Petroleum & Energy Infrastructures Ltd.
Oil Products Pipeline Ltd.
Finance Division - Procurement & Engagements Department

September 9, 2020
Ref.: 249647

To: All Tender Participants

Dear Sir / Madam,

Re: Public Tender No. 025-20 (the "Tender")

Clarifications

Petroleum and Energy Infrastructures Ltd. and/or Oil Products Pipeline Ltd. (the "Company") has received certain requests for clarification regarding the Tender, in accordance with Section 5.1 thereof, provided below (the "**Questions**"). Next to each Question is the Company's answer, which shall be considered by the Company to be authoritative. Capitalized terms used but not defined herein shall have the meanings ascribed to them in the Tender.

	Question / Request	**Answer**
1	Are any modifications or other changes to the form Contract attached to the Tender permitted?	In accordance with Section 6 of the Invitation to Submit Bids, the bidder shall not make any changes, additions, deletions, or conditions to or on the Tender Documents in any way. Therefore, no such changes shall be made to the form Contract as published by the Company.
2	**Clause 14 -Liquidated damages clause -** for retraction of bid, material misrepresentation, failure to fulfill requirements. **Please elaborate.**	This request is denied. Section 14 of the Invitation to Submit Bids speaks for itself.
3	How does Section 17.1 of Annex A to the Tender apply to foreign suppliers?	Section 17.1 of Annex A to the Tender does not apply to foreign suppliers, but only to Israeli suppliers. To avoid doubt, Section 17 states that it applies only to the following suppliers: "a person resident or domiciled in Israel, organized under the laws of Israel, or registered in the Companies Registrar or other registry of the Corporations Authority of Israel".

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In addition, attached are the Company's responses to Questions received regarding the Technical Specifications and related matters.

Thank you for your continued interest in the Tender; we look forward to receiving your bids.

Sincerely,

Talmor

Talmor Sela

Procurement and Engagements Department

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	Document		Spec	Technical queries	clarifications
1	Annex D: Technical Specifications	4.1.1	The supply shall include: 4.1.1 Skid mounted pump, installed with motor and all other components as detailed below.	Please confirms, whether pumps are skid mounted or foundation monted - Grouted type or non grouted type. If skid mounted, then skid shall be rigid one.	Skid mounted
				We did not reached such motor datasheet. Please send	Supplier shall send the information
2	Annex D: Technical Specifications	4.1.4	Supply of flexible couplings and non- sparking coupling guards. Coupling shall preferably be Mesta stream with stainless steel 316 disks. Allstro materials should be resistible for liquid fuels.	Please clarify Allstro materials	Elastro materials
3	Annex D: Technical Specifications & ATTACHMENT A PUMP DATA SHEET	4.1.6, 10.2, 10.6, 10.7, PDS	Annex D: 10.2 Mechanical seals shall be single type. Annex D: 10.6 To the client approval, mechanical seals shall have throttle bushings and external seal quench with flashing liquid vassel. Annex D: 10.7 Mechanical seals shall preferably be of John Crane, K.S.B manufacture or similar high	1) Seal Type needs to be discussed & finalized. One of the supplier recommend single seal with plan 11, 61 & other supplier recommended double seal with plan 11, 53B. Please let us know which one is to be considered in final offer. 2) In case of double seal, please let us know, whether seal system is required with switches or with transmitters. 3) In case of transmitters, Whether fixed alarm strategy or floating alarm strategy	To Supplier decision\ recommendation according to standards

			quality brand (to be approved by client). ATTACHMENT A - PDS: SEALING MECHANISEM SHOULD BE ACCORDING TO API-683	4) In case of plan 11, 61 or 11, 53B: any type of level switches for dripping traces will not be applicable. 5) This clarify requirement of external seal quench with flashing liquid vessel. 6) Make will be either - JC / KSB / EB / FSL / Equivalent. 7) We considering seal & seal system as per API 682 4 th edition.	
4	Annex D: Technical Specifications	4.1.6	4.1.6 Mechanical seals complete with seal flush and external seal quench. In addition, the pump shall be equipped with leak detection alarm system from the mechanical seals, using dripping traes with level switches. Mechanical seal shall be according to API 682 .	First, as per API682 4th edn, switches need to be replace with transmitters.	OK
				Hence, please clarify, whether client will accept switches?	The pump shall be according to standard
				What is mean by *"dripping traes with level switches"*, is this flush plan 52 or 65A / 65B? Note that double seal need to be supplied with either flush plan 11/52 or 11/53B. Plan 65 can be provided for single seal only. Hence please clarify type of mechanical seal and flush plan need to be offered	To supplier recommendation
				Confirm whether double seals are required per the data sheet or whether single seal with plan 65A per the specification	Double seal
5	Annex D: Technical Specifications	4.1.7	Temperature transmitters for bearings and casing- type PT100 or 3 wire (one element for pump casing and	What is expected in casing body temperature?	Supplier shall answer the question

			two elements for pump bearings). All transmitters and thermocouples/thermistors will be wired to a common junction box Junction box will have 10 spare connections for additional instrumentation		
6	Annex D: Technical Specifications	4.1.10	Loosed item shall be packed separately	Loose items will be packed separately, however depending on loose item box size, same may be packed in main box or will be delivered separately.	OK
7	Annex D: Technical Specifications	4.1.12	Spare Parts / Special Items and special tools	Please let us know list of required spare items. One special tool of assembly & dis assembly of pumps will be supplied.	To be recommended by supplier
8	Annex D: Technical Specifications	5.2	Pumps will be installed outdoors, in areas subject to dusty and corrosive environment.	Whether any shelter will be provided on complete skid including pump, motor, etc.	Pumps will be installed under shed
9	Annex D: Technical Specifications	5.5.8.2	The provisions taken by the manufacturer for variable speed application shall be quoted as required app B	App B is not available. Do we need to quote VFD separately? Is there any VFD specification & datasheet we need to follow?	Irrelevant there is no VFD
10	Annex D: Technical Specifications &	7.3	Selected impeller, for the rated performance, should be 10% less of max diameter.	We will ensure 10% head reserve. Rated 10% less than max dia. on each impeller will not be maintained Rated dia. 313 mm, Max dia. 330 mm.	Shall be according to spec, after submitting bids the company will

