulation.

Power and control cables shall be tested with a 1,000 V insulation tester while instrument cables shall be tested with a 500 V insulation tester. Records shall be supplied to the Owner.

Cables shall be terminated using proprietary preformed heat shrink stress control materials, proprietary cable glands and compression lugs, where stud or bolted connections are required, or shall be terminated directly into the equipment's integral screw-type termination.

Terminations for armored cables shall comprise compression type of gland with armor and bonding clamps to meet the requirements of type E1 to BS6121 or equivalent and shall be designed to secure the armor wires, to provide electrical continuity between the armor and the threaded fixing component of the gland and to provide watertight seals between the cable's outer sheath and gland and between the inner sheath and threaded fixing component. The glands shall project at least 10 mm above the gland plate to avoid moisture collecting in the cable crutch. Glands shall ground the armor and shields at one end only, preferably the feed end. Neither metallic screen (shield) nor armor shall be used as the protective (PE) conductor. Shrouds shall be fitted to cable glands where exposed.

Terminations for non-armored cables shall comprise compression type glands where the function of the gland is to secure the outer sheath of the cable, in accordance with the requirements of type A2 to BS 6121 or equivalent. A watertight seal shall be provided between the outer sheath and the gland.

All cables shall be tagged, tested for continuity, identification, and insulation resistance with the suitable testing ridding.

All cables shall have secured and protected cable route using Steel or PVC conduit, cable tray, cable trench where needed and as per the site conditions.

The Contractor shall provide, install and connect up all earthing and bonding to all equipment as required by this Specification and drawings, relevant Codes, Standards and local authorities.

All cable ladder and metallic conduits shall be bonded to provide earth continuity over their entire length.

The necessary earthing terminals are to be provided for the earthing of the boxes and cabinets. Earthing resistance shall be in accordance with the electrical and I&C requirements and less than 0.5 ohm.



The whole system shall be constructed in such a way as to allow conductivity of electrostatic charges and shall be connected to the earthing system.

The metal sheath of the cables shall be connected to the earthing system at the sealing ends.

Cable armoring, if applied, shall be bonded to earth. Cable armoring shall be used for earthing purposes and may also be supplemented with additional cores within the cable. The appropriate compression gland shall be used for glanding the armored cable. The gland shall be complete with an integral earthing tag suitable for bonding to the equipment earthing terminal via an earthing lead with compression lug type connections.

A separate instrument earth shall be provided, and all instrumentation cable screens and instrument earths shall be connected to this earth. The instrumentation earth should be connected to the main station earth at one location.

4.5.7 Lighting System

Light fittings and accessories for outdoor lighting shall be IP 65 rated. Fitting bodies shall be constructed from die cast aluminum construction with toughened glass face. All fittings shall have high grade reflectors.

The Contractor shall use industrial heavy duty LED lighting fixtures.

The location of the lighting and small power equipment shall be reviewed at site before installation so that satisfactory co-ordination with pipework, ductwork, power cables, and other plant can be assured.

4.6 Control and Instrumentation

4.6.1 General Requirements

The contractor shall design and propose the control, monitoring, and instrumentation needed to ensure reliable and safe operation for all equipment, the minimum requirements and configuration as follows:

New DM Water Tank Filling Pumps:

- The new DM Water tank to be equipped with Pressure and Level. Transmitters with full redundancy (2 transmitters. At least).
- Each transmitter to Provide (HI Alarm, HI-HI Trip level) to protect the DM water Tank from overflow.
- Pressure Transmitter after the filling Pumps header to monitor the filling line and to be connected to the DCS.
- The Filling pumps to be tripped after (5 sec.) when the header pressure less than Pump nominated press value.

DM Water Forwarding pumps:

- Install Min. flow Valve (Mech. Movement - not control) for water circulation.
- The new DM Water tank to be equipped with Press. Level. Transmitters with full redundancy (2 transmitters. At least).
- Each transmitter to Provide (LO Alarm, LO-LO Trip level) to protect the pumps.
- Pressure Transmitter after the forwarding Pumps header to monitor the suction line, and to be connected to the DCS.



- The forwarding pumps to be tripped after (5 sec.) when the header pressure is less than Pump nominated press value.
- After the forwarding pumps install two isolation valves with two branches to direct the water flow to Fogging system or to transfer the DM water to the existing DM Water tank at phase III.

4.6.2 Existing Distributed Control System (DCS)

The Existing DCS is EMERSON OVATION (Phase I: **3.1**, Phase II: **3.3.1**, Phase III: **3.5**, Phase IV: **3.5.1**).

The Filling and Forwarding Pumps shall be connected to existing DCS and have the following features:

1. Start/ Stop Command
2. Running Status
3. Alarm/ Trip Signals.
4. System Parameters.

The New DM Water Tank graphic shall be interfaced to the existing DCS of Phase III and interface the actual tank level and alarms of (LO, LO LO, HI, HI HI).

The Fogging Pump Skids (7 in total) shall be interfaces to existing DCS and have the following remote signals:

1. Start/ Stop Command
2. Running Status
3. Alarm/ Trip Signals.

See the enclosed layout of the control and monitoring system Connection (Appendix A).

4.6.3 Transmitters

Transmitters shall be used to provide the required signals being 4 to 20mA_{dc} and/or serial digital bus signals.

Transmitters shall be designed with provisions for zero and span adjustments and shall have accuracy of 0.1percent of calibrated span. Where necessary, transmitters shall include mathematical functions or tables to convert measured value into appropriate engineering units.

4.6.4 Process Measurement Switches

Process measurement switches shall have screw type or compression type terminal connections on a terminal block for terminating field wiring. Switch set points shall be adjustable. Contacts shall be of the snap-acting type. Mercury switches are not acceptable.

4.6.5 Local Indicators

Indicators for local mounting shall have 115 mm minimum dial size. Dial scales shall be such that the normal operating range is in the middle third of the dial range.

4.6.6 Solenoid Valves

Solenoid coils shall be Class H high temperature construction and shall be designed for continuous duty. Three-way solenoid valves shall be designed for universal operation so that the supply air may be connected to any port. Solenoid enclosures shall be weatherproof.



4.6.7 Instrument cables

Instrument cable 300 V, flame retardant, gas vapor tight PVC rated 70°C.

If instrument cable cannot be purchased with armor, it must be physically protected by rigid conduit the full length of the run.

Power wiring to and from the instruments and power supply units shall be such that power supply units can be removed without total system shutdown.

Wire and cables of electronic instrument installation shall be single pair not less than 1.5 mm² tinned copper conductors with PVC insulation, twisted, with aluminum shielded Mylar tape separators with drain wire, extruded PVC inner sheath, wire braid or armor, and overall PVC jacket.

Single pair wires shall be run in separate trays from the various transmitting and control devices to centrally located field terminal junction boxes in the process area.

The Contractor shall provide proper wire and cable and its installation works for digital communication (e.g. Mudbugs, Fieldbus) that shall be met with the standard code.

AC power and signal wiring shall be separated by a minimum spacing of 100 mm in all cases and shall not under any circumstance be run in the same wireway.

Wiring between terminals shall be point-to-point and free from wire splicing and T connections.

When shielded cables or wires are necessary, an insulating sheath shall be included. Provision for termination of shields or means to maintain the continuity of isolated shields shall be provided as required. Cable shields shall be connected and earthed in a manner that prevents circulating currents.

All cables shall be tested for continuity, identification and insulation.

Cabling and wiring constructions, fixings, ladders, labels, junction boxes, terminations and other accessories shall be in accordance with Section 3.8.3.

4.7 Civil Works

4.7.1 General Requirements

1. The contractor shall perform a Geotechnical investigation to determine the foundation design required (Retaining wall and tank foundation), one copy shall be submitted to the Owner.
2. All roads and concrete structures shall be designed, handling and tested per the following codes (ACI, AASHTO, ASTM) and Jordanian Statutory codes and regulations.
3. Foundations shall be designed and adopt necessary earthquake design criteria suggested by UBC 1997. The seismic risk zone for this site shall be considered Zone 2B from UBC 1997.
4. The design of all pavements shall conform to the requirements of the American Association of State Highway and Transportation Officials (AASHTO), and/or local standards whichever is more stringent and to accommodate AASHTO semi-truck loading with impact added.
5. All tests required by approved codes and standards shall be borne by the Contractor including preparing, storing, and transporting test specimens to the place of testing.
6. Disposal of Unusable Materials, Work output waste and any obstacles shall be removed from the Site to disposal areas as approved by Owner.

See enclosed Site Plan and its Topographic Survey (Appendix A).



