

## **TERMS OF REFERENCE**

### **TECHNICAL & ENGINEERING SPECIALIST (ELECTRO-MECHANICAL)**

#### **KARACHI WATER & SEWERAGE SERVICES IMPROVEMENT PROJECT**

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##### **1. Introduction**

The Karachi Water and Sanitation Services Improvement Project (KWSSIP), supported by the World Bank, AIIB, and the Government of Sindh, aims to improve water supply and sanitation services in Karachi and strengthen the operational and financial performance of the Karachi Water and Sewerage Corporation (KW&SC).

The Technical & Engineering Specialist (Electro-Mechanical) will support the client i.e. PIU-KWSSIP in reviewing and providing technical comments on electro-mechanical designs, drawings, specifications, and BOQs for water supply, sewerage, pumping, treatment, and associated utility systems to ensure compliance with local & international standards and operational requirements, while providing technical guidance for rehabilitation, upgrading, and performance optimization of pumping stations, filtration plants, chlorination systems, and related infrastructure; support procurement and implementation through preparation of technical inputs, evaluation of bids and submissions, and review of shop drawings, method statements, and quality assurance processes during construction, testing, and commissioning; and assist the PIU in coordination, contract management, energy efficiency assessments, O&M readiness, and resolution of technical issues including review of claims, variations, and overall performance of electro-mechanical systems.

##### **2. Key Duties, Functions and Responsibilities**

The Technical & Engineering Specialist (Electro-Mechanical) will be responsible for providing specialized electro-mechanical engineering expertise for planning, review, coordination, procurement support, technical due diligence, and implementation backstopping of all electro-mechanical infrastructure components under KWSSIP. The specialist will provide technical support in all the project phases including design review, procurement process, implementation, contract management, testing/commissioning and O&M readiness.

Given the integrated nature of pumping, treatment, transmission, and utility infrastructure under the project, the Specialist shall provide coordinated oversight across both mechanical and electrical engineering disciplines to ensure compatibility of pumping machinery, power systems, controls, process equipment, and energy performance requirements throughout the project cycle from design development through procurement, construction supervision, testing & commissioning, and operational handover.

The Specialist shall particularly focus on pipe jointing, rehabilitation upgrading and optimization, reliability enhancement, and energy efficiency improvement of critical KWSC electro-mechanical infrastructure including filtration plants, chlorination stations, distribution pumping stations, Dhabeji Pumping Complex, KWSC other pump houses, K-IV downstream allied facilities, major transmission and pressure systems, associated electrical systems, motor controls, and process utility installations.

The Specialist shall review that all electro-mechanical systems are planned, designed, procured, installed, tested, and commissioned in accordance with applicable local & international standards, utility best practices, World Bank technical and procurement compliance requirements, and KWSC long-term operational sustainability objectives.

### **3. Scope Of Work**

- Review electro-mechanical designs, drawings, calculations, technical reports, specifications, equipment schedules, single line diagrams, process layouts, and Bills of Quantities prepared under KWSSIP-II for water supply, sewerage, pumping, treatment, and associated utility infrastructure.
- Review electro-mechanical works related to pressure pipelines including mechanical joints, welding procedures, hydrostatic testing protocols, corrosion protection systems, installation methodology, and contractor quality assurance submissions.
- Provide specialized engineering review and technical guidance to the interested parties including consultants for rehabilitation and upgrading of filtration plants, chlorination stations, distribution pumping stations, Dhabeji Pumping Complex, KWSC pump houses, K-IV downstream allied works, and associated electro-mechanical utility systems.
- Review all proposed pumping systems, pumps, motors, valves, manifolds, chlorination equipment, pressure mains, mechanical installations, switchgears, transformers, motor control centers, standby generators, cabling systems, instrumentation interfaces, and control arrangements to ensure operational efficiency, safety, maintainability, and compliance with international standards.
- Support planning and review of investment grade energy audits for major KWSC pumping infrastructure and electro-mechanical assets with particular focus on pump efficiency, motor loading, power consumption patterns, system losses, demand management, operational inefficiencies, and identification of energy efficiency improvement measures.
- Provide technical inputs in preparation of Terms of Reference, consultant packaging, technical specifications, employer's requirements, and bidding documents for design review consultants, supervision consultants, energy audit consultants, contractors, suppliers, and specialized electro-mechanical assessment assignments.
- The specialist will be responsible for maintaining confidentiality of all procurement-related information and documents during the entire procurement cycle.
- Assist the PIU in technical review and evaluation of consultant proposals, contractor bids, equipment offers, manufacturer submissions, and compliance statements related to electro-mechanical works.
- Review all electro-mechanical engineering submissions prepared by design consultants, supervision consultants to ensure conformity with applicable international codes, standards, utility operational requirements, and safety practices.
- Coordinate with other Specialists, procurement team, consultants and KWSC operational departments to ensure complete integration of electro-mechanical systems with civil, structural, hydraulic, and operational requirements.
- Provide technical input to the consultant during construction supervision stage as needed..
- Witness periodic site inspections, Factory Acceptance Tests (FAT), Site Acceptance Tests (SAT), electrical safety tests, hydrotests, performance tests, trial runs, commissioning procedures, and operational handover inspections for major electro-mechanical systems from the PIU-KWSSIP
- Review contractor claims, technical deviations, substitution proposals, variation requests, and extension of time submissions related to electro-mechanical engineering works and provide recommendations.