	ATTACHMENT A PUMP DATA SHEET		PDS Note- SELECTED IMPELLER SHOULD BE 10% LESS OF MAX DIAMETER*	Rated head 716.6 m, Maximum achievable head with max dia (330mm) is 860 m, which is approx. 20% extra.	examine exceptions individually
			Selected impeller, for the rated performance, should be 10% less of max diameter. PDS Note- SELECTED IMPELLER SHOULD BE 10% LESS OF MAX DIAMETER*	With this requirement, pump number of stages need to be increased which is just waste of money. With speed of 2900 rpm, we able to fit a 8 stage pump but to maintain selected impeller less than 10% of max diameter, we need to increase number of stages to 10. When you have VFD, it really does not matter as VFD will be able to adjust the speed	Irrelevant there is no VFD, PEI request was 10% spare
11	Annex D: Technical Specifications	7.6	Flanges for inlet and outlet shall be to ANSI B16.5 standard. Gasket contact surface shall have serrated spinal grooves machined with a 0.8 mm nominal radius rounded-nose tool producing a groove pitch of 0.35-0.45 mm.	Flanges will be as per ASME B16.5	Same as in the spec
12	Annex D: Technical Specifications	7.7.2	All tapped holes shall be plugged, including seal, vent and drain connections. Plugs shall have hexagon shanks of at least 1” in length. Plugs shall be lubricated with an anti-seize compound (e.g.	Hexagon shank length will be as per applicable standards. Plugs will be without any anti seize compound.	OK

			copper slip) before installation.		
13	Annex D: Technical Specifications	7.11	Pumps shall be of “double volute” design.	Not applicable for offered BB3 type pumps	
14	Annex D: Technical Specifications	7.14	Manufacturer to specify time that pumps may operate at "no-flow” condition as well as minimum continuous flow required	Pump cannot be operated at no flow. Pump can be operated at minimum continuous flow.	We have to set the delay for the discharge flow switch. The question is in which unit :micro sec, mil sec, etc
15	Annex D: Technical Specifications & ATTACHMENT A PUMP DATA SHEET	8.1, PDS	Materials of construction shall be in accordance with API 610 standard recommended for kerosene, gasoil, naphtha and unleaded gasoline (MATERIAL CLASS S-1). Where not specified - parts shall be made of the Manufacturers normal construction materials, subject to client’s approval. ATTACHMENT A- PDS : MATERIAL OF CONSTRUCTION - SS316 for impellers	We can offer pumps in S5 / S6/ S8 MOC as per API 610. If impellers will be in SS then it falls under S8 MOC. Please check & let us know which MOC is to be followed from API 610: S5 or S6 or S8.	To be recommended by supplier
				However, datasheet calls for double mechanical seal. Refer our query no 5 above and advise whether you need single or double seal. In case of single seal we can provide flush plan 11/65A or 65B. plan 65A or B is seal leakage detection system. In case of double seal then flush will be 11/52. Plan 52 also detects seal leakage	OK

16	Annex D: Technical Specifications	10.5	Flushing fluid tubing shall be equipped with filter.	Not applicable.	Please explain why
17	Annex D: Technical Specifications	13	NOISE The noise generated by the pump and driver when operating at rated conditions shall not exceed 75 dBA when measured 1 m from the surface of the equipment.	As motor rating is of 800 KW, noise level will be more than 75 dBA. We will give the Nosie level later on.	OK waiting for the information
18	Annex D: Technical Specifications	14.2	The tests shall be witnessed by an independent inspector approved by the Purchaser.	Noted however, independent inspector charges will be in customer scope.	OK
19	Annex D: Technical Specifications	17.1	PACKING 17.1 Following final inspection and cleaning all openings are to be closed and sealed. Nozzle flanges are to be closed by means of wooden plates with flexible gasket.	Pump nozzles will be closed by rubber gasket & metallic plate.	OK
20	Annex D: Technical Specifications	17.3	Pumps are to be dowelled to baseplates.	Pumps will not be dowelled to base frame	Please give information about the connection to the base frame

21	Annex D: Technical Specifications	18	SPARE PARTS 18.1 Vendor shall quote the recommended spare parts. 18.2 List of spare parts shall include but not limited to the following: 18.2.1 Body gaskets cut with bolts holes – 1 set. 18.2.2 Glass for lubricating bearing oil – 10 sets. 18.2.3 Lubricant filter elements – 20 sets.	18.1 - Optional offer for recommended spare list with price will be submitted along with main offer. 18.2.1 - Ok 18.2.2 - We understand requirement is of oil sight glass on bearing housing. Please confirm the same. 18.2.3 - Lubricant filer is not applicable.	18.2.3 Please explain
22	Annex D: Technical Specifications	19.3	Terms – should any defect in performance, materials or workmanship become apparent within 12 months from date of commissioning or 18 months form date of delivery (whichever comes last), the manufacturer shall repair or otherwise rectify the defects free of charge to the purchaser.	We give warranty of 12 months from date of commissioning or 18 months form date of delivery, whichever comes first.	warranty of 12 months from date of commissioning or 18 months form date of delivery, whichever comes **first**
23	Annex D: Technical Specifications	20	Maximum allowable forces and moments on pump nozzles. 20.2 Details of any deviations from this specification and pump data sheet.	20.1 During detailed engineering 20.2 OK 20.3 OK 20.4 OK 20.5 Preliminary data sheet will be submitted. 20.6 cut view will be provided, rest during detailed	20.7 Please explain why not applicable

			20.3 Detailed performance curves 20.4 Detailed datasheets for the suggested pump assembly 20.5 Pump and motor data sheets 20.6 Dimensions drawings (PDF and DWG, model is preferable), cut view drawings 20.7 Hazardous areas classification drawings PDF and DWG 20.8 Reference list of similar pumps 20.9 Manufacturers quality assurance program. 20.10 Any special tools or equipment as may be required for pump maintenance. 20.11 All documents to be in English language. 20.12 List of recommended spare parts. 20.13 Detailed installation and maintenance instructions	engineering 20.7 Not applicable 20.8 Later on 20.9 OK- Sample copy will be submitted. 20.10 Special tools will be required for pump assembly & dis-assembly. 20.11 OK 20.12 OK 20.13 During detailed engineering.	