4.7.2 Cutting, Filling and Leveling

The Contractor shall carry out the Cutting, Filling, and leveling in all areas inside the new concrete retaining walls until the level (BM00 +115.90):

- All levels under +115.90 level shall be filled with approved and tested backfilling materials.
- Filling, leveling and compaction on the Site shall be carried out in layers not exceeding 250 mm thickness after compaction.
- The Contractor shall carry out all necessary quality control works including in-situ soil density tests and other laboratory testing to ensure that all materials used in the filling elsewhere are compacted in accordance with the specified requirements, The maximum dry density (MDD) for the purpose of this specification shall be determined by the 95% of Modified Proctor per ASTM D1557 or equivalent.
- Disposal of Unusable Materials and any obstacles shall be removed from the Site to disposal areas as approved by the Owner.
- Final grading to include 10 cm gravel topping to reach +116 level, Gravel to be same size as agreed with Owner.

4.7.3 Retaining Wall

The Contractor shall Design and erect concrete reinforcement retaining Wall:

- The top level of all concrete walls shall not be less than 230 cm above +116 level.
- The minimum depth of foundation shall be not less than 1 meter below natural ground level.
- The galvanized wire angle and mesh above concrete wall shall be erected same existing.
- Blinding concrete and lean mix concrete shall be not lower than $f_c' = C20$ Mpa with 10 cm Min thickness.
- Adequate drainage behind the retaining wall shall be considered in design.
- The structural concrete with compressive strength shall be not lower than $f_c' = C25$ Mpa.
- Reinforcement bars to be deformed high yield bars grade 60 according to ASTM.
- All concrete shall be ready mixed.
- All concrete shall be fair faced; Exposed edges shall be properly chamfered.
- Water curing for reinforced concrete shall be made for a minimum period of 7days.
- Below grade concrete shall be coated by two layers of bitumen.
- Compression test for concrete shall be tested by contractor.

4.7.4 DM Water Tank Foundation

The Contractor shall design and erect DM water tank Ring Foundation and shall be founded on suitable, reinforced concrete foundation with appropriate design, foundation shall have minimum plinth height of 300 mm from adjacent final ground level:

- The top tank's level concrete foundation shall be same the level of existing demi tanks phase 3.
- Blinding concrete and lean mix concrete shall be not lower than $f_c' = C20$ Mpa with 10 cm Min thickness.
- The structural concrete with compressive strength shall be not lower than $f_c' = C30$ Mpa.



- Reinforcement bars to be deformed high yield bars grade 60 according to ASTM.
- All concrete shall be ready mix.
- All concrete shall be fair faced; Exposed edges shall be proper chamfered.
- Water curing for reinforced concrete shall be made for a minimum period of 7 days.
- Below grade concrete shall be coated by two layers of bitumen.
- Compression test for concrete shall be tested by contractor.

4.7.5 Road

The Contractor shall design, erect new Road and it shall be connected from the existing Road inside power plant to the new tank area, it shall be 6 meters asphalt-paved lanes 7.5 cm thickness in two layers (including MC & RC layers) with concrete curbs, the concrete curbs specifications and construction (cast concrete below and behind the curbs) shall be same the existing in power plant.

- The work includes removing an eight-meter length for all height from the existing concrete wall and the existing pedestrian walkway and any obstacles to connect the existing road to the new tank.
- Excavation, leveling, filling, backfilling by approved materials works is included.
- Asphalt mix design shall be submitted for approval.
- The contractor shall submit suggested road drawings for approval before proceeding with the work.
- The backfilling materials and asphalt pavement shall be tested by the contractor.
- The work includes erect rainfall drainage system (four concrete manholes same the existing) and shall connect them with the nearest existing rainfall drainage manhole.

4.7.6 Sidewalks

The contractor shall design, supply and erect Sidewalks around tank foundation and new asphalt roads, the Sidewalks shall be 1.0 meters wide, 150 mm thick reinforced concrete pavement:

- Reinforced steel shall be $\phi 10/15$ cm in both directions.
- The work includes 8 cm lean concrete under the sidewalks.
- Ground layers under lean concrete shall be compacted.

4.7.7 Fogging Pump Skid foundations

The Contractor shall supply and erect the fogging Skid foundations (Seven (7) in total) and shall be founded on suitable, reinforced concrete foundation with appropriate design, foundation shall have minimum plinth height of 200 mm from adjacent final ground level.

- The approximate dimensions of each foundation are 3*5 m.
- blinding concrete and lean mix concrete shall be not lower than $f_c' = C20$ Mpa with 10 cm Min thickness.
- The structural concrete with compressive strength shall be not lower than $f_c' = C25$ Mpa.
- Reinforcement bars to be deformed high yield bars grade 60 according to ASTM.
- Reinforcement bars to be grounded.
- All concrete shall be ready mixed.



- All concrete shall be fair faced; Exposed edges shall be proper chamfered.
- Any backfilling materials that are needed shall be supply, compacted and tested by contractor.
- water curing for reinforced concrete shall be made for a minimum period of 7days.
- below grade concrete shall be coated by two layers of bitumen.
- The location of each foundation to be determined later near each gas turbine area.
- The Contractor may excavate by any method he considers suitable, subject to the approval of the Owner.

The aforementioned is the general requirement is for the foundations, the detailed design and drawings of the fogging pump skids foundation will be provided to the Contractor by the fogging system supplier through the Owner after the Tender Award.

4.7.8 Electrical duct bank and manholes

Electrical duct bank and manholes shall be erected as tender drawings with the below specifications:

- The duct banks shall have 4 PVC rated for electrical installation 6 inch in diameter and encased in reinforced concrete, concrete with compressive strength shall be not lower than $f_c' = C20$ Mpa.
- Manholes with inside dimensions 80*80*100 cm, 20 cm base and wall thickness, reinforcement steel two layers of $\phi 10 / 15$ cm.
- Top level of manhole shall be covered with galvanized steel plate cover.

Electrical ducts, trenches with covers, lids, and manholes shall be constructed of concrete appropriately sized for earth and hydrostatic pressures, and live loads applied by vehicles, cranes or cable installation equipment. Manholes or access points shall be placed at practical intervals to enable ease of inspection, maintenance, and cable installation.

4.7.9 Filling and Forwarding Pumps Foundations

Pertinent information about equipment such as the footprints, weights, anchorage requirements, nature of equipment, whether rotating or vibrating, static or dynamic loading criteria or any special recommendations by equipment manufacturers shall be considered in the design of equipment foundations. In general, equipment shall be supported on mat-type or spread footing type foundations; or, piling or drilled pier (caisson) if required due to the soil conditions.

The Contractor shall perform dynamic analyzes for the rotating equipment foundations. The design of the foundations shall take due account of differential settlement and dynamic loadings either from earthquake or rotating machinery and possible ground subsidence.



4.8 Closed Circuit Television (CCTV) System

Closed Circuit Television (CCTV) shall be provided for operational and security monitoring. The additional CCTV system shall be interfaced to the CCTV system of the existing plant and shall monitor the entirety of the expanded area and its boundary including the new DM Water Tank and pumps.

- **Minimum System requirements:**

1. Power over ethernet.
2. Outdoor PTZ.
3. IP cameras (not less than 6 cameras).
4. Resolution 8 MP at last.
5. HD-TVI Accessories.
6. Ethernet over Coax (< 100 m).
7. Connected to Media Convertor.
8. PTZ Brackets Camera.
9. Client SW.
10. Environment: CE-RoHS (2011/65/EU); WEEE (2012/19/EU).

Exact locations shall be subject to the approval of the Owner.



5 Bidder Provided Documentation

The Bidder shall provide at a minimum the following documentation as part of the contract. Bidder to provide schedule of all documentation that will be provided after signature the Contract Agreement.

5.1 Project Documentation

- 1 Provide a complete turnkey project schedule from initial design to installation and test.

5.2 Engineering Documentation

1 System Descriptions

2 Calculations

The Contractor shall provide the followings for the Owner's review and approval before ordering the material, equipment, and systems:

- a) The new DM Water Tank detailed design and engineering Documents and as described in the Owner's Technical Specification.
- b) The pumps sizing design includes pump rating point and operating point (speed/pressure/flow) and as described in the Owner's Technical Specification.
- c) The piping network sizing design and detailed engineering documents and as described in the Owner's Technical Specification.
- d) Bidder shall provide the electrical, control and instrumentation cables and equipment design and sizing calculation documents and as described in the Owner's Technical Specification.

3 Drawings

- a) General Arrangements.
- b) P&IDs.
- c) Piping Isometrics.
- d) Electrical Schematics and Installation Drawings.
- e) Control Logic Diagrams and Instrument Details.
- f) All relevant documentation from sub suppliers for all relevant equipment. This includes, but is not limited to, pumps, PLC, motors, piping, valves, and instrumentation.
- g) Catalog sheets indicating general assembly drawings, section drawings, dimensions, weights, and material of construction.

5.3 Construction and Commissioning Documentation

- a) Erection and Commissioning Documentation,
- b) Operation and Maintenance Documentation, and Parts Catalogue,
- c) Provide a copy of manufacturer's Quality Assurance Manual and procedures.
- d) As-Built Drawings.

