ATTOCK PETROLEUM LIMITED

BULK OIL STORAGE TERMINAL AT DAULATPUR

TENDER DOCUMENT

FOR

SUPPLY, INSTALLATION, TESTING, PAINTING & COMMISSIONING OF FIRE PUMPS

TABLE OF CONTENTS

MATERIAL REQUISITION

CLIENT : ATTOCK PETROLEUM LTD. **JOB NO. :** 2740

PROJECT : BULK OIL TERMINAL AT DAULATPUR

NUMBER	PAGE	SUBJECT :	ISSUED FOR
2740-MR-001	1 OF 1	FIRE PUMPS MOTOR & ENGINE DRIVEN	BIDDING
			BID REQUEST NO.
PREPARED BY :		ATTACHMENT	
SMS		* : Specifications for Fire Pumps (SP-067)	PURCHASE ORDER NO.
FACTORY INSPECTION		* : Data Sheet Fire Pumps (2740-DSM-010)	
○ YES ○ NO		(2 sheets)	SUPPLIER

REV.	ITEM	MATERIAL DESCRIPTION	QTY. (Nos)	SUPPLY (USD)	INSTAL./COMMISS. (PKR)
0	1.0 1.1	**FIRE PUMP MOTOR DRIVEN:** Design, Supply of all equipment & material, testing, pre- commissioning and commissioning of 01 no. Fire Water Pump Motor Driven having capacity 750 USgpm @ 150 Psi head UL Listed / FM approved as per Project Specification and Data sheet. It includes (but not limited to) pump with motor mounted on common base plate, suction and discharge Pressure Indicators, Circulation Relief Valve, Air Eliminator, Control Panel, brass piping with fittings and valves, etc.,	1 Job		
0	2.0 2.1	**FIRE PUMP ENGINE DRIVEN:** Design, Supply of all equipment & material, testing, pre- commissioning and commissioning of 01 no. Fire Water Pump Engine Driven having capacity 750 USgpm @ 150 Psi UL Listed / FM approved head as per Project Specification and Data sheet. It includes (but not limited to) pump with Engine mounted on common base plate, suction and discharge Pressure Indicators, Main Relief Valve with Waste Cone & sight glass, Air Eliminator, Doubled Wall Fuel day tank, Control Panel, brass piping with fittings and valves, etc.,	1 Job		
0	3.0 3.1	**WATER FLOW TEST DEVICE** Supply, installation, testing and commissioning of 01 no. UL Listed fire water flow device dia. 6"-150# R.F. Flanged Ends.	1 Job		
0	4.0 4.1	**CONTROL PANEL PIPING AND CABLING** Supply, installation, testing and commissioning of dia. ½" brass pipe with fittings, 4 nos. globe valves dia. ½" and 02 nos. bronze check valves dia. ½" with 2 mm orifice in clapper for each set of fire pumps and jockey pump complete in all respect as per NFPA 20. Contractor scope also include supply, installation, hook up, testing and commissioning of cables, cable glands, etc., from each Control Panel to pumps.	1 Job		
0	5.0	**SPARES** Supply of spares for 2 years normal operation (List to be provided seperately mentioning cost & specification of indiviual items)	1 Lot		
		Total Amount			

REV.	DATE	DESCRIPTION	SIGNATURE

DATA SHEET
FOR
FIRE PUMP (MOTOR DRIVEN)
(NFPA 20 UL LISTED / FM APPROVED)

Spec. No.	2740-DSM-010		
Prep. By	IA	Apr. By	SMS
Sheet	1 of 2		
Rev.	1		
Date	06-Aug-2019		

Applicable To: Proposals X Purchase O As Built O
Note: O Indicates Information to be Completed by Purchaser;
O By Manufacturer

For Attock Petroleum Limited — Site Daulatpur-Sindh
Unit Daulatpur Terminal — Service Fire Fighting System
No. Pumps Req'd 1 — No. Motors Req'd 1 — Provided By Pump Manufacturer — Mtd. By
Item No. — Item Description
No. Engines Req'd — No. Turbines Req'd - — Provided By — Mtd By
Item No. **P-6001A** — Item Description **Fire Pump (Motor Driven)**
Pump Mfr. — Size and Type — Serial No.

OPERATING CONDITIONS, EACH PUMP

Liquid City Water — US GPM at P.T. Nor. — Rated 750
Disch. Press., Psia 159
P.T. ºC, Nor. 30 Max. 50 — Suct. Press., Psia max. Rated 9
Vap. Press. at P.T, Psi 1 — Diff. Head, Ft. 347
Vis. at P.T., Ssu - cP 1 — NPSHA, Ft. 18
Corr/Eros. Caused by Water — Hyd. HP
Location: O Indoor | X Outdoor — Area: X Safe | O Hazardous
Working: O Continuous | X Intermittent | O Random

PERFORMANCE

Proposal Curve No.
RPM — NPSHR (Water)
Eff. — BHP Rated
Max. Head Rated IMP
Min. Continuous gpm
Rotation (Viewed from CPLG End)

CONSTRUCTION

Nozzles	Size	Rating	Facing	Location
Suction		150#	RF	
Discharge		150#	RF	

Case-mount: O Centerline | O Foot | O Bracket | O Vert. (Type)
- Split: O Axial | O Rad; Type Volute | O SGL | O DBL | O Diffuser
- Press: O Max. Allow, psig ºF; O Hydro Test psig
- Connect: X Vent | X Drain | X Gage | X PSV

Impeller Dia.: O Rated | O Max. | O Type:
Mount: O Between Brgs | O Overhung
Bearings-type: O Radial | O Thrust
Lube: O Ring Oil | O Flood | O Oil Mist | O Flinger | O Pressure
Coupling: O Mfr. Metastream or Eq. | O Model Sparkproof
Driver Half Mtd By: O Pump Mfr. O Driver Mfr. O Purchaser
Packing: X Mfr. & Type Yes | O Size/No. of Rings
Mech. Seal: O Mfr. & Model — API Class. Code
O Mfr. Code