24	ATTACHMENT A PUMP DATA SHEET	PDS	ALL PUMPS WILL BE EQUIPPED WITH VFD IN ORDER TO SUPPLY THE REQUIRED CAPACITY WITH MAXIMUM EFFIECENCY.	As of now we are considering VFD suitable motor. Max efficeiency speed & operation will be decided during detailed engineering.	irrelevant there is no VFD
				Does it mean that we need to include VFD also in scope or clients will purchase themselves?	irrelevant there is no VFD
				Confirm whether VFD is required and if so provide VFD data sheet	irrelevant there is no VFD
25	ATTACHMENT A PUMP DATA SHEET		Double seal API683, seal flush plan by fuel	Note that API683 is typo, it supposed to be API682	OK
				We assume client is looking double seal with flush plan 11&52? Please confirm	Plan 11 is better but don't cool down the seal. 52 does cool down with recycling but takes more time for maintenance.
26	ATTACHMENT A PUMP DATA SHEET		Bearing lubrication- FORCED	Forced lubrication is not required as power is less and energy density is around 1, 8 10^6 kW/min only. Forced lubrication is required when energy density is more than 4,0 10^6 kW/min	Shall be according to spec, after submitting bids the company will examine exceptions individually

				Confirm if forced oil lubrication is required for pump bearings according to the data sheet yet not mentioned in the specification	Required
27	ATTACHMENT C ELECTRICAL MOTOR REQUIREMENTS	3.8	No aluminum or its alloys shall be used for the manufacture of motor parts or accessories.	3.8 Auxiliary terminal boxes shall be made of powder coated Aluminum.	According to spec
28	ATTACHMENT C ELECTRICAL MOTOR REQUIREMENTS	3.9	All bolts shall be cadmium plated.	Bolts will be without cadmium plated	Please detail the bolts material and the bolts protection
29	ATTACHMENT C ELECTRICAL MOTOR REQUIREMENTS	5.3	Efficiency high energy efficient motors shall be preferred. The bidder shall provide nominal efficiency values measured at 80%,115%,100%,75% of motor rating power. The efficiency shall be measured to international IEC 60034-2. The additional investment cost of the motors will be weighed against the cost of energy saved due to reduced while the energy considered payback period shall be three years and the enrgy cost-	We will check with motor supplier for any increase in efficiency & will quote for optional price adder. Customer to calculate power saving.	The supplier shall give the data as written in the spec

			0.09 $\kwh. 8000 hours per year for 80% loaded motor.		
30	ATTACHMENT C ELECTRICAL MOTOR REQUIREMENTS	5.4	Vibration and noise 5.4.1. The vibration and noise levels of the motors shall fall within the limits prescribed in I.E.C 60034-parts 1 and 9 respectively. 5.4.2. If silencers or other noise reducing devices are necessary to satisfy the noise limitations imposed, their cost where applicable shall be quoted separately in the tender.	This needs to be more clarided along with combined noise level of complete package.	Please confirm that the all package is by spec
31	ATTACHMENT C ELECTRICAL MOTOR REQUIREMENTS	5.5.1.1	Hazardous locations enclosures totally enclosed, fan cooled with non sparking fan EExn, suitable for division 2, zone 2 groups IIA, IIB & IIC locations to BS 4683/3 and BS 5000/16.	Please clarify whether motor suitability require of all IIA, IIB, IIC or either IIA/IIB or IIC.	According to spec : all IIA, IIB, IIC
32				Confirm when running in parallel whether the indicated rated is to be used for each pump or split the flow rate between the pumps	For each pump

Petroleum & Energy Infrastructures Ltd.
Oil Products Pipeline Ltd.
Engineering Department

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BARAN ISRAEL

תשתיות נפט ואנרגיה בע"מ
קו מוצרי דלק בע"מ

PETROLEUM & ENERGY INFRASTRUCTURE LTD.

SPECIFICATION FOR CENTRIFUGAL PUMP BB3

SPEC. No. _____

PEI PROJECT No.__2533__

PEI – Engineering Division

August 2019

P2	11.9.19	FOR BID	I.T	C.S	
REV.	DATE	ISSUE	PREPARED	APPROVED	CLIENT APP'D

CONTENT

15. PACKING

16. GURANTEE

17. BID

ATTACHMENTS

A. PUMP DATA SHEET

B. DOCUMENTATION REQUIREMENTS

C. ELCTRICAL MOTOR REQUIEREMENTS

D. BILL OF QUANTITIES

1. GENERAL

This specification covers the requirements for the design, manufacture and supply of centrifugal pumps to be installed in the ESHEL Terminal operated by the Petroleum and Energy Infrastructure Ltd. Located in Israel.
The pumps and pumps auxiliaries shall meet the requirements of this specification, the attached data sheet and the latest API 610 standard as ammended or supplemented by this specification.
In the event of conflict between this specification and the attached data sheets the data sheets shall govern.
Should there be conflict between the Requisition, data sheets, specifications, codes and standards or lack of clear definition as to the applicability of any specification or standard, the Supplier shall obtain a written clarification from the Client before proceeding

2. DEVIATIONS AND EXCLUSIONS

The Supplier shall identify any requirement for which he is unable to comply and shall list all deviations and exclusions to all requirements in question
Unless deviations / exclusions are specifically identified by the Supplier in the bid proposal and agreed by the Client, the Supplier shall be deemed to have confirmed full compliance with all listed requirements.

3. CODES, STANDARDS, REGULATIONS AND REFERENCES

API Standard 610 11TH EDITION, 2010 - Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
API Standard 682 4TH EDITION, 2014- Pumps—Shaft Sealing Systems for Centrifugal and Rotary Pumps
ANSI/ASME B16.5, *Pipe Flanges and Flanged Fittings*
ANSI/ASME B16.20 Metalic Gasket For Pipe Flanges
ASTM A-193

4. SCOPE OF SUPPLY

Design, manufacture, assembly,supply and delivery of type BB3 centrifugal pumps and related equipment / components as applicable and in accordance with this specification and the latest edition of API 610. The scope includes shop test and inspection, painting, marking and packing, engineering, documentation, mechanical guarantee, performance guarantee, mounting of main driver and auxiliary equipment on common baseplate at shop / site piping with the package, shipping and transportation as per agreed terms, documentation and drawings, certification, final data books

4.1 The supply shall include:

4.1.1 Skid mounted pump, installed with motor and all other components as detailed below

4.1.2 The Supplier shall complete the data sheets, and include a copy with the Bid Proposal.

4.1.3 Combined fabricated steel baseplate for pump and motor.

4.1.4 Supply of flexible couplings and non- sparking coupling guards. Coupling shall preferably be Mestastream with stainless steel 316 disks. Allstro materials should be resistable for liquid fuels.

