Jordan Petroleum Refinery Co. Ltd.	شركة مصفاة البترول الأردنية المساهمة المحدودة
Tender No. 139/2024 Upgrade of Automation System for Water Treatment Unit No. (2) at Zarqa Refinery Site including Supply, Installation, Commissioning, and Startup of PLC & HMI - Turnkey Project.	**مناقصة رقم 2024/139** ترقية نظام الأتمتة لوحدة معالجة المياه رقم (2) في موقع المصفاة/ الزرقاء، بما في ذلك التوريد والتركيب والتسليم والتشغيل لأجهزة (PLC&HMI) – تسليم مفتاح.

- ANNEX.	- ملحق.
- TENDER AND CONTRACT INVITATION.	- دعوة العطاء والعقد/الشروط العامة.
- QUALIFICATION FORM.	- نموذج التأهيل.
- COMMERCIAL OFFER FORM.	- نموذج العرض المالي.
- STANDARD SPECIFICATION NO. 1223/1/2024	- المواصفة القياسية رقم: 2024/1/1223
- ATTACHMENTS.	- المرفقات.

ANNEX

* Offers must be submitted in sealed envelopes on or before the closing date on Thursday 16/1 /2025 not later than 12:30 (Jordan Local Time) - Offers received after that time be disregarded.
* Local agents must submit with their offers a valid copy of their registration certificates in the Ministry of Industry & Commerce and their registration certificates in Great Amman Municipality.
* JPRC is entitled to cancel the tender or to postpone the opening of bids, to date it deems adequate.
  Participants will however be notified of the time and place of opening the bids.
* Enclosed herewith a form to be filled accurately, as it is an integral part of Contract conditions.

Please abide strictly the required conditions and specifications.

ملحق

* يجب تسليم العروض بالظرف المختوم قبل الساعة 12:30 من ظهر يوم الخميس الموافق 16/ 1/2025 توقيت الأردن ولي يقبل أي عرض بعد الموعد المذكور.
* على الوكلاء والوسطاء التجاريين أن يرفقوا مع العرض نسخة من سجلهم التجاري ورخص المهن الصادرة من وزاره الصناعة والتجارة وأمانة عمان الكبرى.
* يحق للمصفاة إلغاء المناقصة أو تأجيل فتح العروض للوقت الذي تراه مناسبا على أن يتم إعلام المشاركين بالمناقصة بالموعد الجديد لفتح العروض ومكانه.
* مرفق نموذج لتعبئته وإرفاقه مع العرض.
* إرفاق ثلاثة نسخ من العروض أو نسخة إلكترونية.

راجين الالتزام تماما بالشروط والمواصفات المطلوبة.

نموذج معلومات المورد والوكيل SUPPLIER & LOCAL AGENT INFORMATION		مناقصة رقم 2024/139
الوكيل المحلي Local Agent	المورد Supplier	البنود المطلوبة
		الاسم التجاري Commercial Name
		أسماء مالكي الشركة Director/ Manager Name
		هاتف رقم Tel No:
		فاكس رقم Fax -no
		بريد إلكتروني E-mail
		خلوي Mobile:
		رخص مهن Profession License Certificate
		سجل تجاري Trading Registration Certificate
		رأس مال الشركة Capital
		البنك Reference Bank
		مجموع الإيرادات السنوية Turnover
		مجموع حقوق الملكية Owners' Equity

- دعوة العطاء والعقد/الشروط العامة

-TENDER AND CONTRACT INVITATION

I. Tender & Contract Invitation

1. The following Instructions and General Conditions are integral part of the invitation, and have the power of the purchase contract.

   The listed conditions hereunder are binding for the tenderers, unless otherwise is stated in the documents.

   Offers (technical & commercial) shall be submitted in triplicate, in **English language**, including the following details, before the **CLOSING DATE on Thursday 26/12/2024**, at 12.30 PM (Jordan Local Time).

2. **Identifications:**

   The Company: Jordan Petroleum Refinery Company Ltd., (JPRC).

   The Manager: Chief Executive Officer.

   The Contractor: The successful Tenderer/ Supplier/ Manufacturer.

   The Tenderer: The participant in tender.

3. **Offers shall** include the following:

   A. Printed price and clearly written in figures and capital letters. (**Currency** shall be JOD).

   B. **Valid** for (120) days, at least, from closing date, unless otherwise stated, and also fixed during the completion period.

   C. **Execution time:** the shortest execution period to be stated in your offer.

   D. **Country of origin :** origin of goods shall be stated.

   E. **Any extra optional and / or additional services** to the required specifications should be clearly detailed & priced.

   F. **Manufacturer's name and full address.**

4. **Catalogues:** Operation, maintenance and spare parts manuals, as well as any necessary leaflets and information shall be submitted **in English language**, all shall comply with tender documents requirements, if any.

5. **Required Certificates**: Test Reports Laboratory certificate, API, Baseeffa, UL listing, FM approvals, Mill Test Certificate, Third Party Inspection Certificates and/or as required by Tender documents, codes, etc.

6. The Tenderer guarantees that materials are to be supplied **brand new, updated in design, free from any failure, fault, damage, or defects in material, design, or manufacturing, and of latest model,** unless the offer states otherwise.

7. Any items or accessories necessary to have the offered system/ equipment complete in every respect shall be quoted even if they are not mentioned in this standard specification, noting that failure of the Contractor to do so shall be at his full responsibility, and the said equipment / system shall be rectified as necessary at the **Contractor's own expense.**

8. The COMPANY is not obliged to award on any offer or the **lowest offered prices.**

9. The COMPANY has the right to **cancel** any part or the whole Tender without justifications.

10. The COMPANY is **not bound** to consider any offer which does not follow closely Tender requirements.

11. The COMPANY shall be exempted from serving **notarial notice/s** on the tender.

12. The Tenderer is required to provide **qualification documents** with his offers.

These documents shall include details of his production and general catalogues, and explain, in detail, his past experience in same required equipment and projects, and provide **reference lists including customers/refineries** to which he delivered similar equipment and projects, dates, and contract values. The COMPANY has the right to disregard any offer which may be received from unqualified Tenderers and / or Manufacturer. The COMPANY shall not accept any responsibility or liability of any type or any kind in any way whatsoever.

13. The Tenderer shall submit all documents which show financial statement of the supplier for the latest three years including balance sheet and profit and loss accounts with the offer.

Qualification Form (attached to the tender documents) shall be completely filled by the Tenderer and submit with the offer.

14. It is the full responsibility of the Tenderer to provide all required information during the offering stage, where any lack or misguidance of the required information provided by the Tenderer shall be considered a cause of rejection of his offer.

15. **Payment method:**

A- Payment shall be made either by Bank Transfers or Cheques against contractor's tax invoices.

B- **Payment in advance is not acceptable.**

C- A payment schedule connected to the project milestones shall be included in the submitted offer.

16. **Instructions of the Central Bank**: All parties to this transaction are advised that where the **U.S., EU, UN** impose specific sanctions against certain countries, entities and individuals banks may be unable to process a transaction that involves a breach of such sanctions, and authorities may require disclosure of information.

II. Successful Tenderer/ Supplier shall be responsible for the following:

1. All the documents pertaining to the General Conditions, Specifications, Drawings and any Annexes shall form an integral part of the **agreement/ contract / purchase order**.

2. **After awarding any change in the offered specifications shall not be acceptable.**

3. **Performance guarantee (bank guarantee) equal (10%)** of the total amount through a local Jordanian bank. shall be submit within (10) days of award of tender, to guarantee that materials will be supplied and the works will be executed according to tender specifications and conditions, submitted offer on this tender, and related correspondences as well as to guarantee that the whole consignment will be delivered within the specified period.

This guarantee must be valid for period of not less than **(24) months after the work completion** unless otherwise is stated, subject to extension when required and payable partially or totally to COMPANY at first demand.

Copy of bank guarantee text is herewith attached.

4. **(6) per one thousand** of Contract value shall be paid to cover **revenue stamps** to **be paid to the Ministry of Finance** according to prevailing Jordanian law. The total sum shall be paid within (10) ten days after the date of award letter to avoid delay penalty, or deduct it from the purchase order.

5. No assigning of the awarded Tender (partially or totally) to any other contractor without a written permission from the COMPANY.

6. Delivery delay **liquidated damages**: in the event that the Supplier failed to execute the required works within the specified period, which prevents putting the project in service, the sum of **JOD (50)** per day or any part thereof shall be paid by the supplier to COMPANY. **(Not exceeding 15 % of contract value)**.

7. As the contract is a Jordanian one, any dispute arising between COMPANY and the Contractor on the interpretation or execution of the contract, which can't be solved amicably, shall be governed by and construed in accordance with **Jordanian laws**, and shall be referred to arbitration. Arbitration shall be conducted in Arabic, or English translated into Arabic. The venue of arbitration shall be in Amman – Jordan.

8. The COMPANY in **cashing the guarantees** shall not be deemed to have waived any of its rights under the Contract. For tender performance purpose, the local agent and the Contractor are jointly and severally responsible. The COMPANY has the right to claim its rights legally against each, or both of them, in case they do not comply with any of the Tender conditions.

9. The COMPANY has the right to reject of any supplied materials and/or performed works which not in conformity with the required specification, and shall hold the contractor liable for any damage resulting there from including taxes, custom fees, clearance fees ...etc.)

10. **If the defect or function failure can't be corrected**, the Contractor / Supplier shall promptly replace said equipment (free of charge) or remove the equipment with refund the full purchase price

III. Important Notes for Tenderers:

1. Offers shall be submitted in two separated, closed and sealed envelopes (**One original and two copies**) indicating clearly contents of each envelope as follows:
   - The 1st envelope shall include the **technical offer and qualification documents**.
   - The 2nd envelope shall include the **commercial offer**.

2. **Name and address of Tenderer** is to be printed on closed and sealed envelope in addition to Tender number and closing date. Noting that **different offers** shall be treated separately.

3. Offers shall be submitted to the following address:
   Jordan Petroleum Refinery Co.
   Jabal Amman, 1st Circle, Rainbow St., Building No. 44
   Amman - Jordan

4. Offers by fax or e-mail are only acceptable on:
   Fax No.: (+962 6 4657 630)
   E-mail (ceo.jprc@jopetrol.com.jo),
   Offers by telephone are strictly prohibited.