SHOP TESTS

O Non-Wit. Perf. X Wit. Perf.
O Non-Wit. Hydro X Wit. Hydro
O NPSH Req'd. X Wit. NPSH
X Shop Inspection
X Dismant. & Insp. After Test
O Other

MATERIALS

Pump: Case/Trim Class O
Impeller Material Bronze / S.Steel
Shaft S.Steel
Casing C. Iron
Baseplate: x

AUXILIARY PIPING

O C.W. Pipe Plan O CU; O SS; O Tubing; O Pipe
O Total Cooling Water Req'd, gpm O Sight F.I. Req'd
O Packing Cooling Injection Req'd: O Total gpm O psig
O Seal Flush Pipe Plan O CS O SS O Tubing O Pipe
O External Seal Flush Fluid O gpm O psig
O Auxiliary Seal Plan O CS O SS O Tubing O Pipe
O Aux. Seal Quench Fluid

VERTICAL PUMPS

Pit or Sump Depth
Min. Submergence Req'd.
Column Pipe: O Flanged O Threaded
Line Shaft: O Open O Enclosed
Brgs: O Bowl O Line Shaft
Brg. Lube O Water O Oil O Grease
Float & Rod O CS O SS O BRZ O None
Float Switch O
Pump thrust,lb. O UP O Down

MOTOR DRIVER

HP RPM Frame Volts/Phase/Cycles 380-400/3/50
Mfr. Siemens or Eq. Bearings Lube
Type TEFC Insul. F Full Load Amps
Enc Temp. Rise, ºC 80 Locked Rotor Amps
O VHS O VSS Vert. Thrust Cap., lb.

Approx. WT. Pump & Base
Motor Turbine

NOTES :
1- Pump set shall meet the requirement of NFPA-20, UL Listed and FM approved and NFPA 70.
2- X : means requirement
3- Pump suction and discharge nozzles should be of standard size. If non-standard size like 2 1/2", 3 1/2", 5", etc. is provided with pump, then mating flange with next higher standard size reucer shall be provided with pump.
4- Pump with Motor should be mounted on common base plate by pump manufacturer.
5- Pump should supply with Control Panel as per NFPA 20 requirements.
6- Pump shall have Circulating Relief Valve, Pressure Indicators at Suction and Discharge, Air Eliminator, etc.,

DATA SHEET
FOR
FIRE PUMP (ENGINE DRIVEN)
(NFPA 20 UL LISTED / FM APPROVED)

Spec. No.	2740-DSM-010		
Prep. By	IA	Apr. By	SMS
Sheet	2 of 2		
Rev.	1		
Date	6-08-2019		

Applicable To: Proposals X Purchase O As Built O

Note: O Indicates Information to be Completed by Purchaser;
O By Manufacturer

For Attock Petroleum Limited — Site Daulatpur-Sindh
Unit Daulatpur Terminal — Service Fire Fighting System
No. Pumps Req'd 1 — No. Motors Req'd — Provided By — Mtd. By
Item No. — Item Description
No. Engines Req'd 1 — No. Turbines Req'd - — Provided By Pump Manufacturer — Mtd By
Item No. **P-6001B** — Item Description **Fire Pump (Engine Driven)**
Pump Mfr. — Size and Type — Serial No.

OPERATING CONDITIONS, EACH PUMP

Liquid City Water — US GPM at P.T. Nor. — Rated 750
Disch. Press., Psia 159
P.T. ºC, Nor. 30 Max. 50 — Suct. Press., Psia max. Rated 9
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Vis. at P.T., Ssu - cP 1 — NPSHA, Ft. 18
Corr/Eros. Caused by Water — Hyd. HP
Location: O Indoor | X Outdoor — Area: X Safe | O Hazardous
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Proposal Curve No.
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Rotation (Viewed from CPLG End)

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Nozzles	Size	Rating	Facing	Location
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- Press: O Max. Allow, psig ºF; O Hydro Test psig
- Connect: X Vent | X Drain | X Gage | X PSV

Impeller Dia.: O Rated | O Max. | O Type:
Mount: O Between Brgs | O Overhung
Bearings-type: O Radial | O Thrust
Lube: O Ring Oil | O Flood | O Oil Mist | O Flinger | O Pressure
Coupling: O Mfr. Metastream or Eq. | O Model Sparkproof
Driver Half Mtd By: O Pump Mfr. O Driver Mfr. O Purchaser
Packing: X Mfr. & Type Yes | O Size/No. of Rings
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MATERIALS

Pump: Case/Trim Class O
Impeller Material Bronze / S.Steel
Shaft S.Steel
Casing C. Iron
Baseplate: x

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O C.W. Pipe Plan O CU; O SS; O Tubing; O Pipe
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O Packing Cooling Injection Req'd: O Total gpm | O psig
O Seal Flush Pipe Plan O CS O SS O Tubing O Pipe
O External Seal Flush Fluid | O gpm | O psig
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O VHS O VSS Vert. Thrust Cap., lb.

Approx. WT. Pump & Base
Motor Turbine

NOTES :

1- Pump set shall meet the requirement of NFPA-20, UL Listed / FM approved
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3- Pump suction and discharge nozzles should be of standard size. If non-standard size like 2 1/2", 3 1/2", 5", etc. is provided with pump, then mating flange with next higher standard size reucer shall be provided with pump.
4- Pump with Engine should be mounted on common base plate by pump manufacturer.
5- Pump should supply with Control Panel as per NFPA 20 requirements.
6- Pump shall have Main Relief Valve, Pressure Indicators at Suction and Discharge, Air Eliminator, etc.,

ATTOCK PETROLEUM LIMITED

BULK OIL TERMINAL AT DAULATPUR

GENERAL TERMS AND CONDITIONS FOR SUPPLY OF EQUIPMENTS AND MATERIALS

TABLE OF CONTENTS

1.0 SCOPE

This document covers general conditions governing the manufacture and supply of equipments for Daulatpur Terminal of M/s. **A**ttock **P**etroleum **L**imited **(APL)**. The terms mentioned here form integral part of the Purchase Order.