4.1.5 Lubrication system and fittings, including any piping and/or tubing which may be necessary. Constant level oil bottles shall be made of glass.

4.1.6 Mechanical seals complete with seal flush and external seal quench. In addition the pump shall be equipped with leak detection alaram system from the mechanical seals , using driping traes with level transmitters. Mechanical seal shall be according to API 682 .

4.1.7 Temperture transmitters for bearings and casing- type PT100 or 3 wire (one element for pump casing and two elements for pump bearings). All transtmitters will be wired to a common junction box Junction box will have 10 spare connections for additional instrumentation

4.1.8 Painting of the supplied assemblies as per paragraph 14 of this specification.

4.1.9 Valves, including auxiliary systems, shall be securely mounted or supported to eliminate damage during shipment, storage, operation, and maintenance.

4.1.10 Lossed item shall be packed separately

4.1.11 Documentation as per attachment B.
4.1.12 Spare Parts / Special Items and special tools
4.1.13 Packing for ocean freight

5. OPERATING CONDITIONS

5.1 Pumps shall be designed for continuous duty, 4000 hours per year, i.e Bearings, shafts, motors, seals etc shall have a minimum rated life of 25000 hr.

5.2 Pumps will be installed outdoors, in areas subject to dusty and corrosive environment.

5.3 Ambient tempertrue 0ºC minimum 47º maximum.

5.4 Humidity: 30-90%

6. PROCESS DATA

As per attached data sheet, attachment A.

7. MECHANICAL DESIGN

7.1 The pumps and all auxiliaries shall comply with the latest edition of API 610 and the supplementray requirments of this specification.

7.2 Pump ratings shall be designged for not less than 70% efficiency.

7.3 **Selected impeller, for the rated performance, should be 10% less of max diameter.**

7.4 **Max. head at rated diameter shall be added to the bid documents**

7.5 The baseplate shall include mechanical means for the alignments of the motor with the pump's shaft.

7.6 Flanges for inlet and outlet shall be to ANSI B16.5 standard. Gasket contact surface shall have serrated spinal grooves machined with a 0.8 mm nominal radius rounded-nose tool producing a groove pitch of 0.35-0.45 mm.

7.7 Casing

7.7.1 Casing bolts shall be according to ASTM A- 193

7.7.2 All tapped holes shall be plugged, including seal, vent and drain connections.
Plugs shall have hexagon shanks of at least 1" in length.
Plugs shall be lubricated with an anti seize compound (e.g copper slip) before installation.

7.8 Vendor to advise maximum allowable forces and moments on pumps nozzles.

Pumps shall have "spacer"- type couplings to allow a back "pull-out" Spacer coupling removal shall not involve moving of pump or motor. s

7.9 Pumps shall be fitted with impeller and casing wear-rings.

7.10 Pumps shall be suitable for parallel operation. Pump H-Q curves shall be gradually sloping in one direction with maximum head at "no-flow" condition. **H-Q curve for 2 pumps working in parallel shall be added to the bid documents including efficeny, power and NPSH curves.**

7.11 Pumps shall be of "double volute" design.

7.12 Multi-stage pumps shall be balanced by opposed impeller arrangement.

7.13 All values in the H-Q cureves shall refer to diesel fuel including NPSH and head values. H-Q curves shall include also efficiency curves, various impellers, power curves for all range of ratings

7.14 **Manufacturer to specify time that pumps may operate at "no-flow" condition as well as minimum continuous flow required .**

8. MATERIALS

8.1 **Materials of construction shall be in accordance with API 610 standard recommended for kerosene, gasoil, naphtha and unleaded gasoline (MATERIAL CLASS S-1)**. Where not specified - parts shall be made of the Manufacturers normal construction materials, subject to client's approval.

Material certificates: The Manufacturer shall provide material certificates type including chemical composition and mechanical data EN 10204 3.1 type for all pressure containing parts of the pump. **Material specification of all components listed in shall be clearly stated in the supplier's's proposal**

9. GASKETS

9.1 Flange gaskets for all piping shall be spiral wound graphite 98% to ASME B16.20.

9.2 Case gasket shall be non–asbestos sheet gasket, shall be with full description and vendor manufacture including materials, thickness etc.

10. MECHANICAL SEALS

10.1 Mechanical seal shall be designed and fabricated according to API 682

10.2 Mechanical seals shall be double type.

10.3 Mechanicall seals shall have provision for venting and flushing the seal faces.

10.4 Seal flushing shall be by the pumped fluid.

10.5 Flushing fluid tubing shall be equipped with filter..

10.6 To the client approval, mechanical seals shall have throttle bushings and external seal quench with flashing liquid vassel.

10.7 Mechanical seals shall preferably be of John Crane, K.S.B manufacture or simmimlar high quality brand (to be approved by client).

10.8 All bearings shall be self- lubricated type.

11. ELECTRICAL MOTORS

11.1 Electrical motors shall be in accordance with the attached motor specification –Attachment C.

12. PUMP NAMEPLATE

Pump nameplate shall be of austentic stainless steel not less than 1.5 mm thick. The manufactures name shall be stamped on the nameplate in addition to the information specified by API 610.

13. NOISE

The noise generated by the pump and driver when operating at rated conditions shall not exceed 75 dBA when measured 1 m from the surface of the equipment.

14. INSPECTION

14.1 The pump shall be inspected and tested in accordance with API 610 requirements.

14.2 The tests shall be witnessed by an independent inspector approved by the Purchaser.

14.3 All tests shall be in accordance with the appropriate ASTM or equivalent specifications. Test procedure will require pre-approval by client's representative

15. TESTS

15.1 Tests to be performed are specified by API 610.

15.2 Manufacturer shall advise Purchaser of tests scheduled to be withnessed at least 14 days in advance to enable Purchasers representative to be present.

16. Painting

All external surfaces, others then austenitic steel surfaces shall be coated by an Epoxy painting system with UV protection according to the standard painting procedure of the manufacturer - shall be subject to review and specific approval from the Client Complete, dry, painting system shall be not less then – 300 microns.

Final color will be RAL-1015.

17. PACKING

17.1 Following final inspection and cleaning all openings are to be closed and sealed.
Nozzle flanges are to be closed by means of wooden plates with flexible gasket.