5. **Any questions regarding the Tender** shall be addressed in writing to:
   E-mail: administartion&services@jopetrol.com.jo

6. Tenderer is absolutely not permitted to contact and or meet and or visit any one of the technical team during tender study stage without prior post coordination and written approval by **JPRC**.

7. Any offer after the closing date shall not **be accepted.**

8. **The offers must be signed and stamped by the Tenderer**; otherwise, it shall be disregarded. And shall be submitted to the COMPANY as prepared and arranged by the manufacturer.

9. Tenderers shall provide the COMPANY with the name and full address of the **Agent or Representative / Regional office in Jordan** and his registration number, if available.

10 **Local Agent** shall submit a valid Career License and Registration Certificate with the offer.

- QUALIFICATION FORM

- نموذج التأهيل الفني والمالي

QUALIFICATION FORM

FOR COMPANIES PARTICIPATING IN TENDER NO. (139/2024)

TENDER NAME:	Upgrade of Automation System for Water Treatment Unit No. (2) at Zarqa Refinery Site including Supply, Installation, Commissioning, and Startup of PLC & HMI - Turnkey Project.

NAME OF THE COMPANY REQUESTING QUALIFICATION:

.....

DATE OF ESTABLISHNENT :.....

PERMANENT PLACE OF BUSINESS :.....

CITY :.....

STATE :..... STREET :.....

TELEPHONE :..... FAX NO. :.....

ADDRESS :.....

FINANCIAL CAPABILITY:

	LOCAL CURRENCY	EQUIVALENT ☐ US$ ☐ EURO
- CAPITAL		
- ANNUAL INVESTMENT (TURNOVER)		
- NAME OF BANKERS		
• BIDDER SHALL SUBMIT ALL DOCUMENTS WHICH SHOW HIS FINANCIAL SITUATION FOR THE LAST THREE YEARS, INCLUDING BALANCE SHEETS AND PROFIT AND LOSS ACCOUNTS, ISSUED BY THIRD PARTY AUDITOR(S).		

BUSINESS AND ORGANIZATION

(DESCRIBE TYPE AND SCOPE OF ACTIVITY AND STRUCTURE OF YOUR ORGANIZATION)			
ACTIVITY	YES	NO	NOTES
ENGINEERING			
PROJECT MAGENGMENT			
TURNKEY PROJECT JOBS			
FABRICATION, COBISTRUCTION, INSPECTION, TESTING, ...ETC.			
OTHERS			

A. TECHNICAL CAPABILITY:
WE ARE APPLYING FOR QUALIFICATION FOR THE SUPPLY & CONSTRUCTION OF REQUIRED EQUIPMENT AND PROVIDE DOCUMENTS TO COVER THE FOLLOWING:

A1) PREVIOUS EXPERIENCE IN UPGRADE & EXPANSION OF AUTOMATION SYSTEM (PLC & HMI) SIMILAR TO THE REQUIRED ONE (5 PROJECTS MINIMUM)

COUNTRY/ CUSTOMER / ADDRESS	MAIN ACTIVITIES	SUPERVISION FIRM	COST US$	EXECUTION PERIOD AND DATE

A2) ACCREDDIATIONS AND AUTHORIZATION CERTIFICATE OWNED BY THE CONTRACTOR:

NATIONAL CODE	NATIONAL REGULATION	INTERNATIONAL CODE	INTERNATIONAL REGULATION

A3) FOLLOWING ARE OUR RENOWNED CLIENTS:

S. NO.	CLIENT NAME/COUNTRY	DETAILS OF PROJECT	DELIVERY YEAR
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

A4) PLEASE ANSWER THE FOLLOWING QUESTIONS:

S. N	QUESTION	ANSWER
1.	Advise type approvals for automation system (PLC & HMI)	
2.	Advise brand name for the offered automation system (PLC & HMI)	
3.	Do you have authorization / accreditation certificate issued by an authority / agency / association specialized in facilities and certify you to manufacture similar equipment according to international codes and regulations?	
4.	Do you have the capability to solve all problems, which may be encountered by the client, including carrying out necessary or desirable alterations, replacement and repairs of defective equipment?	
5.	Can you perform specialized training courses to qualify operators to operate and carry out maintenance work on the required equipment at Refinery site?	
6.	Do you have a local agent in Jordan who is authorized to provide maintenance and spare parts services?	

B) COMPANY BRANCHES AND LIECENSING

.....

.....

C) DESIGN CODES AND REFERENCES USED BY US

.....

.....

D) LOCAL BRANCHES OR AGENCIES AND THEIR CLASSIFICATION

.....

.....

E) THE FOLLOWING IS A LIST OF MAJOR SUPPLIES EXECUTED BY US WITHIN LAST 5 YEARS:
(USE SUPPLEMENTARY SHEETS IF REQUIRED)

CLIENT	COUNTRY	COST US$	EXECUTION PERIOD AND DATE

F) THE FOLLOWING IS A LIST OF CONTRACTS ON HAND AT THIS TIME:
(BIDDER SHALL EXTEND TABLE BY MEANS OF SUPPLEMENTARY SHEETS, IF REQUIRED).

S. NO.	TYPE OF WORK	CONTRACT PRICE (US$)	EXPECTED DATE OF COMPLETION

- COMMERCIAL OFFER FORM

- نموذج العرض المالي

TO: M/S: JORDAN PETROLEUM REFINERY CO LTD
AMMAN-JORDAN

FROM:

COMMERCIAL OFFER FORM

TENDER NO. 139/2024

SUBJECT: Upgrade of Automation System for Water Treatment Unit No. 2 at Zarqa Refinery Site including Supply, Installation, Commissioning, and Startup of PLC & HMI - Turnkey Project.

Item No.	Description	Unit	Price to be filled by the Contractor (JOD)
1.	Upgrade of Automation System for Water Treatment Unit No. (2) Including Supply, Installation, Commissioning, Start-up, and Training of All Equipment and Instruments in Compliance with The Tender Standard Specification "Turnkey Project".	Lump Sum	
2.	SALES TAX (...%)		
3.	OTHER TAXES, FEES, EXPENSES, ...ETC. (IF ANY) (CONTRACTOR TO SPECIFY IN DETAILS)		
TOTAL IN WRITTEN		TOTAL:	

SIGNATURE: -

TENDERER'S STAMP: -
L.S= LUMP SUM

- STANDARD SPECIFICATIONS NO. 1223/1/2024

- المواصفة القياسية رقم 2024/1/1223

JORDAN PETROLEUM REFINERY COMPANY LTD.
P. O. BOX 1079
AMMAN - JORDAN

STANDARD SPECIFICATIONS NO. 1223/1/2024

Upgrade of Automation System for Water Treatment Unit No. 2 at Zarqa Refinery Site including Supply, Installation, Commissioning, and Startup of PLC & HMI - Turnkey Project

ISSUED : NOV, 2024
REVISION : 2
SUPERSEDES :

STANDARD SPECIFICATIONS NO. 1223/1/2024

STANDARD SPECIFICATIONS NO. 1223/1/2024			
PART- I	GENERAL REQUIREMENTS:		
S. NO.	**SPECIFICATION**		**DEVIATION**
1.	**INTRODUCTION:**		
	1.1	**Purpose:**	
		The purpose of this publication is to set forth the specification for the supply, Installation, commissioning, start-up of equipment's to be replaced, upgraded of the automation system at water treatment unit No. (2) located in Zarqa site. The objective is to enhance the reliability, efficiency and safety of the system by incorporating the latest industry standards. The entire job is to be undertaken on a turnkey basis covering instrumentation, PLC & electrical works including supply of all required material for electrical works.	
	1.2	**Scope:**	
		This specification shall cover the Company's requirements for the replacement and upgrading of water treatment unit No. (2) control system. The scope of work shall include the replacement, design, manufacturing, testing, supply, installation of a new water treatment automation system, commissioning, documentation, guarantee, and warranty. The work includes (but is not limited to) the following: **1. Removal of Existing Control Cabinet:** Dismantle and remove the existing control cabinet and all related items. **2. Supply and Installation of New Control Panel:** Supply and install a new control panel, including PLC and HMI, with all necessary accessories. **3. Supply and Installation of Pneumatic Panel:** Supply and install a new weatherproof, harsh environment, and humidity-resistant pneumatic panel, including all necessary electrical cables and solenoids to convert electrical signals to pneumatic signals. Existing copper tubes shall be utilized. **4. Supply and Installation of Limit Switches for the Sequence Valves:** Supply and install (50) new limit switches with all necessary cables and accessories on all shut-off valves to provide feedback (ON/OFF) signals to the control system. **5. Supply and Installation of the following Meters and Analyzers:** a. (1) One Feed Conductivity Meter. b. (1) One Product Conductivity Meter. c. (1) One Silica Analyzer. d. (1) One pH Meter. including all necessary cabling and accessories. **6. Supply and Installation of (5) five Vibronic (Tuning Fork) Point Level Switch for Liquids.**	
	1.3	**Existing System**	
		The existing system comprises of: 1. (25) Sequence valves. 2. Electrical & Pneumatic cabinet containing the following components: a. **110 Vac Solenoid Valves:** These are used for controlling pneumatic signals. b. **Timers:** For timing functions within the system. c. **Pushbuttons:** Manual controls for various functions.	