2.0 DEFINITIONS

2.1 Owner

Attock Petroleum **L**imited **(APL)**

7th & 8th Floor,
Attock House,
Morgah, Rawalpindi
Pakistan

2.2 Vendor

Means the company, firm or agency with whom has order been placed the supply of Equipments.

2.3 Bidder

A potential supplier of Equipment and material who has been invited to bid.

3.0 INSTRUCTIONS

This general specification for the supply of equipment and material apply to all procurement and shall be considered an integral part of the purchase order. These may be modified by particular conditions stipulated in the purchase order and/or through attached technical documents. Where requirements of the general specification deviates from the said particular conditions and/or purchase orders, later shall govern.

No deviation from the general specifications for the supply of equipment and material will be acceptable unless special exception is agreed and notified in writing to the manufacturers/suppliers by the Owner.

These general conditions shall supersede any conditions indicated by the manufacturer in his bid unless such conditions have been specifically included in the Purchase Orders.

4.0 APPLICABLE TECHNICAL DOCUMENTS

The applicable technical specifications, data sheets, respective codes, standards and general specifications enclosed to the purchase order, form integral part thereof. All the equipment supplied against such purchase orders shall strictly conform to the aforementioned technical documents.

5.0 LIMITS OF SUPPLY

The scope of supply shall include the manufacture and supply of equipment, fabrication, painting, testing of equipment and packing, all in accordance with the applicable drawings/specifications, Data Sheets and Standards. In case the equipment is to be assembled at site, the procedures and facilities for assembly, necessary spare parts needed at site and experts personnel for supervision during erection/commissioning (where required) is also included in the scope of supply.

When a purchase order includes two or more similar items the supplier shall ensure maximum interchange ability of components such as couplings, electric motors etc.

5.1 Spare Parts

Vendor shall guarantee the supply of spare parts for a minimum of 10 years. The vendor is required to provide complete spare part list accompanied by all sectional drawings and other documents needed for the identification of the spare parts. Price of spare parts for Two 02 years shall be quoted as per material requisition.

5.2 Lubricants

Vendor shall provide detailed list of lubricants, specifying the quantities and grades to be used for **"first fill"** and for subsequent operations.

5.3 Commissioning Spares

All the spares required for the successful commissioning of the equipment / material shall be supplied by the vendor and the priced list shall be submitted along with the bid.

6.0 TESTING & INSPECTION

Vendor shall carryout all tests on equipment as per international practices and those specified in the technical documents, attached to the purchase order. Testing procedure of Equipments shall be given in the technical documents attached to the purchase order. Where such procedures are not given, following test and checks shall be carried out

according to applicable codes and standards and relevant test certificates issued to the Owner.

- Performance Test of all equipment.
- Tests and inspection on electrical equipment as generally prescribed in industrial practices, codes standards etc.
- Hydrostatic test on all equipment operating under pressure/static head.
- Dimensional checks.

Material / Mill Test Certificates shall be submitted as per EN 10204/3.1 B.

It will be OWNER's right to have a 'Pre-inspection meeting' with the Vendor in order to discuss the Construction and/or test plans in details. They shall have free access to the premises of the manufacturer and their sub-supplier, and vendor shall ensure that all possible help and assistance is made available to such representative.

Inspectors of OWNER and/or those appointed by them, shall witness the tests required by the purchase order and/or by the specifications. Any waiver of witnessing the tests will be notified to vendor in writing only. Such waivers will not relieve the vendor of his liabilities.

Vendor shall carryout the inspections/tests required by the purchase order and/or attached specifications and inspection data sheets. Vendor shall notify OWNER in writing or by fax at least 30 days before the date established for the testing/inspection. However, the presence of OWNER inspectors and/or those appointed by them does not relieve the vendor of any of his responsibilities/liabilities.

The sub-vendor's inspection and test are the vendor's obligation and responsibility. However, OWNER reserves the right to carry out their own inspection at the sub-vendor's workshop and to witness the tests on such vendor.

Any or all tests/inspection may also be witnessed by official institutions.

Within 15 days of the final successful tests the Vendor must send to OWNER one original and 3 copies of all material and test certificates.

6.1 **Expediting**

Expeditors of OWNER will carry out the expediting of the order, by visiting or otherwise contacting the vendor. Vendor shall appoint a "Vendor's Co-ordinator" responsible for giving complete and reliable information on the purchase order

status. The information will include supply schedule, design and work progress, issuance and progress status of any sub-orders, critical sub-orders and the expected delivery date.

7.0 VENDOR'S TECHNICAL DOCUMENTS

Upon receipt of the purchase order, the vendor is required to furnish the following:

a) The Vendor shall furnish within one week, the schedule of manufacture and delivery program in two copies. The schedule shall indicate the time table of the activities including, manufacturing stages, assembly, testing and delivery of the equipment. Within 2 weeks of the receipt of purchase order the Vendor shall supply to OWNER, the fabrication specifications and drawings for its comments/approval and shall commence the fabrication work only after the receipt of comments/approval on such drawings/specifications. The Vendor shall also submit weekly progress reports indicating the manufacturing status report.

b) Vendor shall furnish within 3 weeks of the receipt of purchase order, 4 sets with one reproducible of each certified equipment mounting and dimensional drawings and equipment weight for the purpose of foundations/piping design.

c) The Vendor shall furnish, upon delivery:

   1) All drawings and specifications developed for the equipment in 4 copies and one reproducible.

   2) 4 copies of complete equipment data books which will include material mill test certificates, inspection certificates, radiographic reports, hydro-static test certificates etc.

   3) 4 copies of Installation, Operations and Maintenance Manuals.

d) In addition to the instructions provided in the technical specifications/data sheets, Vendor shall comply with the following requirements for Installations, Operations and Maintenance Manuals.