17.2 Any loose parts are to be packed and tagged with item number of pump and part description.

17.3 Pumps are to be dowelled to baseplates.

17.4 Vulnerable threaded parts are to be coated with an anti-corrosive paste and protected by a suitable tape.

17.5 Pump assemblies are to be packed and firmly fixed in wooden crates suitable for ocean shipment

18. SPARE PARTS

18.1 Vendor shall quote the recommended spare parts.

18.2 List of spare parts shall include but not limited to the following:

18.2.1 Body gaskets cut with bolts holes – 1 set.
18.2.2 Glass for lubricating bearing oil – 10 sets.
18.2.3 Lubricant filter elements – 20 sets.

19. GUARANTEE

19.1 Performance – the manufacturer shall guarantee that the pump supplied shall perform in accordance with the relevant data sheet purchase order. If a pump is unable to preform as specified, the manufacturer shall make the appropriate modifications, including supply and installation of components, in order to comply with the specified performance.

19.2 Mechanical – the manufacturer shall guarantee that all materials and workmanship are free of defect and conform to the appropriate specifications.

19.3 Terms – should any defect in performance, materials or workmanship become apparent within 12 months from date of commissioning or 18 months form date of delivery (whichever comes last), the manufacturer shall repair or otherwise rectify the defects free of charge to the purchaster.

20. Technical documents to be provided with BID

In addition to the information called for in attachment B, the bidder shall include:

20.1 Maximum allowable forces and moments on pump nozzels.
20.2 Details of any deviations from this specification and pump data sheet.
20.3 Detailed performance curves
20.4 Detailed datasheets for the suggested pump asembly
20.5 Pump and motor data sheets
20.6 Dimnesions drawings (PDF and DWG, model is preferable), cutview drawings
20.7 Hazardous areas classification drawings PDF and DWG
20.8 Reference list of similar pumps
20.9 Manufacturers quality assurance program.
20.10 Any special tools or equipment as may be required for pump maintenance.
20.11 All documents to be in English language.
20.12 List of recommended spare parts.
20.13 Detailedinstallation and maintenance instructions

ATTACHMENT A

PUMP DATA SHEET

BARAN EPCO Member of Baran Group Ltd.	DATA SHEET CENTRIFUGAL PUMP	ITEM No. SHEET 1 OF 1

DESCRIPTION:						**JOB NO. :**			
PLANT:						**PROJECT:**	1-033-001		
LOCATION:						**P&ID:**			
1	No. req'd		Operating		Stand by				
2	Make		Size & type		Serial No.				
3	Drive		Drive type			ELECTRICAL			
4	**OPERATING CONDITIONS**								
5	Fluid	LIQUID FUELS	Normal flow		m^3/hr	NPSH avail.	static min 6		m
6	Pump temp	AMBIENT °C	Design flow	300	m^3/hr	NPSH reqd.			m
7	Density @ P.T	842 kg/m^3	Differential head		m				
8	Vap.Pr.@ P.T	0.75 IN 20c mmHg	Suction head	10	m	Corrosion/erosion caused by			
9	Visc. @ P.T	5 cP	Max.disch.pres.	60	barg	External flush available			
10	Solids % by weight	N/A	Average particle size (50% passing)		N/A	mm			
11	Density of solids	N/A kg/m^3	Max. particle size		N/A	mm			
12	**DESIGN**								
13	Mounting	HORIZONTAL	Bearing Lubrication	FORCED	Shaft diameter at coupling			mm	
14	Case split		Visible Lubricator		Water ring clearance				
15	Support		Coupling guard	YES	Stuffing box Depth	NO		mm	
16	Impeller type	Closed			Base plate	YES			
17	Corrosion allowance	mm			Coupling Manufacturer/type				
18	Cooling media piping by		Masses		Nozzles	Position	Size	Rating	
19	Cooling media temp in/design	°C	Pump & Cplg.	kg	Suction	H		#600	
20	External flush rate	lit/min	Base	kg	Disch.	H		#600	
21			Total	kg	Vent	?			
22					drain	?			
23			Space req. with driver		Seal	?			
24	**MATERIAL OF CONSTRUCTION**				**SEAL**				
25	Case		Casing gasket		Mech. Seal	DOUBLE SEAL API 683			
26	Impeller	SS316	Base plate		Seal ring				
27	Shaft	SS316	Protective Lining		Aux. Gland				
28	Shaft Sleeve	YES			Seal Flush Plan	BY FUEL			
29					Packing				
30					No. & Size				
31	**PERFORMANCE**								
32	Head m		No. of stages		Overall length			mm	
33	Speed RPM	2900	Bid impeller	mm	Overall width			mm	
34	Efficiency %	min 70	Max. impeller	mm	Outline diagram No.				
35	BKW		Min impeller	mm	Cross section No.				
36	Shut off H m	6	Eye area	cm^2	Max pressure @ °C	100		barg	
37	BEP Flow m3/hr		Impeller width	mm	Hydro test pressure			barg	
38	Min. Flow m3/hr		Bid imp. max.	kW					
39	Performance curve no.		Max. imp. max.	kW					
40	Driver		Tests	Required	Witnessed	Supply	By		
41	Motor /kW/rpm	50HZ	Shop inspection	☐	☐	Pump	V		
42	Volts/Phase/ Hz	6600V	Hydrostatic	☐	☐	Base plate	V		
43	Frame No.		Perform.	☐	☐	Motor	V		
44	Spec. No.		NPSH	☐	☐	Speed reducer	Optional		
45	Enclosure: Motor					Coupling	V		
46	Rotation facing pump coupling					Guards	V		
47	**REMARKS**								
48	*ALL HEAD VALUES ARE IN m-FUEL								
49	*PUMP BB3 ACCURDING TO API-610								
50	*SEALING MECHANISEM SHOULD BE ACCORDING TO API-683								
51	*SELECTED IMPELLER SHOULD BE 10% LESS OF MAX DIAMETER								
52	*ALL PUMPS WILL BE EQUIPPED WITH VFD IN ORDER TO SUPPLY THE REQUIRED CAPACITY WITH MAXIMUM EFFIECENCY.								
53									
54									
55									

REV	DESCRIPTION	BY	DATE	CHK	DATE	APPR.	DATE	CLIENT	DATE

ATTACHMENT B

DOCUMENTATION REQUIREMENTS

The table below specifies the documents required at various stages of supply.

Supply of the documentation is an integral part of the contract.