6 Quality Control, Inspection and Testing

6.1 General Requirements

The Contractor shall have sole responsibility for ensuring compliance with the overall quality requirements of the Works and shall ensure that Subcontractor's implement those quality control activities that are appropriate to the extent and nature of their supply.

The Contractor shall establish and maintain a documented inspection system capable of producing objective evidence that all materials; manufactured parts and assemblies comply with the quality requirements of the Contract. The Contractor shall establish a written procedure to identify and dispose of any deviations identified during the course of manufacture, inspection and test etc.

6.2 Non-conformance

Non-conformances identified by the Owner shall be notified to the Contractor by issue of the Owner Non-Conformance Report. The Contractor shall receive and action all non-conformance reports and re-inspection shall not be notified until the completed non-conformance report, together with any applicable re-work or concession application, have been accepted by the Owner.

Where applicable, rejection of materials, equipment and/or components will be made as promptly as practicable following any inspection or test involvement by the Owner. Failure to inspect and or reject materials, equipment and/or components shall neither relieve the Contractor from responsibility for such items which may not be in accordance with the specified requirements, nor impose liability for them on the Owner.

The Owner shall have complete authority to accept or reject any equipment or part thereof considered unsatisfactory and/or not in accordance with the contract requirements. The witness of any inspection and tests by the Owner of any components or lots thereof does not relieve the Contractor of any responsibility whatever regarding defects or other failures which may be found before the end of the warranty period.

6.3 Welder Qualification

All welders shall be tested and qualified in accordance with the appropriate pressure piping code. Relevant original documentation verifying the welders' qualifications shall be available for inspection prior to the commencement of any production welding. The test welds accepted by the testing authority in qualifying each welder shall be available for inspection at any time prior to completion of the Work.

The permanent record shall be a set of drawings showing all pipework. The size, type, location, welder identification and date of welding of each welded joint shall be clearly recorded in the drawings. This record shall be maintained by the Contractor and shall be available for inspection at any time prior to the completion of the Work. The permanent record shall be handed over on completion of the Work.



7 The Proposal Price

The bidder warrants that the proposed Price to be inserted in the tables below is based on the requirements of the Tender.

The Proposal Evaluation Process will consider the Grand Total Price (Lump Sum Price – Price Schedule No.3) only.

7.1 Price Schedule No.1 Material and systems Supplied

Table 7.1: Equipment, Material and Systems Supplied as per the Owner's Technical Specification and bidders' proposal

No.	Description	Total Price JOD
1	One (1) Demin Water Storage Tank 2000 m3, with all necessary valves, water filters, piping, drain equipment, inspection manholes, inlet flanges, outlet flanges, recirculating flanges, stair, handrail, vents, cathodic protection system, interconnection cabling, and instruments and any other requirements as described in the Owner's Technical Specifications.	
2	Two (2) filling pumps (2 X 110%) for the New Demin Water Tank 2000 m ³ will be connected to the suction of the existing 500 m ³ Demin Tank of Phase III, with all necessary valves, valves and check valves, water filters, piping, drain equipment, pressure differential indicator and switches local control panel, interconnection cabling and any other requirements as described in the Owner's Technical Specifications.	
3	Two (2) forwarding pumps (2 X 110%) to the fogging pump skids and return the water to the existing 500 m ³ Demin Tank with all necessary valves, check valves, water filters, piping, drain equipment, pressure differential indicator and switches local control panel, control valves, interconnection cabling, and any other requirements as described in the Owner's Technical Specifications.	
4	Piping Network of the New Demin Water Tank and Fogging System, with all necessary valves, water filters, piping, expansion, drain equipment, Supports, and any other requirements as described in the Owner's Technical Specifications.	
5	Electrical Equipment, Material and systems including but not limited to Power cables, Distribution panels, grounding system and cables, CCTV system, lighting system, lightning system, and all necessary accessories to supply the power to the filling, forwarding pumps, and Fogging Pumps Skids, Lighting System, and CCTV System and any other requirements as described in the Owner's Technical Specifications.	
6	Control and instruments' cables and all necessary accessories, equipment, material and any other requirements to connect/ Interface the control and instruments of the new DM Water tank, Filling and Forwarding pumps, and Fogging Systems to the existing DCS systems as described in the Owner's Technical Specifications.	
TOTAL Price DAP (at the Site of Samra Power Plant) Excluding Fees, Taxes, and Customs Duties in Jordanian Dinar (JOD) (To Schedule No. 3 Price Grand Summary)		

Note: See Clause 1.9 Taxes, Duties, and Regulations



7.2 Price Schedule No.2 Services of Design, Installation, Erection, Construction, Testing, Start-up, and Commissioning

Table 7.2: Services of Design, Installation, Erection, Construction, Testing, Start-up, and Commissioning as per the Owner's Technical Specification and bidders' proposal

No.	Description	Total Price JOD
1	Design of the Equipment, Material and Systems required to provide the required Tender's Scope of Work meeting Owners Technical Specification Requirement.	
2	Supply, Construction, Testing the Civil Works as described in the Owner's Technical Specifications	
3	Mechanical Equipment, Material and systems Erection and Installation, testing and commissioning as described in the Owner's Technical Specifications	
4	Electrical Equipment, Material and systems Erection and Installation, testing and commissioning and any other requirements as described in the Owner's Technical Specifications	
5	I&C Equipment, Material and systems Erection and Installation, testing and commissioning and any other requirements as described in the Owner's Technical Specifications	
TOTAL Price Including All Fees and Taxes in Jordanian Dinar (JOD) (To Schedule No. 3 Price Grand Summary)		

7.3 Price Schedule No.3: Price Grand Summary

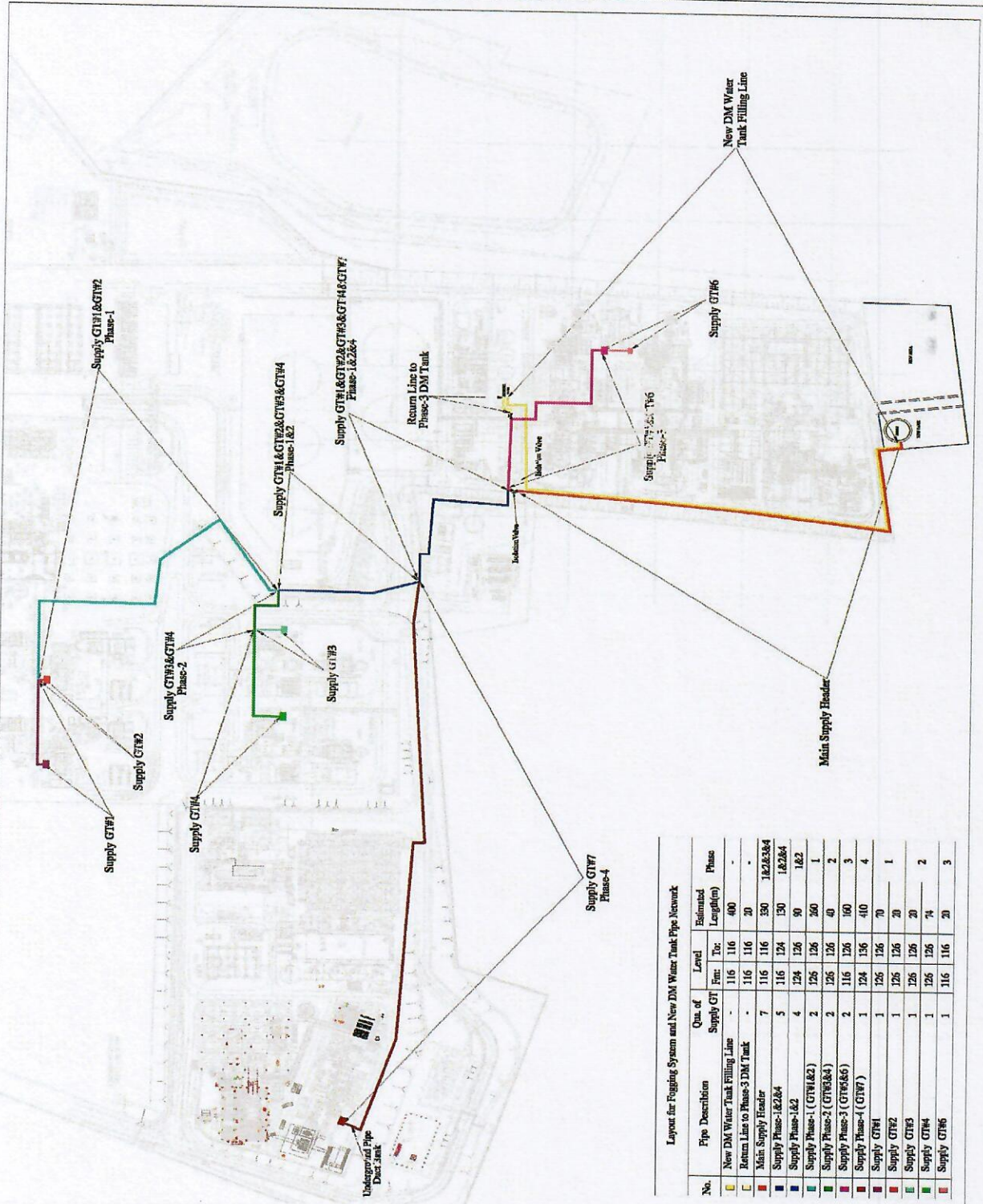
Table 7.3: Price Grand Summary as per the Owner's Technical Specification and bidders' proposal