   1) The front cover, spine and inside page shall state the purchase order number and Vendor's reference number.

   2) The inside front page shall carry an index listing the contents of each section of the manual.

   3) Individual sections shall be complete and shall refer to equipment actually supplied.

4) Published data shall be included, including published data for bought-in items.

5) Devices requiring adjustment and settings shall be fully documented and settings listed.

6) A punch list of 'do's" and don'ts" shall be included.

7) Full details for installation and setting up shall be included.

8) Recommended test data shall be stated, covering initial and also regular testing.

9) Items requiring regular inspection, checking, testing and maintenance shall be listed and the time scale clearly indicated.

10) Important items shall be cross referenced to other parts of the manual as necessary.

8.0 PACKING & SHIPPING

8.1 General

Vendor shall ensure that all items of equipment shall be delivered in proper air/rail/road/sea worthy packing, (as applicable) and where special protection is required, Vendor shall so arrange accordingly. Packing shall be arranged by Vendor and cost to be included in the price of this purchase order. The Vendor shall be liable for any damage to the equipment caused by:

a) Bad or ineffective packing or deterioration/ corrosion as a result of incorrect or inadequate protection during transportation and storage not exceeding eighteen (18) months in total.

b) Corrosion as a result of the Vendor's failure to indicate storage recommendations.

c) Loading or unloading resulting from Vendor's failure to provide any or adequate instructions.

During packing Vendor shall ensure that:

1) A packing list is enclosed with all closed packages.

2) The packages are marked according to specifications.

3) Certificates of origin, where required are available.

8.2 **Preparation for Delivery to Site**

a) After final hydrostatic test, where applicable, the equipment shall be dried and cleaned thoroughly inside and outside to remove grease, loose scale, rust and dirt.

b) All finished surfaces and surfaces which are not protected by blind flanges shall be coated with rust preventive.

c) All flanges opening which are not provided with covers shall be protected by suitable steel plates.

d) Threaded openings shall be plugged.

e) For internal parts (where applicable) suitable supports shall be provided to avoid damage during shipment.

f) Bolts and nuts shall be coated with water proof lubricant.

g) Equipments shall be clearly identified by painting the order and item number in a conspicuous location on the packing.

h) Small parts which are to be delivered loose shall be bagged or boxed and marked with the purchase order and item number of the equipment.

i) Vessel fabricator shall take all necessary precautions in loading by blocking and bracing the vessel and furnishing all necessary material to prevent damages during transport.

j) Packing dimensions will be restricted by the inland transport facilities and passage limitations.

k) Marking Instructions:

- The packages shall carry marking on top and on three sides; an arrow shall indicate top of equipment.

- Name of OWNER and OWNER's mark shall be atleast at two positions on the case:

(EQUIPMENT NAME)
ATTOCK PETROLEUM LIMITED
RAWALPINDI
PAKISTAN
letters minimum 75 mm high unless impracticable.

– At least two position on the case:

  Package number, part number and number of pieces and purchase order number, weight (Gross) and net weight.

– Insurance Policy No. Package stackable Yes/No.

– Warning marks (fragile, top, keep dry etc.).

All markings shall be in indelible ink/paint and easily readable.

8.3 **Shipping Papers**

The Vendor shall submit full shipping documents via airmail by registered post to the Owner, preferably in two separate registered covers. All shipping documents shall be airmailed within a week after the ship has sailed so as to reach the Owner in advance of the arrival of the ship. Responsibility for delay in the receipt of shipping documents shall rest with the Vendor, who shall pay all demurrage and port storage charges accruing as a result of late receipt of shipping documents.

The shipping documents shall be sent as follows:

	No. of Copies Required
1. Payment Invoice	4
2. Original B/L	2
3. Non-Negotiable B/L	3
4. Packing List	4
5. Package-Wise Weighing & Measuring Certificates	4
6. Guarantee & Test Certificates	3
7. Certificate of Origin	3
8. Freight Payment Receipt Invoice	4
9. Insurance Payment Receipt / Invoice	3

9.0 GUARANTEES

The Vendor shall guarantee that all Equipments to be supplied shall strictly comply with the characteristics, requirements and specifications referred to in the Purchase Order, that the materials used are new and free from apparent and latent defects, that the manufacture is carried out in accordance with the best working practices and up to-date techniques and complies with all specifications stipulated in the Purchase Order.

Approval and/or comments by OWNER on manufacturer specifications, drawings and technical documents will in no way release the manufacturer of his full responsibility regarding his supply as stipulated in the purchase order. Inspection and or witnessing tests by OWNER and their acceptance, of such tests and of supply of equipment/material thereof will in no event relieve the manufacturer from his responsibility contained therein.

The warranty shall be for a period of 12 months from the date of initial commissioning or for a period of not less than 18 months from the date of shipment/dispatch of supplied Equipment / Material, whichever is earlier.

The manufacturer shall deliver to the Owner, at the time of delivery, the written warranty in a form satisfactory to OWNER that the equipment/material being supplied is brand new, has been manufactured in accordance with the drawings, specification and other documents and that, should any defect develop during the warranty period due to but not limited to the improper material, workmanship, instruction, practices, assembly or arrangement of the same, together with any other work effected in correcting such defects will upon written notice, be made good by the manufacturer at no cost to OWNER. All such items of equipment/material repaired or replaced shall be like-wise warranted by the manufacturer for 12 months from the date of completion of such repair or replacement.

If defects are found and the Vendor is not in a position to take the necessary action to carry out the repairs within the time required by OWNER and agreed upon between OWNER and Vendor according to OWNER requirements. OWNER shall have such modification and repairs made by others and the resultant expenses will be charged to the Vendor. It is understood that in this case the Vendor shall not be relieved of guarantee contractual obligations.