S. NO.	SPECIFICATION	DEVIATION
	d. **Copper Tubes:** Utilized for transmitting pneumatic signals to shut-off valves. 3. **Flow Meters:** - **Feed Water Flow Meter (FT-8301):** Measures the flow of feed water. - **Weak Anion Filter Feed Water Flow Meter (FT-8309):** Measures the flow of water feeding the weak anion filter. - **Product Flow Meter (FT-8316):** Measures the flow of the final product. These flow meters' signals are connected to a separate recorder. The system also includes an outdated conductivity meter, which is connected to the same recorder but does not trigger any corresponding actions (such as alarms or trips). **Additional Component:** 4. **Silica Analyzer:** None available, and there is no suitable mounting place for one. 5. **Level Switches:** five level switches, only three are present but lack functional integration (such as alarms or trips). Mounting flanges for the level switches are available.	
	1.4 Relationship with Other Documents:	
	This publication shall be read in conjunction with any standard or code referred to herein. In case of discrepancy between requirements of this publication and reference codes, the requirements of codes shall prevail.	
	1.5 Instructions to Tenderers:	
	1. Tenderers shall refer to each clause of the specification and mention if they are substituting it with other idea or not complying. Tenderers are required to fill the column titled (DEVIATION) by (NONE) if the specification of the offer is complying with our requirements. Deviations from our requirements, if any, shall be clearly explained and specified in the above-mentioned column.	
	2. Any item, or accessory necessary to have the offered equipment complete in every respect, shall be quoted even if it is not mentioned in this specification. In this case, detailed quotation with technical clarifications is to be submitted in the offer.	
	3. All Information, documents and correspondences shall be in English.	
	4. All Instructions and General Conditions in the "Tender and Contract Invitation" shall be met.	
	5. The Commercial offer form shall be completely filled and provided with the offer.	
	6. Completion period from date of awarding up to complete the commissioning shall be specified in the offer.	
	7. Followings are considered part of an essential factors in evaluation of the offers:	
	7.1 Short execution period.	
	7.2 Degree of conformity with JPRC and reference Code requirements.	
	7.3 Quality Control Plan of manufacturer's Workshop.	
	7.4 Tenderer's capabilities: Short listed Tenderers shall be required to attend a meeting, in the JPRC's offices, with the JPRC's technical people to evaluate the Tenderer's capabilities and to finalize all technical points at Tenderer's own expense and responsibility, and without any obligation or responsibility of any kind to JPRC in anyway whatsoever.	

S. NO.	SPECIFICATION			DEVIATION
	8.	All codes and standards for manufacture, testing, inspection... etc. shall be of latest editions.		
	9.	A time schedule is requested for the works that will be done from date of awarding. The works shall include the supply, installation, commissioning, and start up.		
	10.	Packing:		
		10.1	All equipment's shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.	
		10.2	All equipment's shall be protected from rust, corrosion and any mechanical damage during transportation and storage.	
	11.	**Site Visit:** Tenderers shall visit the Company at Zarqa Site on **Tuesday 10/12/2024** in order to get a better understanding of the project requirements, collect the necessary data for preparing comprehensive offer, completed with the required site preparation requirements. Tenderers shall notify the Company prior to the visit date in order to issue site entry permits.		
2.	**QUALIFICATION OF MANUFACTURER:**			
	Tenderer is requested to submit, at time of offering his Tender, Qualification Documents and completely filled Qualification Form (attached) which shall show the following:			
	1.	Qualifications of the team proposed for this project.		
	2.	project understanding and approach.		
	3.	work plan/schedule, in full details. detailed plan shall be provided after awarding.		
	4.	qualifications of the firm.		
	5.	list of five similar previous projects completed by the project team members showing with full name and address of clients with contact person details and clear equipment description.		
3.	**PAYMENT METHOD:**			
	100% within (2) months of Successful Commissioning, Startup, Training and Final Acceptance by JPRC.			
4.	**DRAWINGS, MANUALS AND MANUFACTURING DATA:**			
	4.1	Contractor shall provide at the time of offering his offer triplicate copies of technical literature, data sheets, performance data and all information required in this specification, in order to permit comparison and evaluation to be made by the Company. The Company reserves the right to disregard any offer, which is not accompanied with sufficient data.		
	4.2	Point-to-point wiring diagrams indicating all termination points for each connection and for each device, cable types and color coding of each termination if required.		
	4.3	Certificates and datasheets of all equipment shall be submitted prior to supply.		
	4.4	After commissioning and final acceptance test all as-built drawings in softcopy and hardcopies (drawn by AutoCAD or equivalent program) shall be delivered to JPRC engineers.		
	4.5	**Required Documents:** Upon project completion, it is required to provide JPRC with (3) hardcopies and (1) softcopy the following drawings and documents: 1. P&I Diagram. 2. Electrical and instrumentation wiring diagram. 3. Instrument list. 4. Datasheet and manual for each instrument and component. 5. Cause & effect diagram.		

S. NO.	SPECIFICATION		DEVIATION
		6. Control Narrative. 7. Certificates.	
5.	**UTILITY AT SITE**		
	5.1	Service water for construction & potable water for drinking are not available for Contractor use at site. The Contractor shall arrange for procurement of water at his own expense from any available source.	
	5.2	Electric power is not available for construction purposes. The Contractor shall provide his own power generators at his own expense.	
	5.3	Local transport and limited workshop facilities (i.e., crane, any other earth moving vehicle, machine, handling tools.... etc.) are not available. The contractor shall arrange to provide all required equipment at his own expense.	
	5.4	Work yard and/or storage yards, other than the working area of the required work, are not available inside the refinery site without prior arrangements with refinery representative and the Contractor shall be responsible to arrange for any yards outside the site, if needed for his own use at his own expense.	
6.	**ACCESS TO SITE**		
	6.1	The Contractor can use the existing access road in project site. However, the Contractor has to visit the site, investigate, make available and provide any additional required accesses to the work site, or to the storage & pre-installing sites	
	6.2	that may be arranged by the Contractor outside the site, after making all necessary arrangements and taking all approvals of Company for the location of such sites and the proper access to them at his own expense.	
	6.3	Accesses at the main site shall be at all times coordinated and agreed with the JPRC representative.	
7.	**SAFETY PRECUATION**		
	7.1	The Contractor shall be responsible for taking adequate measures to ensure safe working and for the prevention of fires and accidents. The Company safety regulations shall be followed and strictly adhered to by the Contractor. Two copies of Refinery Safety Regulations shall be given to successful Tenderer on borrow basis. The Company Representative may stop any work at any time if it is his opinion that unsafe practices are being carried out, or which may cause any hazard to the project or the existing installations, but this will not in any way absolve the Contractor of his responsibilities. Such stopping shall cause no liability to the Company. The Contractor shall be responsible to follow strictly the Refinery Safety Regulations as well as any other regulations of the Company or the authorities.	
	7.2	The tenderer shall guarantee that the equipment shall be installed in best professional manner so that the Automation System shall fulfill its function satisfactory in a safe and reliable manner, and assured a normal life. Furthermore, risk of fire, damaged or personnel injury due to electrical current shall be eliminated, all material and equipment shall be supplied in accordance with current safety regulations and standard requirements, and that maintenance cost brought to a low level.	
8.	**RESPONSIBILITY FOR ACCIDENTS:**		
	8.1	The Contractor shall be absolutely responsible for accidents and injuries, whether fatal or otherwise, damage or losses occurring to any person or property other than the Permanent Works which may result from or in the opinion of the Representative be traceable to the operations of the Contractor or his subcontractors or their respective Agents or their personnel or in any way to the	

S. NO.	SPECIFICATION			DEVIATION
		execution of the Works or any failure on the part of the Contractor to observe and perform any of his obligations under the Contract Documents		
	8.2	The responsibility of the Contractor as above described shall extend to all cases of accidents, injuries, damages or losses which may occur to any person or property other the Permanent.		
	8.3	Works including, but not limited to the following:		
		a.	Persons employed upon or about the works by the Company, the Contractor and his sub-contractors or by the Government.	
		b.	The Representative and his staff.	
		c.	Persons being for any lawful purpose upon or about the Works.	
		d.	The Contractor shall be solely liable for all compensation becoming payable for loss or damage suffered by reason of or in consequence of any accidents or injuries whether fatal or otherwise, as expressed in subclause (a.) of this clause to workmen or others in the employment of the Contractor or any sub-contractor or other persons acting on the Contractor's behalf in accordance with the Jordan Workmen's Compensation Law 1970 and with any modification thereof which may be put into force by the Government during the continuance of the Contract.	
		e.	The Contractor shall ensure that his staff and labor have been issued with all necessary personal safety equipment and shall further ensure that all said equipment is properly used. The Contractor shall comply with the applicable Company Safety Regulations. The Company reserves the right to inspect all electrical and safety appliances.	
9.	**INSURANCE**			
	9.1	The Contractor shall, throughout the duration of the Contract and until the issuance of the Completion Certificate, maintain insurance coverage for the Permanent Works. The insurance policy shall be of the Contractor's All Risks type from a local insurance company and shall be in his name and the name of JPRC and shall be procured at the Contractor's expense. The coverage must protect against all standard insurable risks, excluding war risks. The insurance policy shall include the following: A. Third Party insurance in the amount of 115% of Contract Price. B. Works and equipment insurance in the amount of 115% of Contract Price. C. Surrounding properties insurance in an amount not less than 10,000 JOD. D. Debris removal insurance in an amount not less than 5% of Contract Price.		
	9.2	The Contractor's obligation to insure in accordance with subclause (9.1) of this clause shall be satisfied in respect of insurance against compensation to be paid in accordance with subclause (8.2 & 8.3) of clause (8) to persons employed by sub-contractor if said sub-contractor shall have insured against the liability in respect of such persons in such a manner that the Company is indemnified under the policy.		
	9.3	The Contractor shall whenever be required by the Company Representative produce the policy or policies of insurance as meant in subclause (9.1) of this clause as well as the receipt for payment of the current premiums and cause any sub-contractor to produce the policy or policies of insurance as meant in subclause (9.2) of this clause as well as the receipts for payment.		
	9.4	In case the Contractor fails to effect and/or keep in force the insurance referred to in the preceding subclauses of this clause or any other insurance which he may be required to effect under the Contract Documents, then the Company Representative may effect and keep in force any such insurance and pay such		

S. NO.		SPECIFICATION	DEVIATION
		premiums as may be necessary for that purpose and deduct the amounts paid from any moneys due or which may become due to the Contractor or recover the same as a debt due from the Contractor.	
	9.5	If the terms of the insurance policy stipulate the existence of a mandatory deductible, the Contractor must pay these values in the event of any claim in this regard.	
	9.6	The Contractor is obligated to insure the workers and employees who work for him and his subcontractors against accidents and work injuries to the extend not covered by Social Security.	
10.	**GUARANTEE & WARRANTY**		
	10.1	The Contractor/Supplier shall provide a full guarantee that all equipment is brand new, updated in design and materials, free from faults in design, workmanship, and material, and is of sufficient size and capacity to meet the specified operating conditions.	
	10.2	**Coverage Period: 24 months** from the date of successful commissioning.	
	10.3	**Responsibilities:** • The Contractor is responsible for repairing or replacing any defective parts or items free of charge within the warranty period. • If defects arise during the first year of operation, the Contractor shall make all necessary repairs or replacements free of charge, including covering transportation costs. • If the defect cannot be corrected, the Contractor must replace the equipment or refund the full purchase price.	
	10.4	**Guarantee:** Performance Guarantee: 10% of the contract value, valid for (24) months from the date of successful commissioning and until the company issues a Completion Certificate. Performance guarantee shall be submitted or confirmed by a local Jordanian bank according to the attached form (attachment No. 2). The warranty covers all required damaged parts at the Contractor's expense.	