No.	Description	Total Price JOD
1	Schedule No.1 Equipment, Material and systems Supplied as described in the Owner's Technical Specifications and bidders' proposal.	
2	Schedule No.2 Services of Design, Installation, Erection, Construction, Testing, Commissioning as described in the Owner's Technical Specifications and bidders' proposal.	
Grand Total (Lump Sum Price) in Jordanian Dinar (JOD)		
Grand Total (Lump Sum Price) in Jordanian Dinar (JOD) in words:		



Appendix A: Drawings and Layouts

1. Layout of Fogging System and New DM Water Tank Pipe Network.

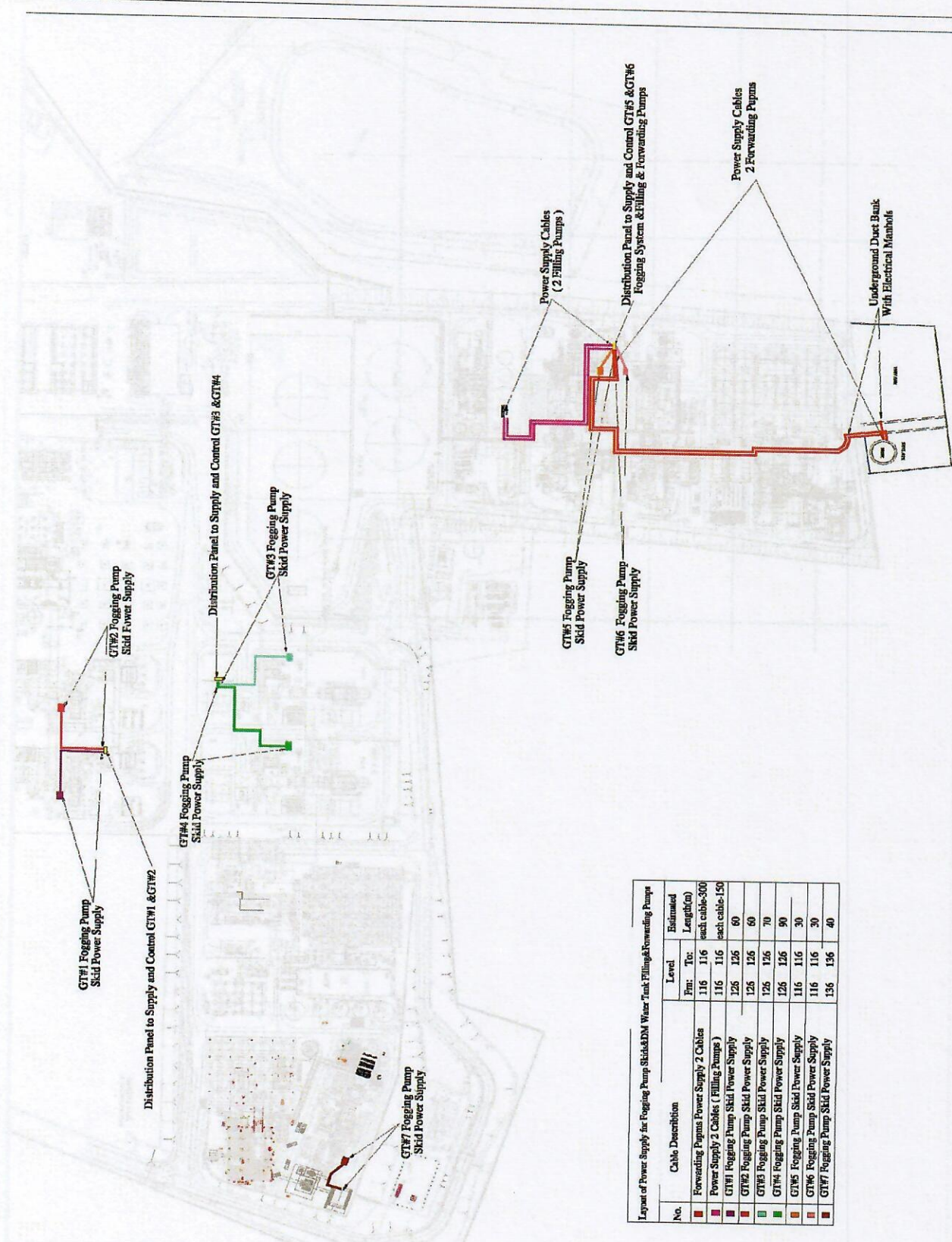


Layout for Fogging System and New DM Water Tank Pipe Network

No.	Pipe Description	Qty. of Supply GT	Level		Estimated Length(m)	Phase
			From	To		
1	New DM Water Tank Filling Line	-	116	116	400	-
2	Return Line to Phase-3 DM Tank	7	116	116	30	-
3	Main Supply Header	5	116	116	330	1&2&3&4
4	Supply Phase-1&2	4	124	126	90	1&2
5	Supply Phase-1 (GT#1&2)	2	126	126	260	1
6	Supply Phase-2 (GT#3&4)	2	126	126	40	2
7	Supply Phase-3 (GT#5&6)	2	116	126	160	3
8	Supply Phase-4 (GT#7)	1	124	126	40	4
9	Supply GT#1	1	126	126	70	-
10	Supply GT#2	1	126	126	20	1
11	Supply GT#3	1	126	126	20	-
12	Supply GT#4	1	126	126	74	2
13	Supply GT#6	1	116	116	20	3



2. Layout of Power Supply for Fogging Pump Skids and New DM Water Tank Filling and Forwarding Pumps.

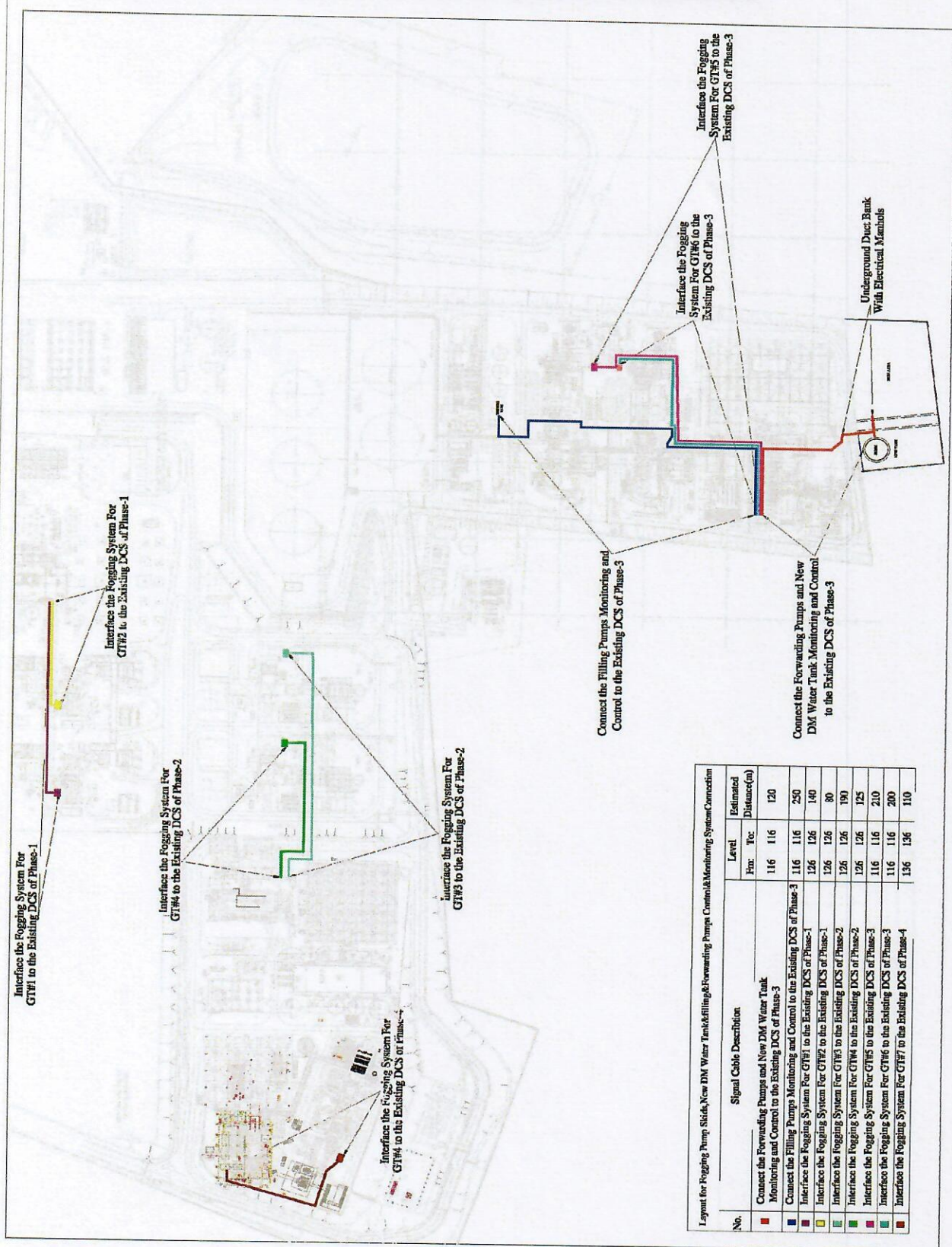


Layout of Power Supply for Fogging Pump Skids & DM Water Tank Filling & Forwarding Pumps