ATTOCK PETROLEUM LIMITED

BULK OIL STORAGE TERMINAL AT DAULATPUR

SPECIFICATION

FOR

FIRE WATER PUMPING SYSTEM

TABLE OF CONTENT

Attachments:

2740-DSM-010 Fire Pumps (Motor & Engine) Pump Data Sheet

1.0 DEFINITIONS

Owner	**:** Attock Petroleum Limited.
Consultant	**:** Petrochemical Engineering Consultants
Contractor	**:** The Company named as such in the deed.
Sub Contractor / Vendor	**:** The Manufacturer / Supplier engaged by Contractor
Shall/ Must/ Is To Be	**:** A Mandatory Requirement
Should	**:** A non-mandatory requirement, advisory or Recommendation

1.1 Errors or Omissions

1.1.1 The review and comment by the Owner of Contractor's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the Contract Documents.

1.1.2 Any errors or omissions noted by the Contractor in this Specification shall be immediately brought to the attention of the owner.

1.2 Deviations

All deviations to this Specification, other related specifications or attachments shall be brought to the knowledge of the Owner in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the Owner prior to execution of Work. Such deviations shall be shown in the documentation prepared by the Contractor.

1.3 Conflicting Requirements

In the event of any conflict, inconsistency or ambiguity between the Contract scope of work, this Specification, National Codes & Standards, referenced in the Project Specification or any other documents, the Contractor shall refer to the Owner whose decision shall prevail.

1.4 Reporting Procedure

1.4.1 A reporting and documentation system shall be agreed between the Owner and the Contractor for the status of procurement, design, manufacturing, inspection, testing and shipment of the equipment/material to be supplied under this specification. Contractor's manufacturer shall provide reports and summaries for production performance and testing operations in conformance with a manufacturing schedule approved by Owner.

1.4.2 Daily, weekly monthly and run summaries of all major aspects of the production process shall be provided as reports to the Owner

1.4.3 Third Party inspection

In addition to the inspection and witnessing of tests by the inspectors to be appointed by the Contractor during the manufacturing and shipment of the equipment/material, Owner may appoint a third party or it Own inspector for witnessing of the inspection and tests to be carried out at manufacturer's facility under this specification.

1.5 Unit Responsibility

The Contractor shall assume full unit responsibility for the complete centrifugal pump package and all ancillaries. The Contractor shall handle and expedite drawings and data, and supervise and coordinate all inspection and testing specified. The pump unit shall be delivered at Site coupled with its drive and mounted on the same base frame.

The Contractor shall properly align pumps with driver.

2.0 GENERAL

2.1 SCOPE

This specification covers the minimum requirements for the design, supply, manufacture, inspection, testing, painting and commissioning of Motor driven Centrifugal Fire water Pump and Diesel Engine driven Centrifugal Fire water Pump as per NFPA-20, UL Listed/FM approved with dedicated Control Panels UL Listed/FM approved. Jockey pump motor driven with Control Panel UL Listed/FM approved is also included. The pump drivers are included in this specification.

Contractor shall be responsible to connect pressure sensing piping from Control Panel to pump. For this purpose, Contractor's scope include supply, installation, testing and commissioning of dia. ½" brass pipe with fittings, 4 nos. globe valves dia. ½" and 02 nos. bronze check valves dia. ½" with 2 mm orifice in clapper for each set of fire pumps and jockey pump complete in all respect as per NFPA 20 (see figure A.4.30 (a).

Contractor scope also include supply, installation, hook up, testing and commissioning of cables, cable glands, etc., from each Control to pumps.

Owner will construct pump foundations as per certified pump drawings to be provided by Contractor. Owner will also install pumps with Motor/Engine. However, it is Contractor responsibility to align pumps as per manufacturer recommendations.

Vendor shall be responsible to provide commissioning spares and list of two years' service, maintenance and manufacturer recommended spares.

Contractor shall supply pump sets as per following requirement but not limited to :

<u>Fire Pump Motor Driven</u>

- Pump with Motor mounted on common base plate
- Control Panel with Soft Starter
- Pressure sensing dia. ½" brass piping with fittings, 04 nos. globe valves, 02 nos. bronze check valves dia. ½" with 2 mm orifice in clapper.
- Pressure Gauges at Pump suction and discharge
- Cable with Cable glands from Control Panel to pump
- Circulating Relief Valve
- Air Eliminator

<u>Fire Pump Engine Driven</u>

- Pump with Engine mounted on common base plate
- Control Panel
- Pressure sensing dia. ½" brass piping with fittings, 04 nos. globe valves, 02 nos. bronze check valves dia. ½" with 2 mm orifice in clapper.
- Pressure Gauges at Pump suction and discharge
- Main Pressure Safety Valve

- Air Eliminator
- Doubles Wall Fuel Tank
- Cable with Cable glands from Control Panel to pump
- Dual Batteries, Starters and Chargers

Miscellaneous Supply Items

- UL Listed flow meter device dia. 8”-150# R.F. fanged ends as per NFPA 20

2.2 FIRE PUMPS

- The horizontal split case fire pump shall be designed as per NFPA-20, with a minimum life of 20 yrs.
- The pump units shall be directly connected to the driver by flexible coupling. The couplings shall be of steel of the non-lubricated spacer disc type with stainless steel disc.
- The Contractor shall provide complete lists of spare parts including housing, bearings (designation, type, number, suffixes, cage type, sizes, clearances, lubrications, replacement details, etc.), glands/ stuffing box, etc.
- The tensional natural frequencies of the engine and driven equipment system, including coupling and gear units shall not be within 10% of any normal operating shaft speed.
- The pump shall have a continuous rising head capacity characteristic from the specified duty point towards the shut-off point, the maximum being shut-off. The horse power characteristic shall preferably be non-over loading type beyond the rated capacity point.
- The gland packing should be easily accessible for changing without having to disassemble the pump.
- The rotor assembly with impeller and shaft sleeve shall be dynamically balanced at 150% of operating speed.
- Pump casing shall be made of cast iron and tested at 150% of shut-off head or 200% of rated total head whichever is higher
- Replaceable / renewable wearing rings shall be provided for both the casing and the impeller or for the casing only.
- All exposed rotating parts (coupling, belt drives, etc.) shall be guarded.
- Firewater pump package shall be provided with a control panel located inside pump room and suitably protected against vibration.
- Manufacturer’s standard red paint shall be applied to factory-assembled and tested units before shipping.
- Nameplate shall indicate the capacities, characteristics and other pertinent data.