STANDARD SPECIFICATIONS NO. 1223/1/2024				
PART- II	TECHNICAL REQUIREMENTS:			
S. NO.	**SPECIFICATION**			**DEVIATION**
1.	**GENERAL REQUIRMENTS:**			
	1.	All new control system and all other components shall be from a well-known manufacturer.		
	2.	Any newly supplied components shall be in active phase of its life cycle with guaranteed availability of spare parts for a period not less than 10 years from the date of delivery.		
	3.	The contractor is responsible for conducting a site visit to survey and gain a better understanding of the company's requirements and specifications, as well as to collect necessary data from the existing equipment, panel, wiring and any relevant items.		
	4.	The programming of the new PLC and HMI will be executed to ensure that the Water Treatment Unit operates in accordance with the Control Philosophy (Attachment No. 4).		
	5.	At the end of the project, the contractor shall submit to JPRC all engineering software, application, and programs for the new PLC, HMI along with all passwords. No portion of the program shall be blocked, and all programs shall be licensed and registered in the name of JPRC		
	6.	The control & Pneumatic panels shall have a minimum Ingress Protection (IP) rating of IP56 or higher. Additionally, they will be epoxy coated to withstand harsh humidity environments effectively.		
	7.	The work shall include but not limited to the following:		
		a.	The examination and survey of project site.	
		b.	Job Specifications for electrical and instruments works.	
		c.	The engineering design and supervision for all works.	
		d.	Procurements and supply at site of all material and equipment needed for complete construction and commissioning of the project.	
		e.	Procurements and supply at site of spare parts and tools for all equipment, machinery & material adequate for first guaranteed year and the following two years of operation.	
		f.	Fabrication, construction, erection, painting, testing, inspection.	
		g.	Remove the existing control panel.	
	8.	The following shall be included in the offer:		
		a.	Specify name of manufacturer, origin.	
		b.	Submit all the required documents, catalogues, manufacturers' specifications, and preliminary design work and calculations according to IEC.	
		c.	Each part of the required systems shall be certified (having certification mark by international approved certification office, institute, laboratory… etc., according to IEC standards latest editions.	
		d.	Provide comprehensive materials specifications, typical installation drawings and procedures, commissioning procedure and operation instructions according to latest editions of approved international standards such as IEC and.	
		e.	All electrical & instruments materials, wiring, cables, and equipment's shall be supplied & installed in best condition by the contractor as part of his obligation under the contract.	

S. NO.	SPECIFICATION			DEVIATION
		f.	Other requirements pertaining to this specification in addition to any other items which deem to be necessary for complete project in every respect are to be provided in details and included in the offers.	
		g.	Restriction signs or barriers of road tankers at weighbridge to prevent touching the sides of weighbridge by road tankers and finally prevent the dropping of weigh shall be included in the offer.	
2.	**TECHNICAL REQUIRMENTS:**			
	2.1	**LOCAL CONDITION:**		
		a.	The atmosphere is sulfurous, tropical and dusty.	
		b.	The elevation of site is less than 550 m above sea level.	
		c.	Minimum / Maximum ambient temperature= -5 °C / +55 °C.	
		e.	Maximum shade temperature = + 45 °C.	
		f.	Maximum relative humidity = 96%.	
	2.2	**PLC:**		
		a.	PLC shall be state of art and sourced from a well-known manufacturer.	
		b.	The PLC should reserve 25%extra I/Os for future use.	
		c.	The PLC manufacturer should provide regular software updates, technical support and maintenance services to ensure long life -term reliability & performance of the system	
		d.	PLC configuration software license is to be supplied to allow future engineering & troubleshooting by JPRC staff	
		e.	Redundancy is only required for power supplies.	
		f.	The required memory should utilize up to 50% of the CPU memory (RAM and ROM) for optimal speed and performance.	
	2.3	**HMI:**		
		a.	TFT LCD touch screen with at least 19" display size and multi touch support	
		b.	Component Type flat screen	
		c.	Backlight to be led type with long life time	
		d.	Shall be rated for operation at ambient temperature of 0 to 60C°	
		e.	Support alarms and logging functionality	
		f.	Support logging data and displaying the logged data in trend views	
		g.	HMI configuration software original license shall be supplied to allow future engineering and troubleshooting by JPRC staff	
		h.	Colored with resolution not less than 1024X768	
	2.4	**Main Control Panel:**		
		a.	Floor Standing Electrical Cabinet.	
		b.	compact enclosure single door with mounting plate	
		c.	Impact protection: IK10	
		d.	2.0 mm wall thickness.	
		e.	Installation accessory type: floor-standing	
		f.	Device composition: body, door, cable gland plate, locking system with handle door, mounting plate	
		g.	This cabinet is designed to withstand high humidity environments with its stainless-steel construction.	
	2.5	**Pneumatic Control Panel:**		
		a.	Material: EGRP (Glass Reinforced Polyester) or Stainless Steel	
		b.	Environmental Suitability: Designed for use in high humidity environments	
		c.	Protection: IP65 or higher ingress protection rating to prevent dust and water ingress.	

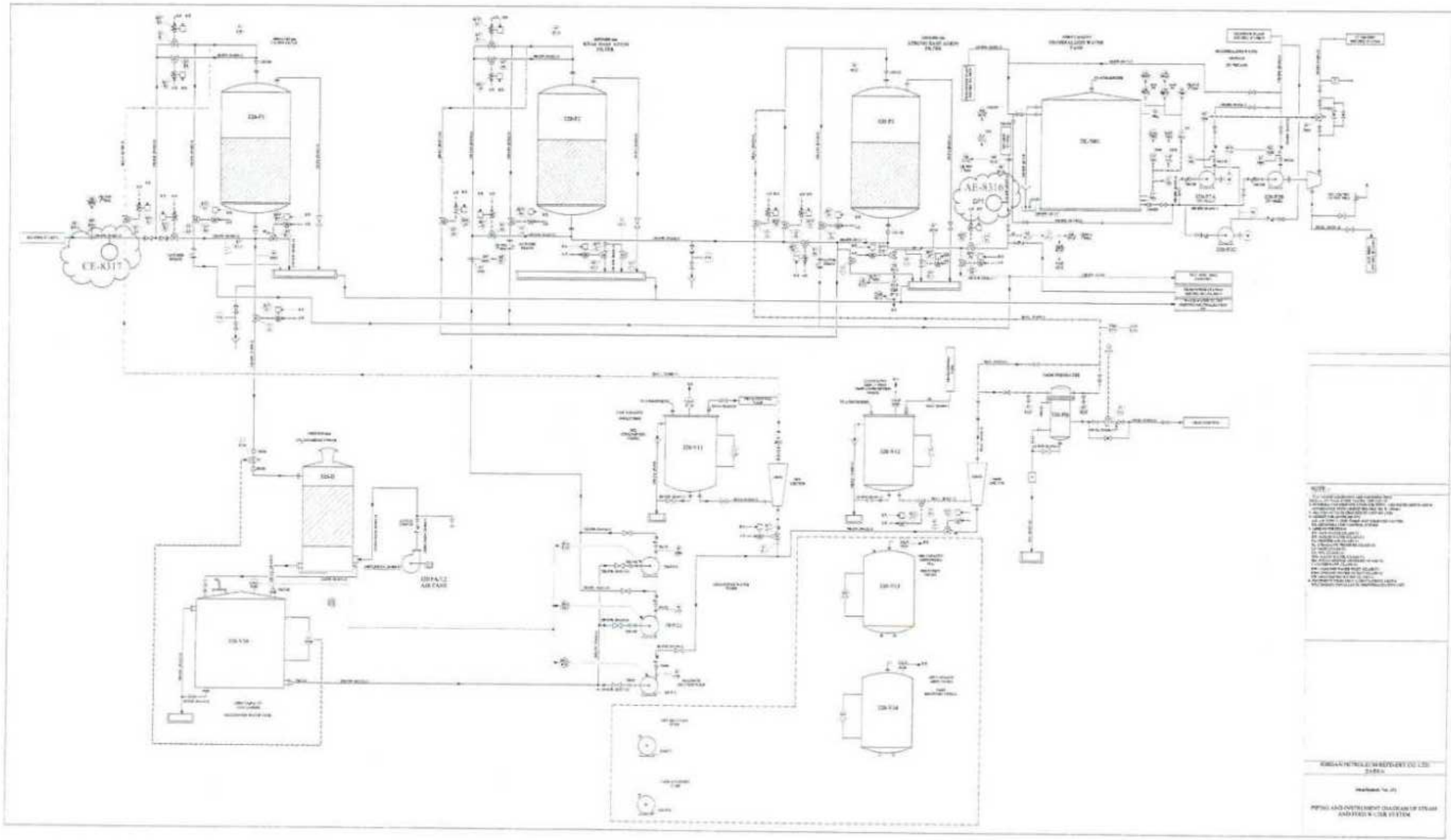
S. NO.	SPECIFICATION			DEVIATION
		d.	**Components:** • Solenoid valves and associated accessories. • Block terminals. • External lock rings for connecting existing copper tubes, which transmit pneumatic signals to the shut-off valves.	
		e.	Durability: Resistant to corrosion and degradation from humidity.	
		f.	Safety: Complies with relevant safety standards for industrial environments	
	2.6		**Feedback Limit Switches:**	
		a.	Two separate feedback switches per shut-off valve (one for open state and one for close state).	
		b.	**Mounting:** • **Location:** To be mounted on all shut-off valves. • **Mounting Type:** Designed for secure attachment to valve body or actuator, ensuring reliable position feedback.	
		c.	**Mechanical Specifications:** • **Actuation Mechanism:** Designed to accurately detect valve positions through mechanical or proximity-based actuation. • **Materials:** Constructed from high-quality materials to withstand environmental conditions and mechanical stresses.	
		d.	**Protection Degree:** IP67	
		e.	**Installation Features:** • **Adjustability:** Allows for fine adjustment to ensure accurate positioning and feedback. • **Connectivity:** Equipped with appropriate terminals or connectors for easy wiring and integration into the control system.	
		f.	**Certification and Standards:** **Compliance:** Meets relevant industry standards and certifications for quality and safety.	
	2.7		**Vibronic (Tuning Fork) Point Level Switch for liquids**	
		a.	Accuracy +/-1mm.	
		b.	**Construction:** Made from durable materials to withstand harsh industrial environments and ensure long-term reliability.	
		c.	**Electrical Specifications:** • **Output:** Provides reliable output signals for integration with the control system. • **Power Supply:** Compatible with standard industrial power supplies and control systems.	
		d.	**Compliance:** Meets relevant industry standards and certifications for quality and safety	
	2.8		**Product Conductivity Meter** (Item No. 320-CE-8313 + 320-CT-8313)	
		a.	Calibration certificate required	
		b.	0-50 µs/cm	
		c.	Accuracy :0.5% of full reading	
		d.	¾" NPT Male Connection	
		e.	Conductivity Meter amplifier with output suits the PLC input channel	
		f.	Temperature Compensation	
		g.	To be used in Harsh, Acidic and corrosive environment	
		h.	Refer to Conductivity Analyzer Data Sheet (Attachment No. 7)	