- Assist the PIU in development of operation and maintenance readiness plans, spare parts requirements, warranty compliance verification, preventive maintenance procedures, electrical safety protocols, and capacity building recommendations for KWSC staff.
- Prepare technical notes, review comments, compliance assessments, and progress inputs for project reporting, World Bank review missions, audits, and management briefings.
- Maintain organized records of technical approvals, inspections, testing outcomes, commissioning observations, and engineering decisions related to electro-mechanical works.
- Identify matters requiring specialized OEM consultation, third-party technical verification, or short-term subject matter expert input and advise the PIU accordingly.
- Undertake any other assignment related to electro-mechanical engineering management and technical implementation support as directed by the Project Director.

#### **4. Qualifications And Experience**

- Bachelor's degree in Mechanical Engineering or equivalent (HEC-recognized), with Master's preferred in Electrical/Mechanical/ Mechatronics Energy/Power/ Utility Systems or related fields.
- Minimum 10 years of experience in electro-mechanical utility infrastructure projects including water supply, sewerage, pumping stations, treatment plants, and rehabilitation works; experience with FIDIC contracts and MDB-funded projects preferred.
- Hands-on expertise in pumping systems, hydraulic analysis, pipelines, treatment and chlorination systems, electrical systems, motor controls, standby generators, and instrumentation, including design review, planning, supervision, and commissioning.
- Experience in preparation of TORs, technical specifications, bidding documents, employer's requirements, as well as FAT/SAT witnessing, testing, commissioning, and contract/consultant management.
- PEC registration (mandatory). Experience in Pakistan or Central/South Asia (required). Familiarity with MDB/World Bank procedures (advantage).
- Strong English communication and technical reporting skills.

#### **5. Reporting Line**

- The Technical Specialist (E&M) will report to the Senior Technical & Engineering Specialist. She/He will be required to submit monthly activity/progress reports, highlighting key tasks undertaken

#### **6. Contract Duration**

The Specialist is initially required to work for the period of three (03) years with an annual review on performance which will form the basis of renewal. The Probation Period will be for 3 months during/up to which the contract may be terminated owing to unsatisfactory performance. The contract can be terminated with one month notice period by either party. The position is based in Karachi with travel requirements to the site as and when required. The Technical& Engineering Specialist (Electro-Mechanical) may also be required to travel to other places or areas within or outside Pakistan on duty carrying out project related tasks including but not limited to meetings, workshops, training, due diligence for procurement, witnessing factory acceptance tests (FAT) etc.

## **7. Salary And Benefits, And Conditions Of Service**

Market competitive salary based on qualification and experience will be offered. The salary, benefits will be discussed and agreed with the successful candidate. The contract and conditions of service follow the general conditions of service as stipulated in the Project Operations Manual (POM). These will also be discussed and agreed with the successful candidate.

## **8. Selection Process**

An individual will be selected in accordance with process stipulated in Section VII of “Approved Selection Methods: Consulting Services, Clause 7.34, Approved Selection Methods for Individual Consultants under The World Bank Procurement Regulations for IPF Borrowers (Fifth Edition September 2023) available on <https://thedocs.worldbank.org/en/doc/6c0602876d68949e80820507d90a14ed-0290012023/original/Procurement-Regulations-September-2023.pdf>