3.0 CODES, STANDARDS & SPECIFICATIONS

The following codes, standards, specifications and drawings (latest edition, addendum and revisions) shall be considered as part of this specification and minimum requirements of these documents are mandatory.

a) National Fire Protection Association (NFPA):

- NFPA 20 - Centrifugal Fire Pumps

b) American Society of Mechanical Engineers (ASME)

- B16.5 - Pipe Flanges and Flanged Fittings.
- B16.9 - Factory-Made Wrought Steel Butt welding Fittings.
- Bl6.21 - Non-metallic Flat Gaskets for Pipe Flanges.
- API 600 – Steel Gate Valve Flanged and B.W. Ends
- API 602 – Compact Steel Gate Valves
- ASTM A 53

4.0 TECHNICAL

4.1 BASIC REQUIREMENTS

4.1.1 General

a) The head curve for the pump shall rise continuously from the specified capacity point to shut-off.

b) Close coupled pumps are not acceptable.

4.1.2 Nozzles and Miscellaneous Connections

a. All suction and discharge connections shall be flanged.

b. The pump casing shall be furnished with drilled and tapped vent and drain openings, which shall be fitted with valves unless plugs are specified.

c. Drain and vent shall not be smaller than 1" where practical. All pipe and nipples shall be Schedule 160-pipe class.

d. Suction nozzle flanges shall be of the same rating as the discharge nozzles flanges.

4.1.3 Couplings

Coupling shall be flexible, spacer type complete with easily removable guard.

4.1.4 Base plate

Base plates shall be provided with grouting holes.

4.1.5 Fire Pump Characteristics

Horizontal centrifugal Firewater pump shall be factory-assembled and tested with driver. Pump and driver shall be supplied mounted on the same base plate.

- Performance and characteristics of the fire pump and driver shall be in accordance with NFPA-20.
- The selected pumps shall be Capable of furnishing not less than 150% at rated capacity at not less than 65% of total rated head. The shutoff head shall not exceed 140 percent of rated head for any type pump.
- Impeller shall be of cast iron and shaft shall be Carbon Steel construction to match fire pump. The impeller shall be statically and dynamically balanced, and keyed to the shaft.
- Coupling shall be flexible and capable of absorbing torsional vibration and shaft miss-alignment. Include metal coupling guard.
- The rated point shall preferably be within 80-110% of the Best Efficiency Point (BEP) capacity of the furnished impeller.
- Driver shall be Diesel engine UL listed/FM Approved for fire pump. RPM of engine shall not exceed 1750 rpm.

- Manufacturer's standard red paint shall be applied to factory-assembled and tested units before shipping.
- Nameplates shall indicate the capacities, characteristics, and other pertinent data.

4.1.6 Construction

- The Contractor shall provide Material Tests Certificates, pressure certificates, testing documents, shipment documents, manufacturer certificates, etc. for all parts. The Contractor shall provide a signed certificate of conformity to verify that all components comply with the list of material specified on the approved manufacturing drawing.
- The NPSH available shall exceed the NPSH required by at least 1 meter at all points on the pump curve from minimum continuous flow to 150 % of the rated capacity.
- The pump unit design shall be hydraulically balanced at all speeds and pressures. The thrust bearings shall be adequately designed to withstand an imbalance conditions from either direction.
- Impellers for multistage shall be individually secured against axial movement in either direction along the shaft. Tapered collects or interferences fits alone are not acceptable. (pump shall be single stage)
- Renewable case wear rings shall be provided as a minimum.
- The pumps should be provided with soft packing. The pump design shall minimize pressure on the stuffing box. Adequate space around the packing gland shall be provided for packing maintenance with a minimum dismantling or removal of parts required other than the packing gland. When possible split type gland shall be provided.
- The Contractor shall supply at least two sets of packing for the service specified.
- Stuffing boxes of all packed pump shall be provided with a renewable throat bushing.
- Anti-friction bearing shall be furnished with mechanical brass cages. Pressed steel cages are only acceptable. Polyamides are not acceptable.
- Flange connections shall conform to ASME B16.5
- Threads for bolts, screws, and nuts shall conform to ASME B1.1
- Pump bowls shall be machined and shall have metal to metal rebated fits. Pump shafts shall be machined or ground and finished throughout their entire length. The total indicated run-out shall not exceed 4 micrometers per 100 mm of length. Total run-out shall not exceed 80 micrometers over shaft length.
- The pump shaft shall be in one piece.
- Pump shall be tested as complete assemblies. Test using only bowls and impellers are not allowed.
- The vibration measured during the performance test shall not exceed the values outlined in ASME / HI 1.1-1.5.

4.2 FIRE PUMP DRIVERS

4.2.1 Diesel Engine

Diesel engine driven pump shall be coupled with horizontal-shaft, open-type diesel engine. The engine shall fulfill the following minimum requirements:

i) Finish

Finish shall be of Manufacturers standard, post office red paint, applied to factory-assembled and tested firewater pump unit, before shipping.

ii) Nameplate

Nameplate shall at least mention engine horsepower, characteristics, and other pertinent data of the diesel engine.

iii) Engine starting

Engine starting shall also be wired to standby engine starting and operation, in case of main controller or wiring failure. Engine block (Oil sump) should have electric heater.

iv) Engine Cooling System

Engine cooling system shall consist of factory-installed Radiator / Heat Exchanger type cooling.

v) Exhaust Connector

Exhaust connector shall be flexible expansion bellows type.

vi) Exhaust Silencer

Exhaust silencer shall be semi-residential type and of stainless steel. The silencer shall be properly insulated to avoid the danger of human burning.

vii) Dual Batteries, Starters, Chargers

Lead-acid-storage type, with 100% standby reserve capacity dual batteries complete with dual starters and dual chargers.

viii) Fuel System

Fuel system shall be as per requirements of NFPA 20.

ix) Fuel Storage Tank

Fuel storage tank shall be doubled walled and its capacity and size shall be as per NFPA-20. It shall include floor legs and direct-reading level gage, breather valves etc.

x) Exhaust System

ASTM A53, Type E or S, Schedule 40, black steel pipe;

xi) Sound Level

Sound level shall not be exceeding than 85 dba @ 1 meter.