Item	With bld	For review	Final	Description
1	X			Dimensional outline drawing
2	X			Cross-sectional drawing with
3	X			Mechanical seal system drawing including related piping
4	X			Lubricarion system components drawing and data
5		X		Electrical and instrumentation schematic wiring diagrams and bill of materials
6	X			Preformance curves
7		X		Vibration data
8			X	Certified hydrostatic test data
9			X	Material certificates
10			X	Bimonthly progress reports
11		X		Weld procedures
12		X		Preformance test data
13			X	Completed data sheet- final as built
14			X	Installation, operating and maintenance instructions
15	X			Price list of recommended spare for 3- years operation
16	X			Dimensional drawing of electrical motor
17	X			Motor performance data
18			X	Motor instruction manual, covering installation, operation ans maintenance
		X		bill of materials

ATTACHMENT C

ELECTRICAL MOTOR REQUIREMENTS

BARAN ISRAEL

תשתיות נפט ואנרגיה בע"מ
קו מוצרי דלק בע"מ

PETROLEUM & ENERGY INFRASTRUCTURE LTD.

SPECIFICATION FOR THREE PHASE INDUCTION MOTOR FOR BB3 PUMP

SPEC. No. _____

PEI PROJECT No.___2533_____

PEI – Engineering Division

April 2019

REV.	DATE	ISSUE	PREPARED	APPROVED	CLIENT APP'D
P2	11.9.19	FOR BID	I.T	C.S	

CONTENT

APPENDICES

A. SITE CONDITIONS
B. VENDORS DRAWINGS AND DATA REQUIREMENTS
C. CABLE SIZE AND
D. MOTOR DATA SHEETS

1. OBJECTIVES

This specification is issued in order to present minimum requirements for the supply of 6600 V three phase induction motor, for hazardous locations.
The motor shall be supplied and isnstalled with an integrated pump, in the Eshel Terminal of Petroleum and Energy Infrastructure Ltd.

2. SCOPE OF SUPPLY

2.1. The 6.6 kV three phase induction motor is required for pump BB3 in Eshel Terminal

2.2. The scope of supply will be as shown below, and complying with the attached "General conditions of purchase and contract" and inclusive of the following items, all in accordance with this specification.

2.2.1. Design, supply, manufacture, and testing of complete unit.
2.2.2. Epoxy painting of the unit in accordance wih approved manufacturer standard (to be provided by vendor).
2.2.3. Packing and preparation for shipment.
2.2.4. Every motor orderd will be accompanied by an individual motor data sheet, which shall completed by the supplier and returned fourteen days after the date of order.
2.2.5. Supply of special tools required for installation and maintenance.
2.2.6. Provision of all technical data as required.

3. GENERAL

3.1. Supplier shall have complete responsibility and it shall be his duty to check himself that the unit supplied is suitable for the duties specified, that they conform to the design and other requirements of this specification and that most particulary the unit is suitable to operate in the ambient conditions of the site without additional protection. Approval by the Engineer of drawings or other documents shall not absolve the supplier from this responsibility.

3.2. All materials and components used in the construction of the motor shall be new.

3.3. The design of the equipment shall provide for interchangeability of components to the maximum extent possible, with particular emphasis on those units for which spare parts are required.

3.4. The inscriptions on rating plates, meters and other indicating instruments shall read in suitable units of the international metric system (SI).

3.5. All inscriptions on nameplates etc. shall be in English and\or Hebrew languages. Only symbols in line with I.E.C recommendations may be used on equipment and drawings.

3.6. Documentation shall be in English or Hebrew language.

3.7. Suitable lifting facilities shall be furnished for shipment and erection for the motors.

3.8. No aluminum or its alloys shall be used for the manufacture of motor parts or accessories.

3.9. All bolts shall be cadmium plated.

4. OPERATING CONDITIONS

4.1.

4.1.1. Squirrel Cage motor design shall be suitable for variable speed driver's applications (if required in the future). In the present stage shall be provided with a soft starter.
Data sheet requirements for supplied the motor to be submitted by supplier to client approval.
Motor shall be 6600 V with 6 terminals.

4.1.2. L.V motor rated voltage shall be as required by motor data sheet

4.1.3. Cable connection to the motor shall be terminals installed on terminal plate.

4.2. The motors, having attained full load temperature, shall then be capable of repeated starts of the frequencies and durations stipulated in the data sheets accompanying the purchase orders, but not less than:
3 cold repeated starts
2 hot repeated starts

4.3. Squirrel Cage motor will usually have soft starting.

4.4. Electric power supply and earthing

- Nominal voltage_____ 6600 V
- Variation from nominal voltage_____±10%
- Phase_____3
- **Nominal frequency**_____**50 Hz**
- Variation fgrom nominal frequency____±2%
- Fault current rating_____35kA @6600V 10kA
- Neutral_____ solid grounded system
- Anti-condensation heater supply_____230VAC single phase.
- cos φ 0.88

4.5. Rating and temperature rise

4.5.1. The motors shall be capable of operating continusly at their nominal full load ratings, notwithstanding variations of opproximately 5% and 2% from the nominal supply voltage and frequency respectively.

4.5.2. The motors shall be capable of operating continuously at their nominal full load ratings without reaching their temperature limit, as measures by the increase in resistance method for class “B”, as stated in the motor data sheet.

4.6. Voltage dips with standing

The power system suffers from short voltage dips several times a year due to bad weather
And faults on overhead lines.
During such dips the voltage may drop to 55% of this nominal value for up to 0.6 seconds. The motors shall be so constructed as to able to withstand, without any harm to them, the most severe occurrence of “anti-phasing” due to slow decay on the back –EMF,during such voltage dips and the subsequent recovery.
The motors shall also be capable of being re-closed onto the power source without sustaining damage in the event of being disconnected for up to 0,6 seconds due to the de-energizing of the respective contacor as a result of voltage dips.

4.7. Performance guarantee

4.7.1. Without limiting or restraining in any way whatever any other guarantees required by thr contract/ourchase order the manufacturer guarantees, to the tolerances laid down in I.E.C 60034, the “on site” performances of all motors as detailed in the relevant data sheets.

4.7.2. Notwithstanding operational criteria specified in this document, the supplier shall carry full responsibility for the successful operation and attainment of the design capacity.

4.7.3. If any criteria specified herewith are at vaiance with what the supplier would guarantee, this should be clearly stated by the supplier on the appropriate sheet in the form of tender.

5. DESIGN AND CONSTRUCTION

5.1. General

motors shall be 3 phase ,6600 volts, low loss, 50 Hz. Induction type, totally enclosed, external fan cooled, squirrel-cage, suitable for ambient conditions as specified in app. A , and use in petrochemical industry. The motors shall be approved for non- classified or for hazardous area operation-see the motor data sheets enclosed to this specification.