S. NO.	SPECIFICATION			DEVIATION
	2.9	**Feed Conductivity Meter** (Item No. 320-CE-8317 + 320-CT-8317)		
		a.	Calibration certificate required	
		b.	0-500 µs/cm	
		c.	Accuracy :0.5% of full reading	
		d.	¾" NPT Male Connection	
		e.	Conductivity Meter amplifier with output suits the PLC input channel	
		f.	Temperature Compensation	
		g.	To be used in Harsh, Acidic and corrosive environment	
		h.	Refer to Conductivity Analyzer Data Sheet (Attachment No. 8)	
	2.10	**Silica Analyzer** (Item No. 320-AE-8315 + 320-AT-8315)		
		a.	Measurement range (0 to 1) ppm SiO2	
		b.	Accuracy 1% of reading	
		c.	Calibration 2-point, automatic calibration	
		d.	Silica Analyzer amplifier with output suits the PLC input channel.	
		e.	½" NPT male connection	
		f.	Calibration certificate required	
		g.	**Compliance:** Meets relevant industry standards and certifications for quality and safety	
		h.	Refer to Silica Analyzer Data Sheet (Attachment No. 6)	
	2.11	**PH Meter** (Item No. 320-AE-8316 + 320-AT-8316)		
		a.	Calibration certificate required	
		b.	1/2" NPT Male Connection	
		c.	Range PH: 0 to 14 PH	
		d.	mV Measurement: 0+/-1999 mv	
		e.	Resolution PH: 0.01	
		f.	Accuracy PH: 0.01	
		g.	Temperature Compensation	
		h.	To be used in Harsh, Acidic and corrosive environment	
		i.	**Compliance:** Meets relevant industry standards and certifications for quality and safety	
		j.	Refer to pH Analyzer Data Sheet (Attachment No. 5)	
	2.12	**Training**		
		a.	Training shall only be done after commissioning and final acceptance test has been completed and passed. Any training done prior to final acceptance will not be accounted for the formal training requested and contractor shall do the training after the final acceptance test is passed at no additional cost to the JPRC.	
		b.	Provide a comprehensive overview of the automation system, explaining its purpose, components, and how it integrates with existing processes and equipment.	
		c.	Explain the architecture of the automation system. Help the staff understand how data flows through the system and how different components interact.	
		d.	Familiarize the staff with the user interface of the automation system. Train them on how to navigate through the screens, access different functionalities, and interpret the displayed information	
		e.	Teach the staff how to handle system alarms effectively. Explain the different types of alarms, their priorities, and the appropriate actions to take when alarms are triggered. Emphasize the importance of timely response and troubleshooting to prevent disruptions	

S. NO.	SPECIFICATION			DEVIATION
		f.	Data Logging and Reporting: Train the staff on how to configure and utilize the data logging capabilities of the automation system. Show them how to generate reports, analyze historical data, and extract relevant information for process optimization and decision-making.	
		g.	Troubleshooting: Provide troubleshooting techniques for identifying and resolving common issues that may arise in the automation system. This includes diagnosing hardware or software problems, verifying communication integrity, and restoring system functionality.	
		h.	Maintenance Procedures: Educate the staff on routine maintenance tasks required for the automation system. Cover topics such as cleaning, calibration, equipment checks, and preventive maintenance schedules. Ensure they understand the importance of adhering to maintenance procedures to maximize system performance and lifespan	
		i.	Documentation and Resources: Provide comprehensive documentation, user manuals, and reference materials related to the automation system. Ensure the staff knows how to access and utilize these resources for ongoing learning and troubleshooting.	
	2.13	**Electrical Wiring:**		
		a.	Electrical wiring shall be according to British standard BS 5308.	
		b.	All electrical wiring shall be Protected against rodent, rain water, sewer water, corrosion, erosion and Hydrocarbon liquid.	
		c.	Proper earthling system shall be provided.	
3.	**SPARE PARTS:**			
	1.	A detailed spare parts list shall be provided, including at a minimum one item quantity of the following: a PLC CPU Card, a PLC Analog Input Card, a PLC Analog Output Card, a PLC Digital Input Card, a PLC Digital Output Card, a PLC Redundant Power Supply Card, and an HMI (Human-Machine Interface).		
	2.	In case that any spare parts needed during the first guaranteed year and not included in the offered spare parts, the Contractor shall provide these spare parts for the first guaranteed year and next two years operation at his own expense, within shortest time (by air freight).		
	3.	Spare parts lists shall be provided with parts numbers cross referenced to relevant drawings.		
	4.	The Tenderer shall guarantee, and secure to the Company, the Manufacturer(s) guarantee(s) for the supply of spare parts upon the Company's request for 15 years after receiving the equipment at the site.		
	5.	The spare parts shall be delivered at the same time as the main equipment and shall be clearly labeled to distinguish them from the main equipment.		
4.	**ATTACHMENTS:**			
	No.1	Piping & instrument diagram (P&ID) of steam & feedwater system.		
	No.2	Performance Guarantee form.		
	No.3	Quality assurance plan and inspection & testing plan.		
	No.4	System Control Philosophy.		
	No.5	PH Analyzer Data Sheet		
	No.6	Silica Analyzer Data Sheet		
	No.7	Product Conductivity Analyzer Data Sheet		
	No.8	Feed Conductivity Analyzer Data Sheet		

ATTACHMENTS

المرفقات


CE-K317
AE-8316
DEHYA/12
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Attachment No. (2)

PERFORMANCE GUARANTEE

MESSRS : JORDAN PETROLEUM REFINERY CO. LTD
P.O.8OX 1079
AMMAN-JORDAN

DEAR SIRS,

AT THE REQUEST OF MESSRS.....
(HEREINAFTER CALLED "THE ACCOUNTEE"), WE HEREBY ISSUE IN YOUR FAVOUR OUR L/G NO. ..... AS FOLLOWS:

WE..... BANK..... , AMMAN / JORDAN IRREVOCABLY AND UNCONDITIONALLY HEREBY UNDERTAKE TO PAY YOU WITHOUT DELAY ON YOUR FIRST WRITTEN DEMAND AND NOTWITHSTANDING ANY OPPOSITION OR OBJECTION BY THE ACCOUNTEE WITHIN THE VALIDITY OF THIS GUARANTEE, THE AMOUNT OF.....
.....
.....
IN RELATION TO TENDER NO. .....
FOR THE SUPPLY
OF.....

THIS GUARANTEE SHALL REMAIN VALID UNTIL ....., AND THE VALIDITY OF THIS GUARANTEE SHALL BE RNEWED AUTOMATICLLY AND WILL NOT BE CANCALLED WITHOUT YOUR WRITTEN CONSENT (ON THE ACCOUNTEE OWIN EXPENSE)

Attachment No. (3)

QUALITY ASSURANCE PLAN AND INSPECTION & TESTING PLAN REQUIREMENTS:	
1.	**QA PLAN**
	Contractor during bidding stage shall submit his quality assurance plans (QAP) consisting of relevant procedures covering various activities like design and engineering, material procurement, manufacture inspection and testing, documentation, dispatch to site, erection and commissioning wherever applicable, and maintenance of quality records in the post-order stage. The contractor shall submit the QAP to the site engineer for approval within 2 weeks from the date of receipt of the purchase order, whichever is earlier. The QAP shall be approved by the authorized representative of JPRC within a week of submission.
2.	**ITP**
	The contractor shall submit an inspection and test plan for approval within 2 weeks of the purchase order and before the commencement of manufacture to JPRC, as well as to the third-party inspection agency (TPIA) that the contractor wishes to appoint for carrying out inspection and testing. This document should clearly specify the name and designation of the person concerned (with telephone/mobile number and email) and the communication address of the TPI.
3.	**DRAWING SCHEDULE**
	Contractor shall submit a total index of drawings and documents required for (approval / review / records) along with the scheduled date of submission of each drawing/document within 2 weeks from date of issue of purchase order.
4.	**PROGRESS REPORT AND SCHEDULE**
	Contractor shall subunit monthly progress report and update procurement engineering and manufacturing schedule ever month starting from 2 weeks from date of issue purchase order.
5.	**WAIVING AND DEVIATION**
	Contractor shall strictly comply with the purchase order stipulations, as well as no deviations shall be permitted.
6.	**PROCUREMENT OF BOUGHT OUT MTERIALS**
	All critical materials (such as casting, forging, fitting, pressure holding parts electrical and instrument accessories.... etc.) shall be purchased by the contractor from subcontractors which instrument accessories having JPRC approval. Contractor shall submit a list of bought out materials for JPRC approval within 2 weeks from the date of issue of purchase order whichever is earlier.
7.	**CALIBRATION RECORDS**
	Contractor shall only use calibrated measuring, test instruments and maintain calibration records- Contractor shall furnish records of calibration of measuring and test instruments including recalibration records to Third party inspection agency on demand.
8.	**INSPECTION TEST STATUS**
	Inspection and test status of products shall be identified by using markings (Authorized stamps, tags, route cards, inspection cards ...etc.) during the course of manufacturing to clearly indicate acceptance/rejection of tests/stages of inspection performed during manufacturing cycle. The identification of test status shall be maintained and submitted the records demanded b JPRC/TPIA.
9.	**QUALITY RECORDS**
	Contractor shall maintain quality records as per his procedures- Inspection reports & test records copies shall be furnished to JPRC/TPIA.