No.	Cable Description	Level		Estimated Length(m)
		From	To	
1	Forwarding Pumps Power Supply 2 Cables	116	116	each cable-300
2	Power Supply 2 Cables (Filling Pumps)	116	116	each cable-150
3	GTW1 Fogging Pump Skid Power Supply	126	126	60
4	GTW2 Fogging Pump Skid Power Supply	126	126	60
5	GTW3 Fogging Pump Skid Power Supply	126	126	70
6	GTW4 Fogging Pump Skid Power Supply	126	126	90
7	GTW5 Fogging Pump Skid Power Supply	116	116	30
8	GTW6 Fogging Pump Skid Power Supply	116	116	30
9	GTW7 Fogging Pump Skid Power Supply	136	136	40



3. Layout of Fogging Pump Skids, New DM water Tank, and Filling and Forwarding Pumps Control and Monitoring System Connection.

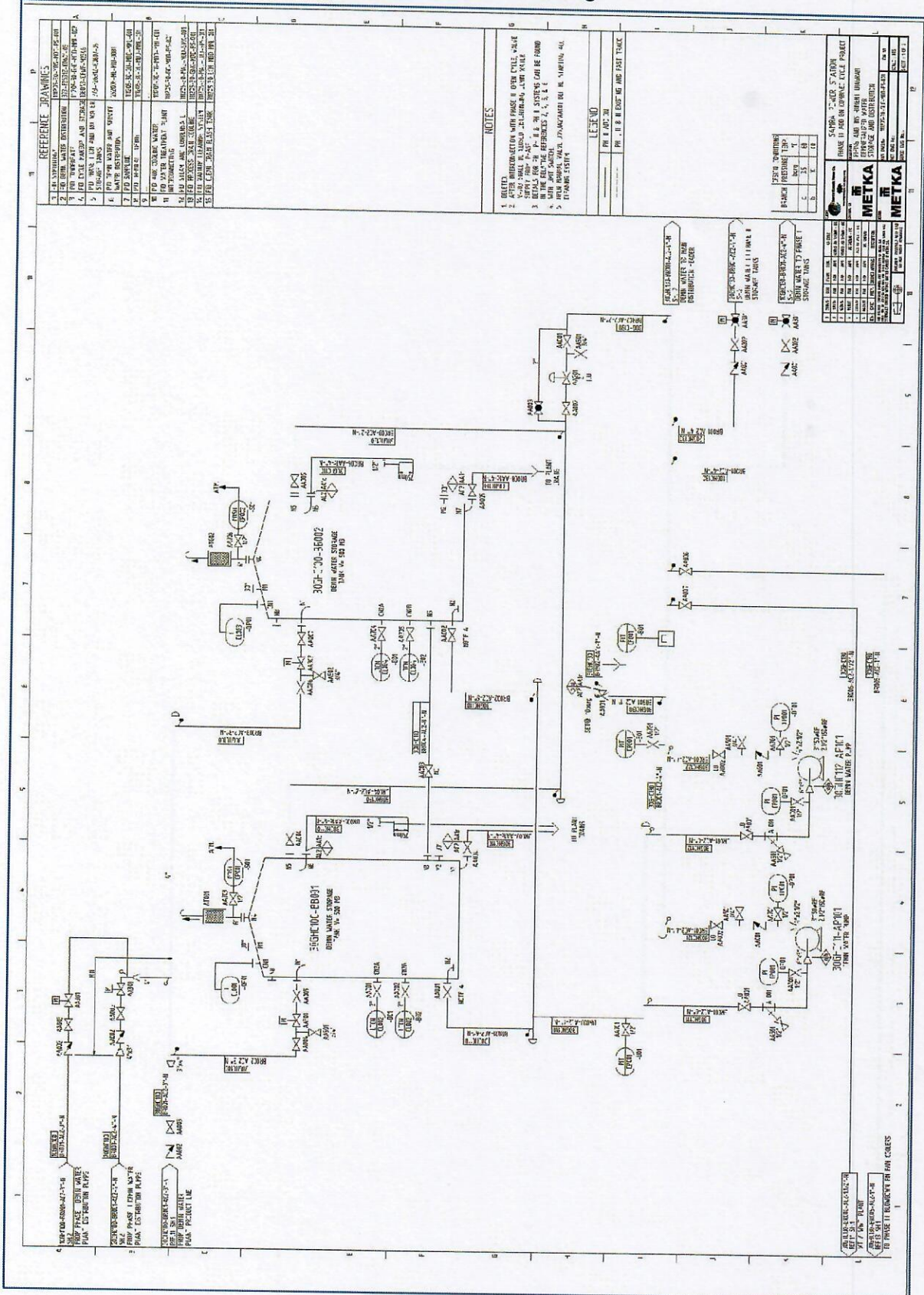


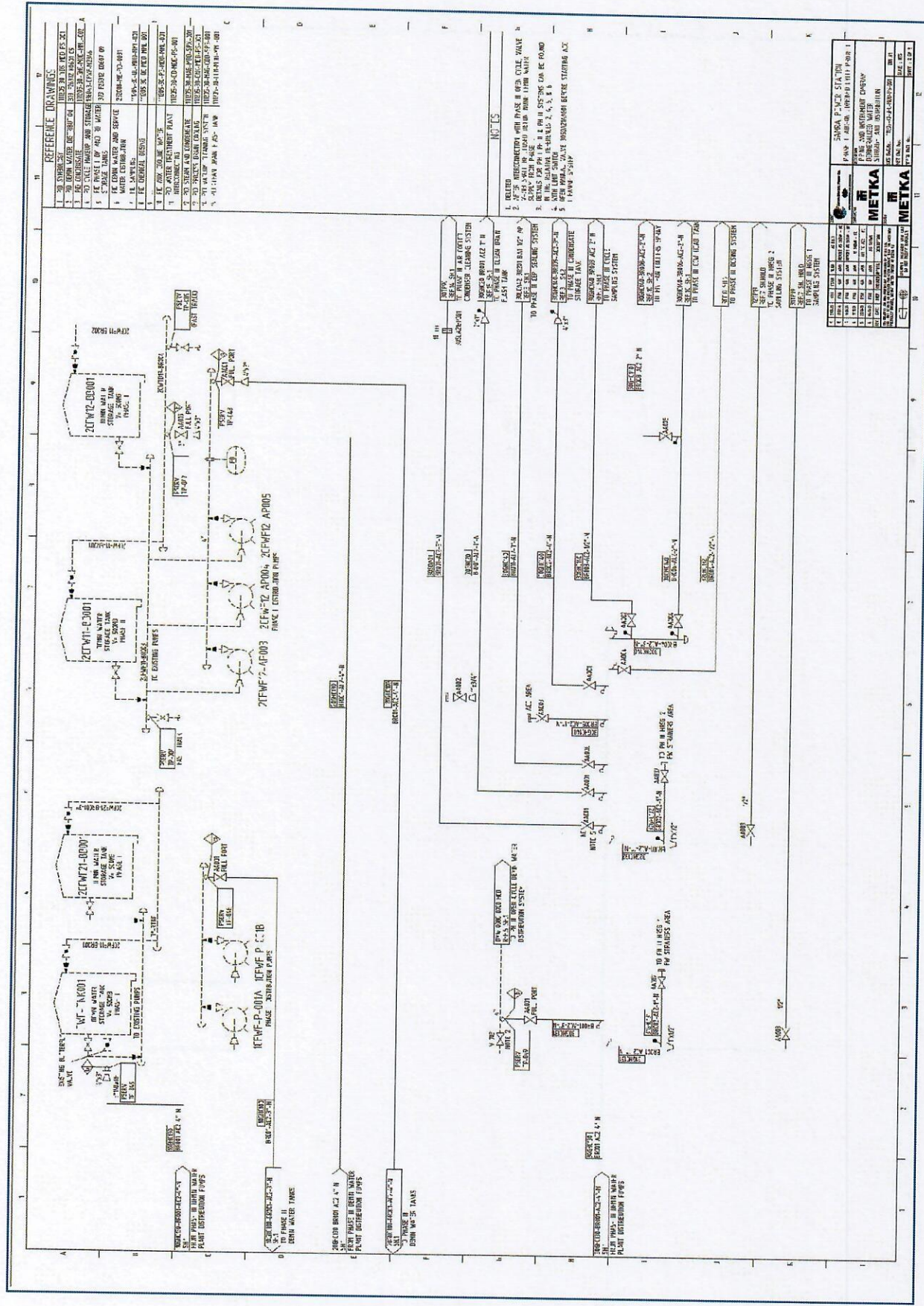
Layout for Fogging Pump Skids, New DM Water Tank, Filling & Forwarding Pumps Control & Monitoring System Connection