The motors shall be constructed to withstand:

5.1.1. The conditions defined in motor data sheets.

5.1.2. Outdoor installation and direct exposure to the sun

5.1.3. Frames shall be cast iron with heavy walls and all surfaces (interior and exterior) shall be epoxy painted.

5.2. Standards

The design, construction and testing of the motor shall conformto the latest applicable editions of the following specifications, recommendations and standards, with precedence given to I.E.C publications wherever content matter conflicts.

I.E.C 60072&72A: dimenisions and outputratings for rotating electrical machines.

I.E.C 60034 part 1: rating and performance of rotating electrical machines

I.E.C 60034 part 2: methods of testing for losses and efficiency of rotating electrical machines.
I.E.C 60034 part 5: degrees of protection for rotating electrical machines.

I.E.C 60034 part 6: methonds of cooling raotating electrical machines.

I.E.C 60034 part 8: terminal markings and direction of rotation of roatating electrical machines.

I.E.C 60034 part 9: noise limits for rotating electrical machines

I.E.C 60034 part 11: rules for protection of rating electrical machinery

I.E.C 60085\ B.S.I 2757: classification of insulating materials for electrical machinery and apparatus

B.S.I 4999 part 111 I.E.C 60077\22761DC PART 1: draft specification built in thermal protection fo electrical motors

I.E.C 60117 : recommended graphical symbols

I.S 1-298: asynchronous squirrel cage motors

I.S 1-549: dimensions of electrical motors

DIN 6885 part 1 center holes type R.A.B and C

5.3. Efficiency

high energy efficient motors shall be preferrd. The bidder shall provide nominal efficiency values measured at 80%,115%,100%,75% of motor rating power. The efficiency shall be measured to international IEC 60034-2. The additional investment cost of the motors will be weighed against the cost of energy saved due to reduced while the energy considered payback period shall be three years and the enrgy cost- 0.09 $\kwh.
8000 hours per year for 80% loaded motor.

5.4. Viberation and noise

5.4.1. The viberation and noise levels of the motors shall fall within the limits prescribed in I.E.C 60034- parts 1 and 9 respectively.

5.4.2. If silencers or other noise reducing devices are necessary to statisfy the noise limitations imposed, their cost where applicable shall be quoted separately in the tender.

5.5. Constructional features

5.5.1. Enclosure and cooling

5.5.1.1. Hazardous loactions enclosures
totally enclosed, fan cooled with non sparking fan EExn, suitable for division 2, zone 2 groups IIA, IIB & IIC loactions to BS 4683/3 and BS 5000/16.

5.5.1.2. Mounting and enclosure protection

Motors shall be of mounting type due to motor data sheet requirements, enclosed and protected in accordance with IP code as stated in the motor data sheets. Stator end plates and terminal boxes shall be suitably sealed.
As a rule, enclosure protection shall be (minimum) IP55

5.5.2. Terminal boxes

5.5.2.1. Terminal boxes shall satisfy IP56, as stated in the motor data sheet, and shall be sealed from the interior air of he motors. Gasket shall be neoprene or approved equivalent.

5.5.2.2. The terminal boxes shall be designed to withstand, without rupture, the effects of electrical faults within the boxes.

5.5.2.3. The terminal boxes shall be designed to permint removal of the motors without significant disturbance of the ends of the feeder cables connected therto. The intergrity of the mortor enclosure must be maintained.

5.5.2.4. Separate terminal boxes shall be provided for each auxiliary function (thermistors, anti-condesation heaters, etc.)

5.5.2.5. Terminal boxes shall be of ample size to permit interchanging of connections and a suitable earthing terminal shall be provided within each box for the connecting of the earth conductor incorporated in the supply cable, in addition to the usual earthing terminal located on the motor frame.

5.5.2.6. All cable entries in the terminal boxes shall be dilled and tapped in accordance with the particulars that will be furnished at the purchase stage. These entries shall be suitably plugged to prevent ingress of contaminants during shipment and prior to cabling.

5.5.2.7. All ends of the motor winding shall be brought out into a terminal box for connection to the incoming and on the terminal plate.

5.5.2.8. Terminal boxes shall be completely hermetically sealed from the stator.

5.5.3. Shafts and bearings

5.5.3.1. Every motor shall be equipped with a standard metric single ended shaft, with key-way and key to metric standards as per DIN 6885, sheet form A, unless otherwise specified in the accompanying motor schedules/data sheets. The shaft will be centering hole tapped as per DIN 332, form D.

5.5.3.2. End shield mounted ball or roller type bearings are preferd for all motors. Pedestal mountings and sleeve bearings are to be avoiding as far as practicable.

5.5.3.3. Antifriction deep bearings, grove ball/roller bearings of the cartridge type shall be used to permint dismantling of the machine without disturbance of the bearings.

5.5.3.4. The sealing of bearings shall adequately cater for the environmental conditions specified in the motor data sheet.

5.5.3.5. Grease relief system shall be provided complete with grease nipples to B.S 1486.

5.5.3.6. Bearing life shall be 40,000 hours at least.

5.5.3.7. Measures shall be taken to prevent damge to bearings during shipment. Should bearings fail or exibit symptoms of the brinelling during the gruarantee period of the motors, they shall be renewed promptly by the supplier or his appointed agent,free of charge. Costs of

any removals, transportation and restoration shall also be borne by the supplier.

5.5.3.8. Lubrication type and interval shall be indicated on a data plate fixed to the motor.

5.5.3.9. Should the motor be equipped with bearings allowing axial displacement, the shaft shall be provided with a marking to indicate the correct coupling position.

5.5.4. Winding insulation

The insulation of the motors shall be according to I.E.C 60085- class "F" as specified in the motor data sheets.

5.5.4.1. Winding insulation phase to phase, and phase to earth, shall be thermosetting resins impregnated class F or higher, conductors will have V.P.I impregnation.

5.5.4.2. The rated oper

5.5.4.3. Windings shall be suitable to resist contaminants and solvents (solid, liquid, grease) of chemical, petrochemical and petroleum industrial environments.

5.5.4.4. Connections between windings and terminals shall be insulated with materials suitable for continuons operation at the maximum temperature (measures by the resistance method) required by the standards for the winding insulation class.

5.5.4.5. Connection as per Para 4.1 shall be fixed and arranged so as to withstand the short circuits and the mechanical stresses and vibrations during normal running.