10.	**IDENTIFICATION AND TRACEABILITY**	
	Contractor shall establish and maintain a written standard procedure for identifying the products from applicable drawing specifications or other documents during all stages of production, delivery and installation. A copy of this standard procedure shall be made available to JPRC/TPIA. The contractor shall ensure that each product that is going in the process of fabrication / manufacture / construction / erection has proper identification throughout the process including the final output.	
11.	**CONTRACTOR DOCUMTENT FOR REVIEW AND RECORDS GENERAL**	
	1	All documents shall be in English language and SI system of units.
	2	review of the contractor drawing by third part inspection agency/ J PRC would be only to review compatibility with basic design and concepts and in no way absolve the contractor of his responsibility to comply with purchase order requirements, applicable codes, specifications and statutory rules/ regulations.
	3	Submission Of documents for review/records shall commence within 2 weeks from the date issue of purchase order.
	4	The contractor shall submit all drawings and documents in four copies.
	5	The documents shall also be submitted in soft copies to expedite the process of approval/ review.
	6	Contractor shall ensure that each drawing shall contain the following information: Purchase Order of Equipment, Tag No. and Part No., name of Project, Client, Drawing No./ Document Title, No. Revision and Date.
	7	The drawing document shall be checked, approved, duly signed and stamped by the contractor revisions and date.
12.	Documents under review category: Following codes shall be used for reviewing issues of the contractor documents / drawings: • AFI: Approved for Inspection. • AFM: Approved for Manufacturing / Fabrication as per comments contractor shall resubmit the same after incorporating the comments before carrying out final inspection by TPIA and Dispatch. • Not Approved: Resubmission required in cases of major non-conformities with respect to purchased order.	
13.	Final documents and drawings consisting of manual technical data as a compilation of As-Built certified drawing and manufacturing data and test records which duly certified by JPRC/TPIA should be submitted in three sets along with soft copy of the same with the original copy of reports to site. Installation, Operating and Maintenance Instructions of the equipment / material (wherever applicable) shall also be submitted in hard copy (three sets) and in soft format (two CDs).	

Attachment No. (4)

Water Treatment System Control Philosophy

Control system for the Water Treatment Unit allows for semi-automatic startup, shutdown, supply and regeneration.

❖ Water Treatment Unit Equipment

The Water Treatment Unit consists of the following main equipment for treatment, storing and transport:

Designation	Item
Feed Water Pumps	31-415 A, B, C
Cation Filter	320 - F1
CO_2 Degassifier	320 - D
Degasified Water Tank	320 - V10
Degasified Water Pump	320 - P11 A, B
Air Fan	320 - FA
Weak Base Anion Filter	320 - F2
Strong Base Anion Filter	320 - F3
Dematerialized Water Storage Tank	320 - T1
HCl Measuring Tank	320 - V11
HCl Ejector	320 - E1
NaOH Measuring Vessel	320 - V12
NaOH Ejector	320 - E2
NaOH Solution Preheater*	320 - PH1
Reagents Dilution Pump	320 - P12

* Currently the heater is out of service, and may be used in the future.

The following HMI operators are given to control how the Water Treatment System is made:

- "Standby" button:
  - After completion of The Water Treatment Unit regeneration sequence. Returning the regenerated unit to "Standby" mode by selecting the "Standby" button.
  - When the Demin Storage Tank No. 7001 level rises above the high level set point. Water Treatment Unit will then return to "Standby" mode by selecting the "Standby" button.
  - During "Service" mode when the Feed water Pumps are unavailable. Water Treatment Unit will then return to "Standby" mode by selecting the "Standby" button.
- "Service" button:
  - After completion of The Water Treatment Unit regeneration sequence. Returning the regenerated unit to "Service" mode by selecting the "Service" button.
  - When the Demin Storage Tank No. 7001 level falls under the lower level set point. Water Treatment Unit will then return to "Service" mode by selecting the "Service" button.

- "Regeneration Start" Push Button:
  - During "Service" mode when the unit regeneration is required (conductivity of treated water is higher than 20 μs /cm) the unit will stay in "Service" till selecting the respective "Regeneration Start" button.

❖ **Description of Control Machines**

1. Regeneration Timer

- In this timer, the motor, cams and micro switches are engaged. It takes 360 minutes for one revolution. The number of internal cams and micro switches is 10.
- When the knob for timer is placed at position "AUTO" (A) the cam shaft and motor clutch will be connected and the regenerating process will progress autumnally. When placed at position "Manual" (M) cam shaft and motor clutch will be disengaged, resulting in stopping of the timer. When the knob for timer is placed at position "M", the cam shaft can be turned manually and regeneration can be made from any process.
- But in the case the knob is positioned at (M) the cam shaft will be separated from the motor. Therefore, as it does not progress automatically, the process at the position will be kept continuing.

2. Pilot lamp for Process

- Water supply process (Service)
- Regeneration process (Regeneration)

Process	Cation Unit	Weak Base Anion Filter	Strong Base Anion Filter
Water supply process	Cation service	Weak Anion service	Strong Anion service
Back washing process	Cation back washing	Weak Anion back washing	Strong Anion back washing
Settling process	Cation rest	Weak Anion rest	Strong Anion rest
Regeneration process	New HCl feeding	From Strong Base Anion Filter	New NaOH feeding
Extruding process	Cation Displacement	Weak Anion Displacement	Strong Anion Displacement
Water washing process	Cation rinsing	Weak Anion rinsing	Strong Anion No.1 rinsing
			Strong Anion No.2 rinsing
Already measured	HCl consumption vessel high level	—	NaOH consumption vessel high level

3. Alarms

a. Pilot lamp for signaling decrease in water quality:
when water quality increases over 20 micromhos/cm, the "high conductivity" lamp stays on.

b. Pilot lamp for increasing of water silica concentration:
When water silica concentration is higher than alarm set value (0.5 ppm) the "HIGH SILICA" lamp stays on.

c. Pilot lamp for increasing of NaOH temperature (For Future):
When the temperature is higher than alarm set value (40 °C) the "NaOH High Temperature" lamp stays on.

d. Pilot lamp for measure failure:
In case the liquid level of LC has not reached the upper limit until Cation rest starts, the main timer will stop and the "Measure fail" lamp stays on.

e. Pilot lamp for low level in CO_2 degasified water tank:
When the liquid level in tank is lower than set water level, the "Degasified water tank low level" will be lighted.

f. Pilot lamp for low level in treated water tank:
When the liquid level in tank is lower than set water level the "Treated water tank tow level" will be lighted.

g. Pilot lamp for high level in treated water tank:
When the liquid level in tank is higher than set water level, the "Treated water tank high level" will be lighted.

Alarm System Operation

Alarm system for alarm points mentioned above (see items a to g) is standard type 'A' as follows:

- Normal condition	No light or audible alarm
- Fault occurs	Flashing light and audible alarm
- Alarm accepted	Steady light and audible alarm silenced
- Condition returns to normal	Light goes out

When fault occurs, flashing light (one from items a to g) and audible alarm (horn H) are in operation. When the push button "ACCEPT" is pressed, alarm is accepted and horn H is silenced, but light stays on.

Pilot lamps for motor running

When one motor (from those listed below) is in operation, the own "MOTOR RUNNING" lamp will be lighted. The same is valid for the following 7 motors:

- Air fan No.1 (320-FA/1)
- Air fan No.2 (320-FA/2) – (Currently the fan is not available and may be installed in the future)
- Degasified water pump No.1 (320-P11/1)
- Degasified water pump No.2 (320-P11/2)
- Reagents diluting pump (320-P12)

4. Switches

Provide the valve position to a PLC to quickly and easily determine a valve's position is recommended.

S1- Main switch for sequence circuit
S2- Switch for sequence circuit of Cation unit
S3- Switch for sequence circuit of Anion unit
b1- Push button switch for regeneration start
b2- Push button switch for lamp test
b3- Push button switch for horn reset

1b1 to 7b1- Rotary selector switch four positions (for motor control regime choice):

R- remote control
H- hand control
O- off
A- automatic

1b2 to 7b2 - Push button for motor starting
1b3 to 7b3 - Push button for motor stopping

- Push button switch for "Standby Mode" is recommended.
- Push button switch for holding regeneration procedure at any time and at any stage, and resume it to complete the regeneration procedure is recommended.

❖ **Usual Regeneration Process**

Before the regeneration process commence it is assumed that raw water is being supplied, raw water is metered by local flow indicator 320-FI-8301 and by flow 2-pen recorder 320-FR-8302 and 320-FR-8309 (on first pen) located at control panel.

When the demineralized water conductivity increases exceeding 20 μs/cm, the signal from conductometer 320-CT-8313 gives an acoustical signal (320-CAH-8313) and the operator orders the beginning of the regeneration cycle by pressing the push button of regeneration start (tag b1). Regeneration duration is 6 hours (360 minutes).

The regeneration cycle consists of the following operation sequence.