No.	Signal Cable Description	Level		Estimated Distance(m)
		From	To	
1	Connect the Forwarding Pumps and New DM Water Tank Monitoring and Control to the Existing DCS of Phase-3	116	116	120
2	Connect the Filling Pumps Monitoring and Control to the Existing DCS of Phase-3	116	116	250
3	Interface the Fogging System For GT11 to the Existing DCS of Phase-1	126	126	140
4	Interface the Fogging System For GT12 to the Existing DCS of Phase-1	126	126	80
5	Interface the Fogging System For GT13 to the Existing DCS of Phase-2	126	126	190
6	Interface the Fogging System For GT14 to the Existing DCS of Phase-2	126	126	125
7	Interface the Fogging System For GT15 to the Existing DCS of Phase-3	116	116	210
8	Interface the Fogging System For GT16 to the Existing DCS of Phase-3	116	116	200
9	Interface the Fogging System For GT17 to the Existing DCS of Phase-4	136	136	110



4. Existing Phase III DM Water System PI&D Drawing.





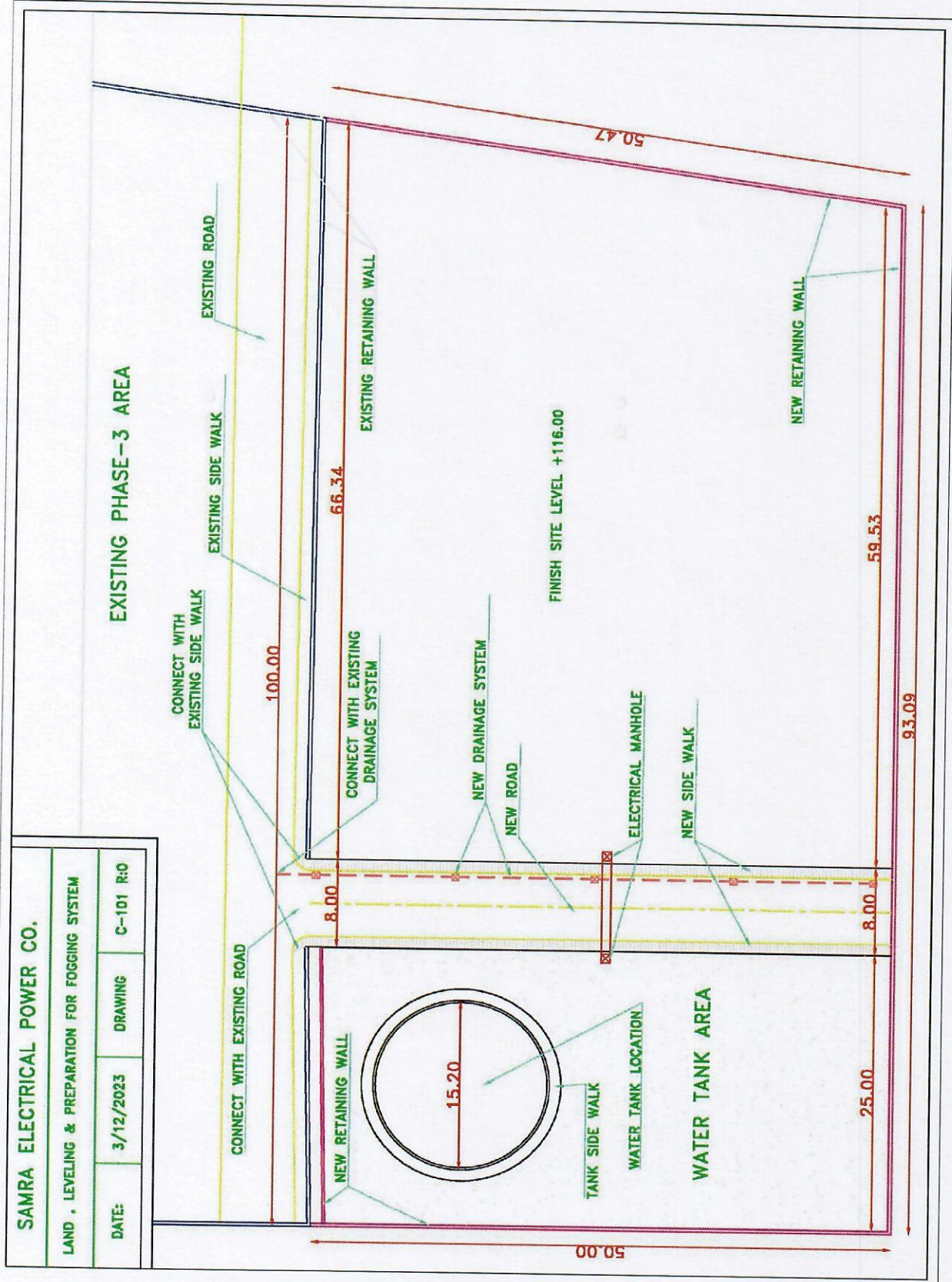
- REFERENCE DRAWINGS**
- 1. 20FW12-03001
 - 2. 20FW12-03002
 - 3. 20FW12-03003
 - 4. 20FW12-03004
 - 5. 20FW12-03005
 - 6. 20FW12-03006
 - 7. 20FW12-03007
 - 8. 20FW12-03008
 - 9. 20FW12-03009
 - 10. 20FW12-03010
 - 11. 20FW12-03011
 - 12. 20FW12-03012

- NOTES**
1. DELT
 2. IF 5% INTERLOCKED WITH PHASE II WHEN CYCLE VALUE IS 50% FROM PHASE II BEING FROM 11000 WATER
 3. DENIES FOR PH I & II PH II STOPPING FOR 10 MIN
 4. WITH LAST 50% IN PHASE II
 5. OPEN PHASE II VALVE INDICATOR BEFORE TIGHTENING AX

SABRA POWER STATION	
PHASE I WATER DISTRIBUTION PLAN I	
FOR THE YEAR 2010	
METKA	
METKA	
Scale:	1:100
Sheet No.:	101
Rev. No.:	1
Date:	10/10/2010



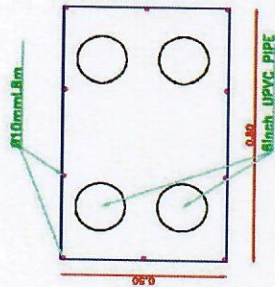
5. Civil Works - Site Plan



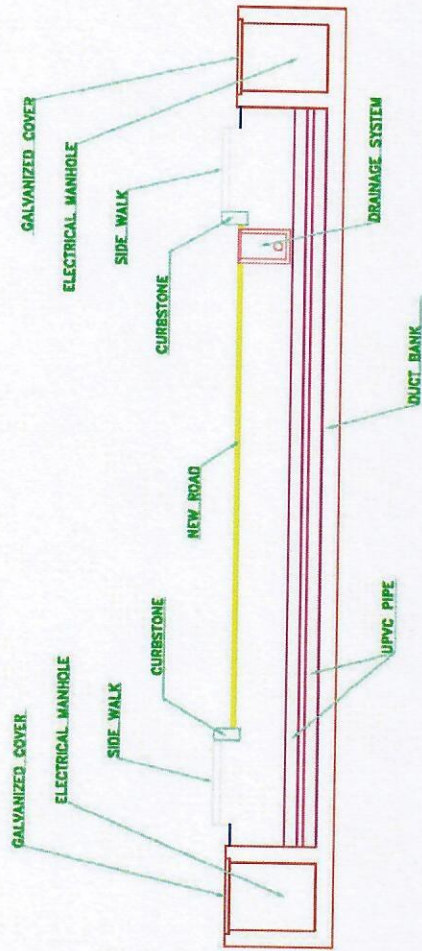
SAMIRA ELECTRICAL POWER CO.