4.2.2 Electric motor

Electric motor driver shall comply with NFPA 20 and NFPA 70, and shall include wiring compatible with controller used.

4.2.3 Miscellaneous

- Caterpillar or equivalent Diesel Engine driver shall meet the requirement of NFPA-20. RPM shall not exceed 1750.
- Electric starting is required with means for recharging batteries in accordance with NFPA-20.
- After correction of altitude and ambient temperature, the engine shall have a bare engine brake horse power at least 20 % greater than maximum brake horse power required to drive the pump at rated speed. A minimum of five 5% more brake horse power that specified in NFPA-20 shall be provided for operations of accessories. Any excess over 5% of bare engine horse power required to drive accessories shall be added to the 20% requirements. Engine shall be with heat exchanger.
- Engine speed shall not increase more than 1750 rpm.
- A satisfactory engine jacket water temperature shall be maintained by closed loop Heat Exchanger cooling system, designed for operation at full load at the maximum ambient dry-bulb temperature for the respective location.
- The engine oil temperature shall not exceed by 121 ^{o}C.
- Engine lubrication shall be by a full flow pressure system with wet sump, strainer, pump, piping, oil cooler, and fill flow type oil filter. The pump shall be driven from the engine crankshaft.
- An engine governor shall be provided in accordance with NFPA-20 to prevent excessive speed should the pump lose suction.
- The engine driver shall be provided with dual battery system and battery chargers.
- The automatic starter, battery chargers, etc shall be installed in a weather tight box.
- Exhaust system design shall prevent condensate from flowing into the engine.
- All engine controls shall be provided with suitably or engraved stainless steel nameplate identifying each control. Engine shall be provided with local readout of cooling water temperature, oil pressure, fuel pressure, tachometer, and engine hour meter.
- The diesel engine shall be fully assembled and tested by the engine manufacturer prior to shipment.

5.0 ELECTRICAL / INSTRUMENTATION

5.1 Fire Pumps Controllers

Controller shall be as per requirements of NFPA 20. The supplier shall be responsible to follow hazardous area classification codes. NEC (National Electrical Code) / NFPA-70/20 and IEC (International Electro Technical Commission) code. Article 505 of 1996 NEC shall also be followed

Minimum requirements shall include the following:

- Enclosure shall be as per NEMA 2
- Enclosure Finish shall be of Manufacturer's standard, red paint, applied to factory-assembled and tested unit before shipping.
- Mounting shall be floor-stand type for field electrical connections,
- Built-in dual-battery charger with battery low voltage alarm contacts rated 24V DC.
- Stainless steel fitted pressure switch
- The Pump Controller meets the requirements of NFPA 20.

The controller will be microprocessor based. The controller shall be housed in a NEMA Type enclosure. All internal components shall be front mounted and wired for ease of inspection and maintenance. All relays shall be of the plug-in type, identical, and complete with visual indication to show that the relays are energized. The controller shall include an LCD display to indicate battery voltage and amperes as well as system pressure, in PSI or Bars (factoryset).

The controller is with twin battery chargers meeting NFPA 20 requirements. The battery chargers will have reverse polarity protection/ indication and be capable of recharging a completely discharged battery within 24 hours.

A solid state pressure transducer is installed with a bulkhead fitting in the enclosure bottom so that all plumbing connections are made external to the controller. The controller piping and pressure system shall be rated for operation in system pressures up to 600 PSI (42.25 kg/cm2) within +/- 1.5% accuracy.

The controller shall be equipped with a line printer-recorder, that will produce hard copy reports of system STATUS; including time, date, weekly test time, AC Power Failure status, print and stop mode status, sequential start time, RPT setting, system pressure set points, charger amperes and battery voltage plus pump running status reports and alarm data. The controller shall have the capability of storing 1024 events for furtherance to the line printer-recorder and shall have the capability of being downloaded to a PC for further manipulation of data.

The following parameters will be programmable and included as standard:

5.2 START AND STOP PSI POINTS

Stop mode: manual / auto

Run period timer: 0-60 min

AC power failure: enable / disable

Sequential start timer: 0-300 sec.

Weekly test timer

Print mode: manual / auto

Low suction shutdown

The following visual and audio alarms shall be provided:

Switch in auto	Fail to start
Low oil pressure	Engine run
Engine over speed	Low fuel
High engine temp	High fuel
Battery #1 failure	Chgr #1 failure
Battery #2 failure	Chgr #2 failures
High reservoir	Low reservoir

The above will be color coded to signify the urgency of the alarms:

- *GREEN: Normal Running Conditions*
- RED: Critical Alarms
- YELLOW: Supervisory Alarms.

6.0 WATER FLOW TEST DEVICE

A fire pump installation shall have the ability to test the fire pump. Metering device shall be flanged end as per ASME B 16.5 and listed. They shall be capable of water flow of not less than 175% of pump rated capacity.

Meter size shall be as specified in NFPA 20.

7.0 PIPES, PIPE FITTINGS AND VALVES

- The vender/supplier shall follow Table 5.25 of NFPA 20 for sizing purpose.
- Pipe material shall be ASTM A 53 Gr. B or equivalent and externally painted with red enamel paint followed by SA 2.5 as per Owner / Consultant instructions. Pipe shall be of Schedule 40 for pipe size from 2" and Schedule 80 for pipe size less than dia. 2".
- Pipes and fittings shall be beveled end as per ASME B 16.9 for pipe size 2" and higher.
- Pipes shall be plain end for pipe size smaller than Dia. 2" and fittings shall be socket welded as per ASME B 16.11. Socket weld fittings shall have 3000# rating.
- All valves shall be flanged end for size 2" and higher, and socket welded ends for size smaller than 2".