1. Backwashing

a. Strong Base Anion Filter, Item 320-F3

- Valves 320-XV-P1, P2 and P10 are closed
- Valves 320-XV-P3 and P4 are opened
- Timer (Start & Finish Times): 0' to 20'
- Operation duration is 20 minutes
- Flow rate is 30 - 40 m^3/hr
- Water Source is degasified water from Degasified Water Tank 320-V10 using degasified water using pumps (320-P11 A, B)

During this period of time 320-F2, the degassing tower 320-D, the fan 320-FA and the pump 320-P11 will be kept in operation. After 20' the valves 320-XV-P3 and P4 are closed.

b. Weak Base Anion Filter, Item 320-F2

- After 20' from the regeneration beginning the valve 320-XV-A1 is closed and the valves 320-XV-A2 and A3 are opened.
- Timer (Start & Finish Times): 20' to 40'
- Operation duration is 20 minutes
- Flow rate is 30 - 40 m^3/hr
- Water Source is degasified water using pumps (320-P11 A, B)

After the backwashing period of time the valves 320-XV-A2 and A3 are closed and the pump 320-P11 is stopped.

c. Cation Filter, Item 320-F1

- After 40' the fan item 320-FA is stopped, the valves 320-XV-K1 and K2 are closed and the valves 320-XV-K3 and K4 are opened.
- Timer (Start & Finish Times): 0' to 35'
- Operation duration 20' is 35 minutes
- Flow rate is 78 -80 m^3/hr
- Water Source is RO permeate water from TK-194 using pumps (31-415 A, B, C)

After 35' from the beginning of the cycle the valves 320-XV-K3 and K4 are closed.

2. Rest

a. Strong Base Anion Filter, Item 320-F3

- Rest duration is 80 minutes

b. Weak Base Anion Filter, Item 320-F2

- Rest duration is 80 minutes

c. Cation Filter, Item 320-F1

- Rest duration is 5 minutes

d. Degassing tower and fan 320-D & 320-FA

- Rest duration is 205 minutes

3. Reagents Feeding

a. Cation Filter - Item 320-F1

Feeding with fresh HCl begins at the moment when the timer reaches 40'. This operation consists of:

- Opening of the valve 320-XV-K11 on the HCl pipe to the ejector (item 320-E1) and the valve 320-XV-K13 on the impulse water pipe of the ejector, item 320-E1, also opening of the valves 320-XV- K6 outlet of HCl ejector 320-E1 to Cation Filter 320-F1 and 320-XV-K7.1 (out to pit).
- Starting-up of the dilution pump item 320-P12
- 8% Hydrochloric acid flow rate downstream the ejector is 20 m^3/hr (15.3 m^3/hr of water and 4.7 m^3/hr of HCl)
- Timer (Start & Finish Times): 40' to 80'
- Operation duration is 40 minutes

- Water Source is degasified water from Degasified Water Tank 320-V10 using dilution pump 320-P12
- Chemical Source is HCL measuring tank / consumption vessel (320-V11)

b. Strong Base Anion Filter 320-F3

Feeding with fresh soda solution begins at the moment when the timer reaches 100'. This operation consists of:

- When the soda solution level reaches the maximum value in the vessel item 320-V12, the valve 320-XV-P11 on the NaOH pipe to the ejector (item 320-E2) and the valve P13 on the water pipe are to be opened.
- The dilution pump 320-P12 is started
- The valve 320-XV-P6 outlet of NaOH ejector 320-E2 to Strong Base Anion Filter 320-F3 and 320-XV-P7.1 (out to pit) are opened
- 4% sodium hydroxide flow rate downstream the ejector is 17.5 m^3/hr (15 m^3/hr of water and 2.5 m^3/hr of NaOH)

The temperature controller TC-8324 to control the solution temperature is out of service.

- Timer (Start & Finish Times): 100' to 145'
- Operation duration is 45 minutes
- Water Source is degasified water from Degasified Water Tank 320-V10 using dilution pump 320-P12
- Chemical Source is NaOH measuring tank / consumption vessel (320-V12)
- After 20 minutes of NaOH regeneration for polisher P7.1 is closed and A6 is opened to start regenerating the anion via the partially spent NaOH.

c. Weak Base Anion Filter - item 320-F2

Feeding with soda solution from Strong Base Anion Filter 320-F3 begins at the moment when the timer reaches 120'. This operation consists of:

- The valve 320-XV-A6 outlet line from Strong Base Anion Filter 320-F3 and 320-XV-A7.1 (out to pit) are opened
- Soda solution flow rate is 17.5 m^3/hr.
- Timer (Start & Finish Times): 120' to 145'
- Operation duration is 25 minutes
- Water and chemical Sources is from Strong Base Anion Filter 320-F3

4. Displacement

a. Cation Filter - item 320-F1

First Stage of Displacement:

- When the level in the vessel 320-V11 has come down to the minimum value level switch 320-LSL-8318 initiates the closing of valve 320-XV-K11 on the HCl pipe.
- Valves 320-XV- K6, K13 and K7.1 are still opening.
- Displacement water flow rate is 15 m^3/hr
- Timer (Start & Finish Times): 80' to 100'
- Operation duration is 20 minutes
- Water Source is degasified water from Degasified Water Tank 320-V10 using dilution pump 320-P12

Second Stage of Displacement:

- Closing of valves 320-XV-K6 & K13.
- Valve 320-XV-K7.1 is still opening.
- Opening of valve 320-XV-K8 of Cation Filter 320-F1
- Displacement water flow rate is 20 m^3/hr
- Timer (Start & Finish Times): 100' to 170'
- Operation duration is 70 minutes
- Water Source is RO permeate water from TK-194 using pumps (31- 415 A, B, C)

b. Strong Base Anion Filter item 320-F3

First Stage of Displacement:

- When the level in the vessel 320-V12 comes down to the minimum value, level switch 320-LSL-8320 initiates the closing of the valve 320-XV-P11 on the NaOH pipe and valve 320-XV-P7.1
- Valves 320-XV-P13 & P6 are still opening
- Displacement water flow rate is 15 m^3/hr
- Timer (Start & Finish Times): 145' to 205'
- Operation duration is 60 minutes
- Water Source is degasified water from Degasified Water Tank 320-V10 using dilution pump 320-P12
- The outlet water from Strong Base Anion Filter 320-F3 is being directed to Weak Base Anion Filter 320-F2

During the period from 205' to 290' all valves of the Strong Base Anion Filter 320-F3 are closed and the filter will be rest.

c. Weak Base Anion Filter 320-F2

First Stage of Displacement:

- Valves 320-XV-A6 & A7.1 are still opening
- Displacement water flow rate is 15 m^3/hr
- Timer (Start & Finish Times): 145' to 205'
- Operation duration is 60 minutes
- Water Source is from Strong Base Anion Filter 320-F3

Second Stage of Displacement:

- Closing of valve 320-XV-A6.
- Opening of valve 320-XV-A8 of Weak Base Anion Filter 320-F2
- Displacement water flow rate is 20 m^3/hr
- Timer (Start & Finish Times): 205' to 250'
- Operation duration is 45 minutes
- Water Source is from Strong Base Anion Filter 320-F3
- Water Source is degasified water from Degasified Water Tank 320-V10 using degasified water using pumps (320-P11 A, B)

5. Washing (Rinsing)

a. Cation Filter item 320-F1

- When the timer indicates 170 minutes, the valve 320-XV-K8 is initiated to close and 320-XV-K1 to open for water washing. Also, the valve 320-XV-K7.1 is initiated to close and the valve 320-XV-K7.2 to open.
- Washing water flow rate is 78 m^3/hr
- Timer (Start & Finish Times): 170' to 205'
- Operation duration is 35 minutes
- Water Source is RO permeate water from TK-194 using pumps (31- 415 A, B, C)
- After 35 minutes, the washing is over. Valve 320-XV-K7.2 is closed and valve 320-XV-K2 is opened and the filter is ready to produce Cation - free water.

b. Weak Base Anion Filter 320-F2

- When the timer indicates 250 minutes, the valve 320-XV-A8 is initiated to close and the valve 320-XV-A1 to open for water washing. Also, the valve 320-XV-A7.1 is initiated to close and the valve 320-XV-A7.2 to open.
- Washing water flow rate is 78 m^3/hr
- Timer (Start & Finish Times): 250' to 290'
- Operation duration is 40 minutes
- Water Source is degasified water from Degasified Water Tank 320-V10 using degasified water using pumps (320-P11 A, B)

c. Strong Base Anion Filter 320-F3

First Stage of Rinsing

- For the washing, the valves 320-XV-P1 and 320-XV-P7.2 are open.
- Washing water flow rate is 78 m^3/hr
- Timer (Start & Finish Times): 290' to 330'
- Operation duration is 40 minutes
- Water Source is degasified water from Degasified Water Tank 320-V10 using degasified water using pumps (320-P11 A, B)

Second Stage of Rinsing

- The valve 320-XV-P1 is kept open.
- Closing the valve 320-XV-P7.2, and opening the valve 320-XV-P9
- Washing water flow rate is 78 m^3/hr
- Timer (Start & Finish Times): 330' to 360'
- Operation duration is 30 minutes
- Water Source is degasified water from Degasified Water Tank 320-V10 using degasified water using pumps (320-P11 A, B)

The conductivity gets lower an after 360 minutes it is 20 µs/cm that means the second stage of washing is over and the filter is ready for operation.

❖ **Demineralized Water Supply**

a. Cation Filter (320-F1)

After 205 minutes the valve 320-XV-K7.2 is closed, the valve 320-XV-K2 is opened and the valve 320-XV-K1 is kept open. The water is sent through the degasifying tower into the degasified water tank 320-V10. At the same time the fan 320-FA is started up.

b. Weak Base Anion Filter (320-F2)

After 290 minutes the valve item 320-XV-A1 is kept open. The valve 320-XV-A7.2 is closed, and water is sent to the strong base Anion filter, 320-F3.

c. Strong Base Anion Filter (320-F3)

The valves 320-XV-P1 is kept open and 320-XV-P9 is closed. When the conductivity decreases under 20 µs/cm the conductometer 320-CT-8313 initiates the opening of valve 320-XV-P2 to the demineralized water tank, item 320-T1.