LAND . LEVELING & PREPARATION FOR FOGGING SYSTEM

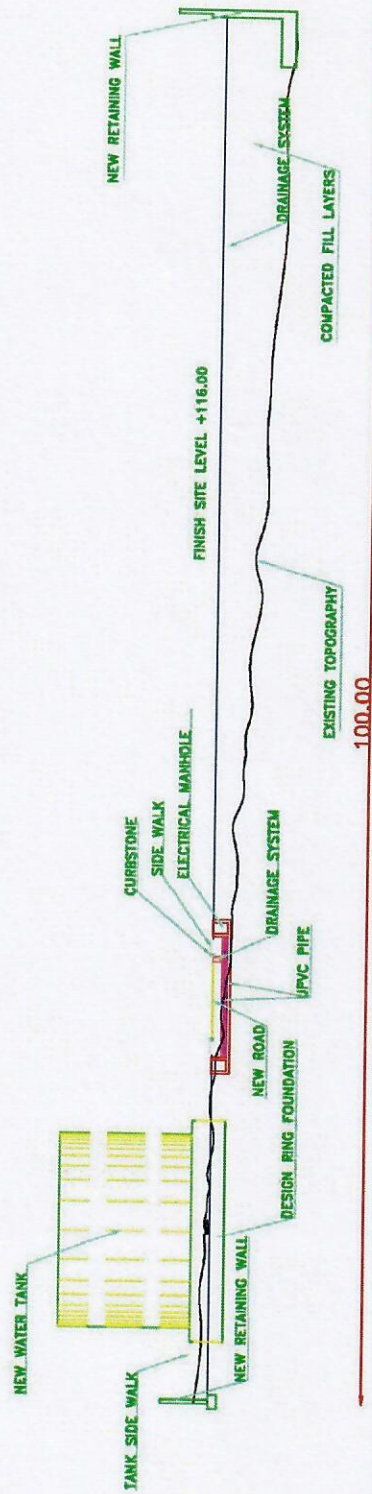
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DUCT BANK SECTION