5.5.5. Embedded temperature detectors

5.5.5.1. Embedded temperature detectors – thermistor or RTD shall be provided for winding temperature monitoring.

5.5.5.2. Temperature detectors of the PT100 type shall be of the resistance type, non inductive, with 100 ohms at 0 C platinum resistor and temperature coefficient of 3.85 10-3 C-1 – RTD DIN 43760 three condutors.

5.5.5.3. One or two PT100 shall be fitted per phase in the anticipated hottest parts of the the windings according to motor data sheet requirements.

5.5.5.4. Two additional PT100 shall monitor the bearings temperature in order to protect them against abnormal conditions caused by overheating or insufficient lubrication.

5.5.5.5. PT100 wiring shall be terminated in separate terminal box possessing the same dgree of protection as the stator terminal box. Terminals shall be of the block type with a pressure pad between the conductor and the clamping screw.

5.5.5.6. All transtmitters and PT100/thermistors will be wired to a common junction box Junction box will have 10 spare connections for additional instrumentation

5.5.6. Anti condensation heaters

5.5.6.1. Anti condensation heaters shall be provided where called for in the accompanying motor schedules/ data sheet.

5.5.6.2. Heaters shall be sufficient power rating to maintain the interior air temperature of the motor above dew point when the motor is not in service.
The heaters shall be suitable for connecting to a 6600V 50Hz supply

5.5.6.3. The leads from the heaters shall be terminated in a separate terminal box possessing the same degree of protection as the stator terminal box.
Terminals shall be of the block tyoe with a pressure pad between the conductor and the clamping screw.

5.5.6.4. The terminal box shall be clearly and durably labeled to define the rated voltage and power consumption of the heater and shall also bear a separate wiring label reading: DANGER – ISOLATE HEATER BEFORE OPENING.

5.5.7. Fans and fan covers

Fans and fan covers shall be fully protected against corrosion.
Covers made of plastic shall not be used.
Fans shall be of non sparking metal.

5.5.8. Variable speed application

5.5.8.1. the propose motors shall be designed for soft start and variable speed (VFD) apllications taking in to consideration:

- Dimensioning and cooling
- Speed range(min/max)
- Lubrication
- Balancing
- Critical speeds

- Shaft seals
- Isulation protection
- Bearing currents (Insulated N- bearing)

5.5.8.2. the provisions taken by the manufacturer for variable speed application shall be quoted as required App.B

6. INSPECTION AND TESTING

6.1. Clients representative shall be permitted to carry out, during normal working hours, periodic inspections of the motors covered by this specification, at any stage of manufacture.

6.2. Clients representative shall be permitted to witness the final factory tests of the motors covered by this specification.

6.3. The manufacturer, shall carry out a “type test: certificate in triplicate for every motor shall be furnished to and approved by the engineer prior to dispatch of the motor.

6.4. Rotine tests shall be conducted on every motor and certificate of routine test in triplicate shall be furnished to and approved by the engineer prior to dispatch of the motor.

6.5. The manufacturer shall give two weeks notice of readiness for final inspection and factory test.

6.6. All tests shall be carried out in compliance with the relevant specification as detailed in clause 5.2 of this specification.

7. TAGGING AND PERMANENT MARKING

7.1. Each motor shall bear prominently positioned rating plate manufactured from stainless steel which shall be indelibly stamped with the information detailed in I.E.C 60034 part 1. Each explosion proof motor shall have on the data plate of its classification.

7.2. In addition to the rating plate, the motor shall have a label of stainless steel bearing:

a. Purchase order number
b. Equipment number
c. Item number

d. Rotation direction (if defined)

8. DRAWINGS AND DATA REQUIREMENTS

8.1. Drawing and data requirements are detailed in attached documentation –see App B
8.2. Bidder shall furnish with his bid a "supplier data sheet" of motor which shall contain all the information required thereon.
8.3. Motor data sheet will be provided by the engineer for each motor at the time of order. The supplier shall complete these data sheets as specified, before the motor manufacture.
8.4. The manufacture shall provide with each motor a certificate from recognized institute, which verifies the suitability of the motor to the area classification and operating conditions.
8.5. The manufacture shall provide details of the production standard and code of manufacturing the motor.
8.6. The supplier shall furnish the motor load curves with the motor supply.

9. SPARES

9.1. spares shall be quoted by the vendor in accordance to the best of his knowledge, and shall list separately commissioning spares, initial spares, and maintenance spaers required for ten years of operation.

10. PAINTING & PRESERVATION

10.1. Paniting

10.1.1. Stainlless steel surfaces, internal surfaces, and finish machined surfaces such as flange faces, shafts, and couplings, shall not be painted.
10.1.2. External surfaces of machinery, baseplats accessories shall be epoxy painted prior to being shipped from the supplier shop in accordance with approved suppliers standard.

10.2. Preservation

Prior to shipment all equipment shall be subjected to the following treatment:

10.2.1. Bearings, bearing housing and oil system shall be thoroughly cleaned and coated with a suitable rust preventative.
Supplier shall ensure that no damge shall occur to bearings during transport.

10.2.2. Seal assemblies shall be fully protected from rusting and entry of moisture and dirt

10.2.3. External nonpainted surfaces (except stainless steel), including bolting and flange faces, shall be coated with a suitable rust preventative.

10.2.4. Exposed shafts and shaft couplings and other machined surfaces shall be wrapped with waterproof moldable waxed cloth or equal.

10.2.5. All flaged openings shall be protected by securely fastened metal covers to prevent damage during shipment. Covers shall be installed with a suitable gasket, using a minimum of four full diameter bolts. The cover and flange shall be taped for waterproof protection. All other openings shall be plugged or covered to prevent damge during shipment.

10.2.6. Supplier is responsible for ensuring that no rust shall occur during shipment.

11. DATA FOR BID COMPARISON ,QUANTITIES AND UNIT RATES

In order to compare bids quickly and on an equal basis, suppliers are requested to fill in the attch “schedule of price and data” (in addition to data sheet).
The bidder is to fill the prices and manufacturer data within the “schedule of prices and data” for various types of motors as specified in this specification.
The motor sizes and the quantities are estimated only and the final quantities and requirements shall be placed with in order.

ATTACHMENT B

BILL OF QUANTITIES

tem	Tag	Type	Size	Location	Qty	Unit price	Total
CENTRIFUGAL PUMP, including motor, all accessories, frame and assembly		BB3			3		