Attachment No. (5)

pH Analyzer Data Sheet			
ITEM NO.	320-AE-8316 + 320-AT-8316 (Detector + Transmitter)	**PLANT**	Water Treatment Unit - 2
SERVICE	pH Measurement	**LOCATION**	Utilities - 2
NO. REQ'D	One Analyzer	**DRAWING**	Attachement No 1
Description	pH analyzer to continuously measure pH of demineralized water		
Location:	At Water Treatment Unit outlet line (Strong Base Anion Filter 320 - F3 discharge line)		
INSTALLATION DATA			
Environment	The atmosphere is tropical, sulfurous and dusty		
Installation	Outdoor		
Electrical area classification	Safe - Area		
ENVIRONMENTAL PROTECTION			
Transmitter enclousure protection	IP 65		
Temperature Protection	Sunshade		
TRANSMITTER DATA			
Range	0-14 pH	**Resolution**	0.01 pH
Accuracy	±1 mV @ 25°C ±0.01 pH	**Repeatability**	±0.01 pH at 25°C
Electromagnetic Compatibility	According to EN 61326	**Stability**	0.25% / year @ 25°C
Ambient Temp. Coefficient	± 0.05% of reading /°C	**Min. Ambient Temperature**	- 5 °C
Temperature Sensor	Integrated	**Max. Ambient Temperature**	45 °C
Instrument Signal	4-20 mA DC	**Max. Shade Temperature**	55 °C
Failure Messages	Yes	**Humidity Limits**	Is various between 50% in summer at 35 °C and 75% in winter at 15 °C. The maximum value = 96%
Electrical Conn.	TBA		
DETECTOR DATA			
Type		**Type of installation**	Retractable
Cell Constant	0.01/cm	**Max. Temperature**	45 °C
Process Connections	3/4 inch NPT teflon coated	**Maximum Pressure**	6 kg/cm^2
Materials			
Sensor	316 stainless steel	**Electrode**	GPHT Glass
O-Ring	EPDM	**Enclosure:**	Cast alluminum containing less than 6% magnesium with epoxy polyester coating
TESTING AND CERTIFICATES			
Calibration Certificate	Yes		
Material Certificate	Yes		
GENERAL NOTES			
1- Utilities available electrical power 110 V AC, 50 Hz			
2- Vendor to provide cable from detector to amplifier transmitter			
3- All equipment shall be tropicalized to eliminate mildew, fungi and other detrimental effects of tropical environment. Packaging shall be suitable for shipment and storage under tropical conditions			
4- Vendor to provide a pH display on a local indicator and transmit a signal to the PLC or equivalent digital type system			

Attachment No. (6)

Silica Analyzer Data Sheet					
ITEM NO.	:	320-AE-8315 + 320-AT-8315 (Detector + Transmitter)	**PLANT**	:	Water Treatment Unit - 2
SERVICE	:	Silica Measurement	**LOCATION**	:	Utilities - 2
NO. REQ'D	:	One Analyzer	**DRAWING**	:	Attachement No.1
Description	:	Silica analyzer to continuously measure the silica concentration of demineralized water			
Location:	:	At Water Treatment Unit outlet line (Strong Base Anion Filter 320 - F3 discharge line).			
INSTALLATION DATA					
Environment	:	The atmosphere is tropical, sulfurous and dusty			
Installation	:	Outdoor			
Electrical area classification	:	Safe - Area			
ENVIRONMENTAL PROTECTION					
Transmitter enclousure protection	:	IP 65			
Temperature Protection	:	Sunshade			
TRANSMITTER DATA					
Range	:	0 - 1 ppm	**Repeatability**	:	
Accuracy	:	±1% of full scale	**Stability**	:	
Electromagnetic Compatibility	:	According to EN 61326	**Min. Ambient Temperature**	:	- 5 °C
Ambient Temp. Effect	:	Automatic compensation (0 - 100 °C)	**Max. Ambient Temperature**	:	45 °C
Temperature Sensor	:	Integrated	**Max. Shade Temperature**	:	55 °C
Instrument Signal	:	4-20 mA HART protocol	**Humidity Limits**	:	Is various between 50% in summer at 35 °C and 75% in winter at 15 °C. The maximum value = 96%.
Failure Messages	:	Yes			
Electrical Conn.	:	TBA			
Sampling Method	:	Batch; update rate every 12-20 minutes			
Temperature Range of Sample	:	15 to 45 °C			
TESTING AND CERTIFICATES					
Calibration Certificate	:	Yes			
Material Certificate	:	Yes			
GENERAL NOTES					
1- Utilities available: electrical power 110 V AC, 50 Hz					
2- Vendor to provide cable from detector to amplifier transmitter.					
3- All equipment shall be tropicalized to eliminate mildew, fungi and other detrimental effects of tropical environment. Packaging shall be suitable for shipment and storage under tropical conditio					
4- Vendor to provide a Silica display on a local indicator and transmit a signal to the PLC or equivalent digital type system					

Attachment No. (7)

Conductivity Analyzer Data Sheet			
ITEM NO.	320-CE-8313 - 320-CT-8313 (Detector + Transmitter)	**PLANT**	Water Treatment Unit - 2
SERVICE	Conductivity Measurement	**LOCATION**	Utilities - 2
NO. REQ'D	One Analyzer	**DRAWING**	Attachement No.1
Description	Conductivity analyzer to continuously measure the conductivity of demineralized water		
Location:	At Water Treatment Unit outlet line (Strong Base Anion Filter 320 - F3 discharge line)		
INSTALLATION DATA			
Environment	The atmosphere is tropical, sulfurous and dusty		
Installation	Outdoor		
Electrical area classification	Safe - Area		
ENVIRONMENTAL PROTECTION			
Transmitter enclousure protection	IP 65		
Temperature Protection	Sunshade		
TRANSMITTER DATA			
Range	0 - 50 µS/cm	**Repeatability**	± 0.25% of reading
Accuracy	± 0.1% of reading	**Stability**	0.25% of reading/24h
Electromagnetic Compatibility	According to EN 61326	**Min. Ambient Temperature**	- 5 °C
Ambient Temp. Coefficient	± 0.05% of reading /°C	**Max. Ambient Temperature**	45 °C
Temperature Sensor for Compensat	Integrated	**Max. Shade Temperature**	55 °C
Instrument Signal	4-20 mA DC	**Humidity Limits**	Is various between 50% in summer at 35 °C and 75% in winter at 15 °C. The maximum value = 96%
Failure Messages	Yes		
Electrical Conn.	TBA		
DETECTOR DATA			
Type	2-electrode type	**Type of installation**	Retractable
Cell Constant	0.01 cm	**Max. Temperature**	45 °C
		Maximum Pressure	6 kg/cm^2
Materials			
Body	316 stainless steel	**Electrode**	Titanium
Insulation	PEEK (polyether-ether-ketone)	**Enclosure:**	Cast aluminum containing less than 6% magnesium with epoxy polyester coating
FLOW FITTING			
Temperature Range of Sample	15 to 45 °C	**Max Pressure**	6 kg/cm^2
Flow rate	By Vendor	**Process Connections**	3/4 inch NPT teflon coated
Materials			
Body	316 stainless steel		
O-Ring	Polypropylene or Viton		
Retaining nut	304 stainless steel		
TESTING AND CERTIFICATES			
Calibration Certificate	Yes		
Material Certificate	Yes		
GENERAL NOTES			
1- Utilities available: electrical power 110 V AC, 50 Hz			
2- Vendor to provide cable from detector to amplifier transmitter.			
3- All equipment shall be tropicalized to eliminate mildew, fungi and other detrimental effects of tropical environment. Packaging shall be suitable for shipment and storage under tropical conditions.			
4- Vendor to provide a conductivity display on a local indicator and transmit a signal to the PLC or equivalent digital type system.			

Attachment No. (8)

Conductivity Analyzer Data Sheet			
ITEM NO.	320-CE-8317 - 320-CT-8317 (Detector + Transmitter)	**PLANT**	Water Treatment Unit - 2
SERVICE	Conductivity Measurement	**LOCATION**	Utilities - 2
NO. REQ'D	One Analyzer	**DRAWING**	Attachement No 1
Description	Conductivity analyzer to continuously measure the conductivity of water		
Location:	At Water Treatment Unit inlet line (Catson Filter 320 – F1 feed line)		
INSTALLATION DATA			
Environment	The atmosphere is tropical, sulfurous and dusty		
Installation	Outdoor		
Electrical area classification	Safe - Area		
ENVIRONMENTAL PROTECTION			
Transmitter enclousure protection	IP 65		
Temperature Protection	Sunshade		
TRANSMITTER DATA			
Range	0 - 500 µS/cm	**Repeatability**	± 0.5% of reading
Accuracy	± 0.5% of reading	**Stability**	0.5% of reading/24h
Electromagnetic Compatibility	According to EN 61326	**Min. Ambient Temperature**	- 5 °C
Ambient Temp. Coefficient	± 0.05% of reading /°C	**Max. Ambient Temperature**	45 °C
Temperature Sensor	Integrated	**Max. Shade Temperature**	55 °C
Instrument Signal	4-20 mA DC	**Humidity Limits**	Is various between 50% in summer at 35 °C and 75% in winter at 15 °C. The maximum value = 96%
Failure Messages	Yes		
Electrical Conn.	TBA		
PLUG IN FLOW DETECTOR DATA			
Type	2-electrode type	**Type of installation**	Retractable
Cell Constant	0.1/cm	**Max. Temperature**	45 °C
		Maximum Pressure	6 kg/cm^2
Materials			
Body	316 stainless steel	**Electrode**	Titanium
Insulation	PEEK (polyether-ether-ketone)	**Enclosure:**	Cast alluminum containing less than 6% magnesium with epoxy polyester coating
FLOW FITTING			
Temperature Range of Sample	15 to 45 °C	**Max Pressure**	6 kg/cm^2
Flow rate	By Vendor	**Process Connections**	3/4 inch NPT teflon coated
Materials			
Body	316 stainless steel		
O-Ring	Polypropylene or Viton		
Retaining nut	304 stainless steel		
TESTING AND CERTIFICATES			
Calibration Certificate	Yes		
Material Certificate	Yes		
GENERAL NOTES			
1- Utilities available: electrical power 110 V AC, 50 Hz			
2- Vendor to provide cable from detector to amplifier transmitter			
3- All equipment shall be tropicalized to eliminate mildew, fungi and other detrimental effects of tropical environment. Packaging shall be suitable for shipment and storage under tropical conditio			
4- Vendor to provide a conductivity display on a local indicator and transmit a signal to the PLC or equivalent digital type system			