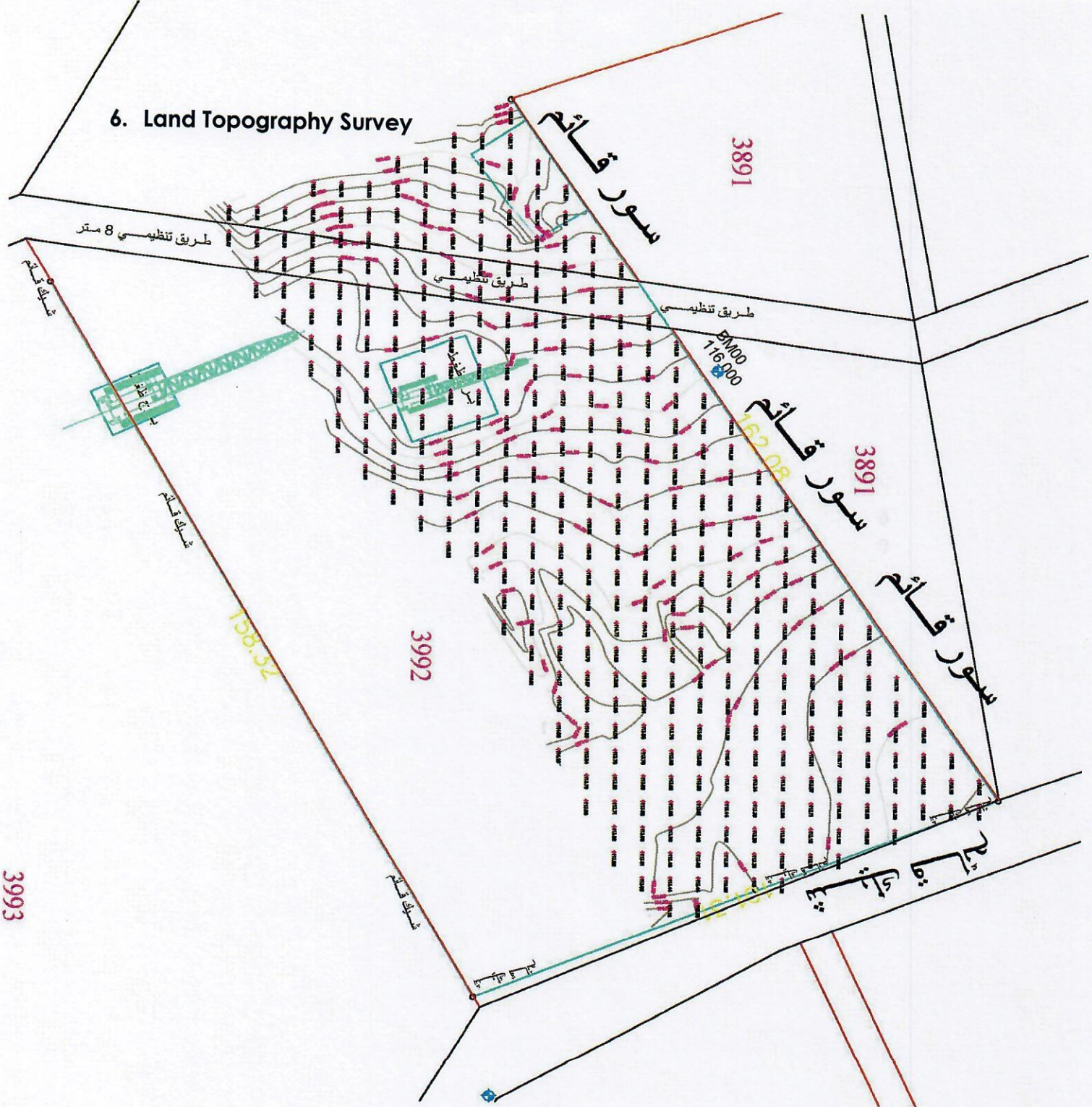


NEW ROAD & AUXILIARY SECTION

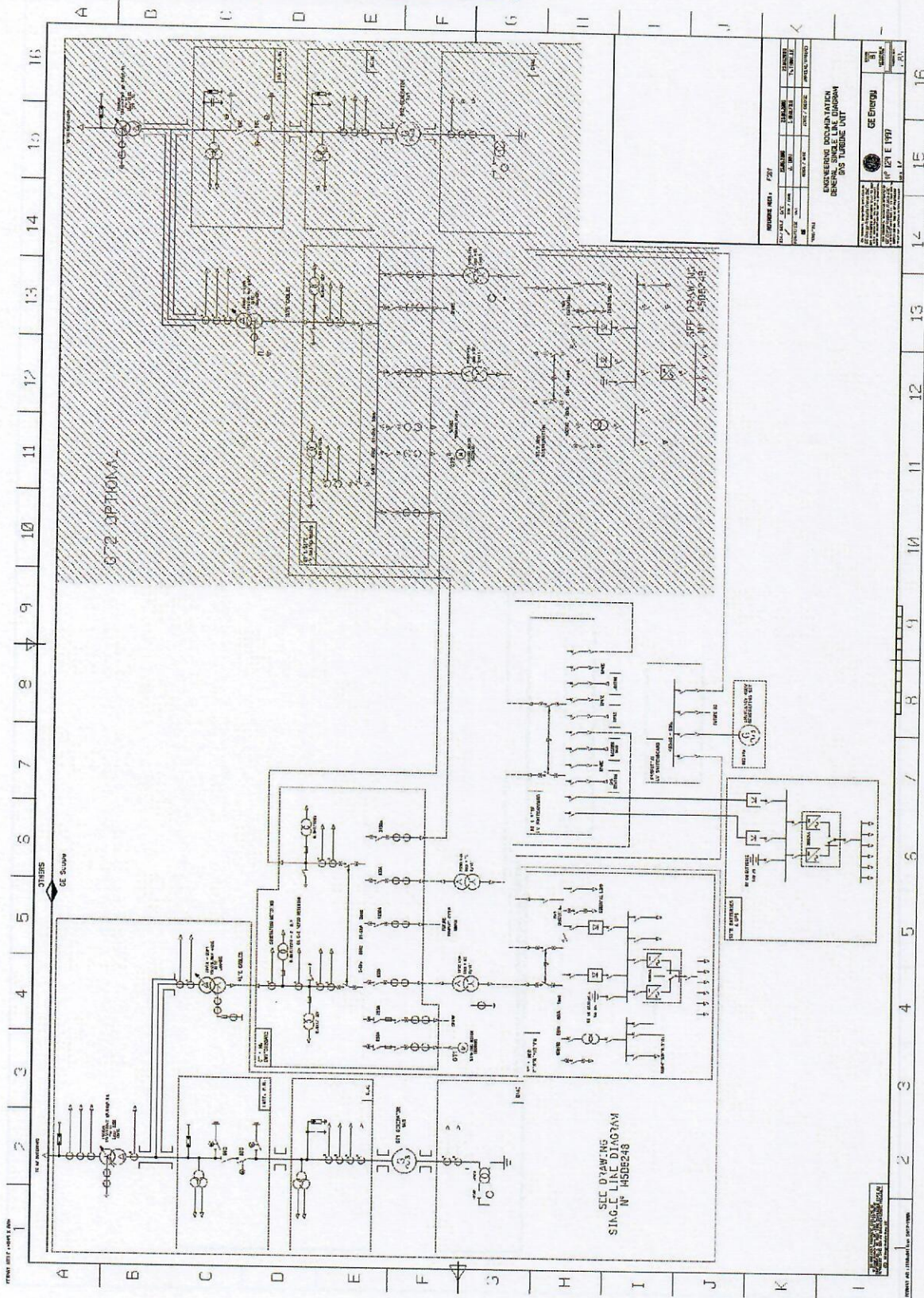


SITE PROJECT LONG SECTION

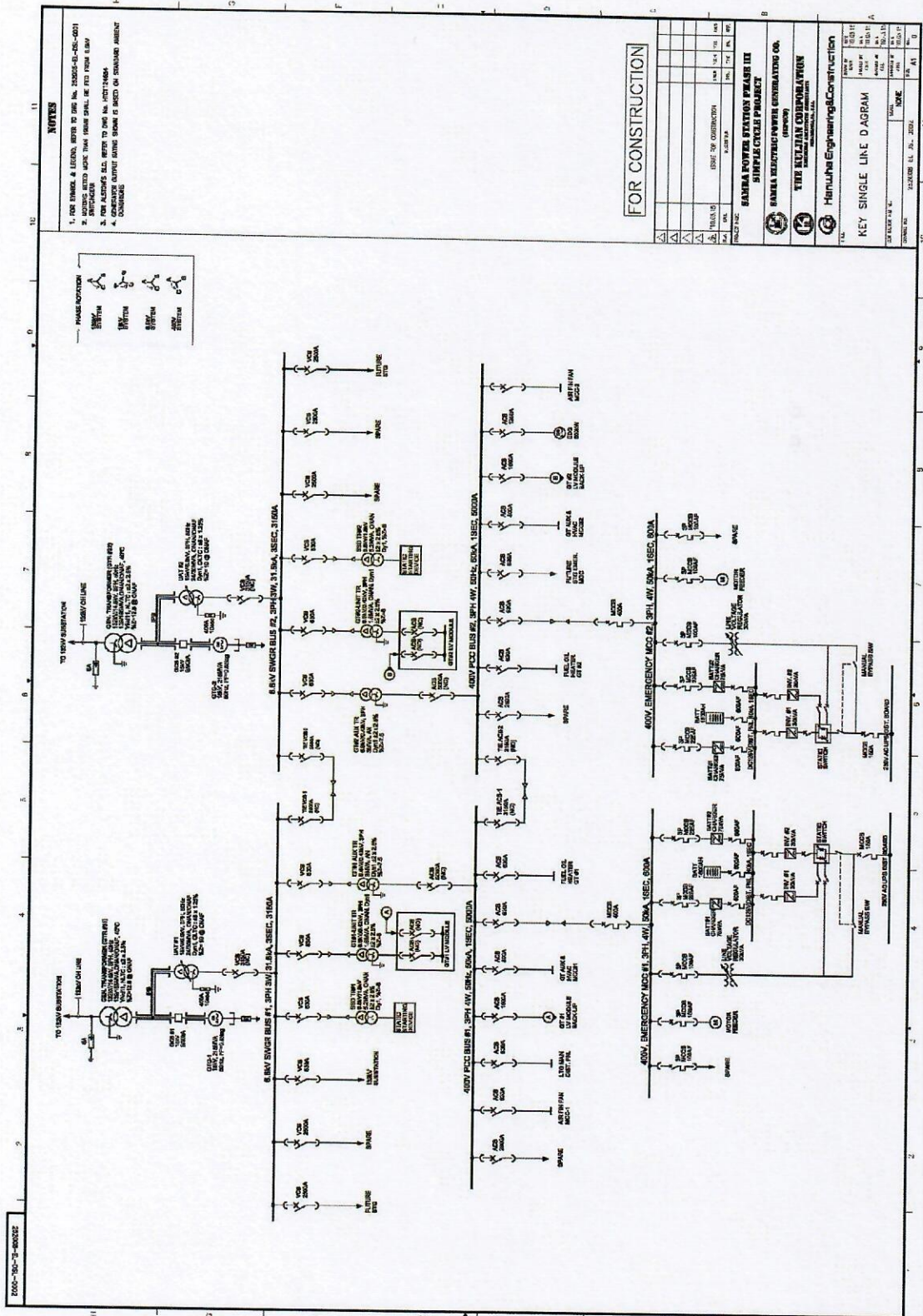
6. Land Topography Survey



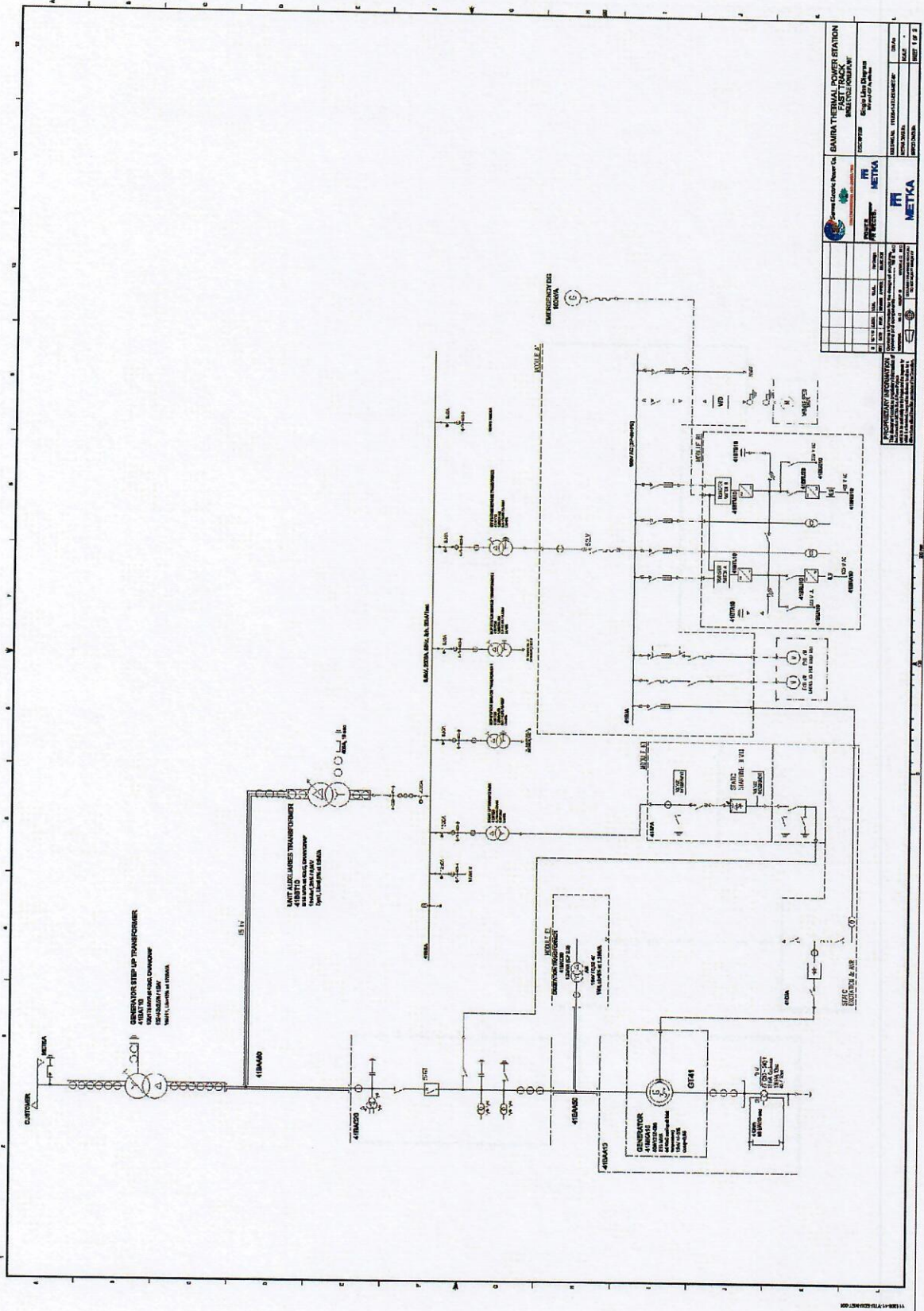
8. GT3 and GT4 Single Line Diagram (SLD)



9. GT5 and GT6 Single Line Diagram (SLD)



10. GT7 Single Line Diagram (SLD)



		SAHRA THERMAL POWER STATION ELECTRICAL DESIGN PROJECT NO. 1001/01/01/01/01 SHEET NO. 10
PROJ. NO. 1001/01/01/01/01	REV. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50	DATE 10/10/2011