8.0 SHIPPING / PACKING

a) All openings such as nozzles, vents and field connections shall be properly sealed and protected during shipment.

b) All fragile items shall be removed and crated in rigid packing crates with sufficient padding to prevent damage during shipment and shall be properly tagged for ease of field installation

c) The Contractor shall provide corrosion inhibitor protection for all internal and external machine parts for sea shipment and six months' outdoor storage.

d) Name plates and rotation arrows on pumps and drivers shall be 18-8 stainless steel, Monel or brass, attached by pins of similar and located easy visibility.

e) The following data as minimum shall be clearly stamped on the nameplates:

- Owner item no.
- Manufacturer's Name
- Pump serial Number
- Date of Manufacturer
- Design Code
- Size and type
- Capacity (m3/hr)
- Head (m)
- Speed
- Bearing Manufacturer Identity Numbers
- Packing and Numbers

f) Same relevant details to be provided with drivers.

g) All material shipped separately shall be properly tagged or marked with item and serial no.

h) Unless otherwise specified, all external surfaces of ferrite material shall be finish painted after shop inspection. All exposed machines shall be thoroughly coated with a rust preventive.

i) All tapped opening shall be provided with substantial wooden closures.

j) All items shall be suitably packed, secured fastened, insured, during shipment. Transit insurance shall be the Contractor's responsibility.

9.0 INSPECTION AND TESTING

a) The Owner / Consultant reserves the right to inspect the equipment at any reasonable time in the Manufacturer's plant. Such inspection does not in any way relieve the Contractor of any responsibility for design, material or workmanship.

b) The Contractor shall be notified the Owner / Consultant at least 40 days' prior notice in advance of all factory tests to be performed on the equipment.

10.0 DOCUMENTATIONS

The bidder in their technical proposal shall include the following information for the fire water pump offered in their bids.

a) Manufacturer and country of origin

b) Head capacity curves.

c) General arrangement sketch showing the instrumentation

d) List of accessories

e) Materials of construction

Following document as minimum shall be furnished with the equipment supply and during its manufacturing as appropriate.

- Product Data

Include rated capacities; certified pump performance curves with each selection point indicated; shipping, installed, and operating weights; furnished specialties; and accessories for each fire-pump and Pressure-maintenance-pump unit

- Shop Drawing

Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, and location and size of each field connection for each fire-pump and Pressure-maintenance-pump unit.

The Contractor shall provide:

- Complete literature / documents.
- Data sheets, specifications.
- Drawings
- Selection curves
- Calibration documents
- Procurement documents
- List of spare parts
- Inspection / testing documents
- Maintenance schedules / procedures
- Shipment documents
- Manufacturer certificates
- Physical orientation of the equipment, piping, and auxiliary system.
- Details of each part with drawing and parts number.
- Balancing /alignment details

11.0 PROPOSALS

The proposals should include following minimum details:

- A general arrangement or outline drawing for each major skid or system, showing direction of rotation, size, rating and location of major connections, overall dimensions, maintenance clearances dimensions, overall weights, maximum maintenance weight, etc.
- Cross sectional drawings showing the details of proposed equipment.
- Schematics of all auxiliary system, including the lube oil, control and electrical systems, Bill of material, etc.
- Sketches that show methods of lifting and assembled machine or machines and major components.
- Literature of fully describe details of equipment offered.
- A schedule for shipment.
- A list of major wearing components, showing interchangeability with other units.
- A list of spare parts recommended for start –up and normal maintenance purposes.
- A list of special tools furnished for maintenance.
- The Contractor shall provide complete performance curves, including differential head, typical efficiency, water NPSHR, power expressed as functions of capacity. The curve shall be extended to at least 120 % of capacity at peak efficiency, and the rated operating point shall be indicated. The head curve for max. and min. impeller diameters shall also be included. The eye area of the first stage impeller and impeller identification number shall be shown on curve. Min flow (both thermal and stable), preferred and allowable operating regions, and any limitation of operation shall be indicated.

12.0 SPARE PARTS REQUIREMENTS

a) The Contractor shall be responsible to supply commissioning spares along with main equipment. However, Contractor shall supply price list of all parts required and recommended for two years of normal operation. This is to be included with initial proposal and shall include all necessary parts and special tools.

b) In order to minimize the spare parts inventory, the minimum number of manufacturer / vendor of a given type of equipment shall be used.

13.0 WARRANTIES

The Contractor shall guarantee that each item will meet the requirement of the specifications, and will be new and free of defects in design, material and workmanship. As to the items originally provided, the guarantee shall apply to discrepancies and defects that are discovered within the shorter of 12 months after being placed in the operation or 18 months after being received on the job site. If corrective work is performed on an item under this guarantee, the guarantee shall also be apply to the discrepancies and defects in the corrected item discovered within the shorter of 12 months after the corrected item is again placed in the operation or 18 months after the corrected work is completed. These guarantees terms shall be extended for any period that and time cannot be operated as a result of such discrepancies or defect in any item provided by the Contractor.

The guarantee shall apply whether or not design, data or information are provided, reviewed or approved by Owner / Consultant, but shall not apply failures caused by subjecting the item to conditions more severe that those described.

Whenever any discrepancy or defect discover, the Contractor shall promptly suggest the method for correcting the defect or discrepancy which meet requirement of standards and involves least operating / maintenance time. Owner / Consultant in its sole discretion, may select Contractor proposed method or any other method of correcting the discrepancy or defect. When required by Owner / Consultant the Contractor shall perform the corrective work required to satisfy guarantee terms on an overtime and /or shift work basis, shall procure required materials using the fastest means available in order to minimize Owner loss of operating time.