



ATTOCK PETROLEUM LIMITED

PORT QASIM BULK OIL TERMINAL PROJECT

**TENDER DOCUMENT
FOR
SUPPLY OF SKID MOUNTED
FOAM PROTECTION SYSTEM**

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS



MATERIAL REQUISITION



CLIENT : ATTOCK PETROLEUM LTD. JOB NO. : 2930
 PROJECT : PORT QASIM BULK OIL TERMINAL PROJECT

NUMBER 2930-MR-002	PAGE 1 OF 1	SUBJECT : FOAM PROTECTION SYSTEM	ISSUED FOR BIDDING BID REQUEST NO. PURCHASE ORDER NO. SUPPLIER
PREPARED BY : SMS		ATTACHMENT * : Specifications for Foam Protection System (SP-066)	
FACTORY INSPECTION <input type="radio"/> YES <input checked="" type="radio"/> NO			

REV	ITEM	MATERIAL DESCRIPTION	UNIT	QTY. A	UNIT PRICE B	TOTAL AMOUNT C=AXB
0	1.0	FOAM PROTECTION SYSTEM Design, Supply of all equipment & material, testing and painting of 01 no. Foam Protection Package as per Project Specification and Manufacturer Recommendations. It includes the following:				
0	1.1	Balanced Pressure Proportioning Skid The centralized Foam Proportioning Pump Skid includes 01 no. PD pump with motor, 01 no. Pump Controller, 01 no. Proportioner, 01 no. Pressure Safety Valve, 01 no. Pressure Regulating Valve, 01 no. Diaphragm Balancing Valves, pressure gauges, pipe, fittings, valves, etc., complete in all respect as per NFPA 11 requirements. The Skid shall be pre-wired, pre-tested, painted and ready for installation and commissioning. The only connection at site shall be inlet/outlet flanged connections and Power & Control cables to skid junction box.				
0	1.2	Foam Concentrate Tank: Capacity = 10,000 Liters Type of Foam Concentrate = AFFF Material of Construction = Vertical Molded high density cross-linked polyethylene	Job	1		
0	1.3	Foam Pourers Capacity = 1957 LPM @ 60 Psig Type of Foam Purer = Surface Injection for Fixed Roof Material of Construction = Body: Carbon Steel & Internals : S.Steel Quantity = 06 Nos. (03 nos. for each tank)	Job	1		
0	1.4	Foam Concentrate Supply of AFFF type Foam Concentrate in 200 Litres Containers/drums for Foam Concentrate Tank.	Ltr	10,000		
Total Amount						

1	05-08-19	Issued for bidding				
0	15-07-19	Issued for bidding				
REV.	DATE	DESCRIPTION	SIGNATURE			



ATTOCK PETROLEUM LIMITED

PORT QASIM BULK OIL TERMINAL PROJECT

SPECIFICATION

FOR

FOAM PROTECTION SYSTEM

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS





	PORT QASIM BULK OIL TERMINAL PROJECT	
Doc. No. : SP-066	Specification For Foam Protection System	Revision No. 1

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Attachments :

1. P&ID For Foam Protection System

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1.0 GENERAL

1.1 Scope:

This specification covers the minimum requirement for fixed low expansion foam injection system as per NFPA 11 to be installed at Port Qasim Bulk Oil Terminal for the protection of Fixed Roof, above ground, atmospheric, vertical Mogas and Gasoil Oil Storage Tanks. The Foam Unit shall consist of a Central Foam skid having foam tank with first fill of foam concentrate (to be supplied loose), skid mounted foam concentrate pump with interconnecting piping and valves, instrumentation including control valves, Balanced Pressure Proportioner and foam generator complete in all respect as per P&ID attached. Foam system shall be used for Surface application. Foam Pourers to be supplied loose are included in this scope.

This specification does not limit Vendor's standard designs or improvements, which may be used if approved by Purchaser, nor does it relieve the Vendor of the full responsibility as to design, material and workmanship. Vendor shall clearly state, by subject and section number, any exemptions taken to this specification.

Foam Proportioning pump package shall be skid mounted, pre-wired, pre-tested, painted and ready for installation and commissioning. The only connection at site shall be inlet/outlet flanged connections and Power & Control cables to skid junction box.


1.2 Definitions

Employer/Owner : [Attock Petroleum Limited.](#)

Consultant : [Petrochemical Engineering Consultants](#)

Contractor : The Company named as such in the deed.

Sub Contractor / : The Manufacturer / Supplier engaged by Contractor

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Vendor

Shall/ Must/ Is To Be: A Mandatory Requirement

Should : A non-mandatory requirement, advisory or Recommendation

1.3 Errors or Omissions

1.3.1 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.

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

1.4 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.

1.5 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.

1.6 Reporting Procedure

1.6.1 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.

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Contractor's manufacturer shall provide reports and summaries for production performance and testing operations in conformance with a manufacturing schedule approved by Owner.



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

1.6.3 **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.



1.7 **Unit Responsibility**

The Contractor shall assume full unit responsibility for the complete Foam Proportion and Injection package and all ancillaries. The Contractor shall handle and expedite drawings and data, and supervise and coordinate all inspection and testing specified. The package shall be delivered at site and Tie-in with piping system.

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2.0 CODES AND STANDARDS

Unless otherwise specified, minimum requirements are to be in accordance with latest editions of NFPA-11 : Standard for low expansion foam.

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3.0 DESIGN

- 3.1 The foam proportioning system shall be Balanced Pressure (Pump Type) Proportioning as per NFPA 11 and as per P&ID attached.
- 3.2 The foam solution shall be produced by introducing the foam concentrate into the water stream by the balance pressure proportioning method using a positive displacement foam pump, atmospheric concentrate tank and factory assembled and tested pressure (BP) proportioner and foam generator. Firewater inlet pressure at proportioner is 150 Psig maximum. Vendor is responsible to design the foam concentrate pump discharge pressure accordingly.
- 3.3 The vertical molded high density cross-linked polyethylene construction is recommended to use. This type offers excellent corrosion and impact resistance through its high density cross-linked polyethylene construction. Molded polyethylene material shall meet ASTM standards for impact test, density, tensile strength, elongation, high and low temperature and flexural modulus. Tank shall be suitable to use at maximum temperature of 60 deg. C
- i. Tank shall have suitable allowance for foam expansion and contraction.
 - ii. All interconnecting piping must be adequately supported. Tank cannot support the weight of any piping. Flexible Expansion joint must be used to allow for piping misalignment and tank wall flexing.
 - iii. A shut off valve is recommended between the tank and the flexible connections for isolating the tank for servicing.
 - iv. Tank shall have flat bottom and must be located on a suitably supported flat, level surface.
 - v. The following appurtenances shall be provided with the assembly.
 - Tank fill connection with cap.
 - Tank vent / drain valves of Brass construction.
 - Pressure Vacuum vent of Brass construction
 - Level Gauge


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- Return connection
- Suction connection with siphon
- Inspection Hatch

- 3.4 Foam concentrate pump shall be a positive displacement type constructed of material compatible with manufacturer's foam concentrate. Pump shall be furnished with a pressure safety relief valve sized appropriate to the rated pump capacity. Pump shall be mounted on a carbon steel base and shall be guards over all couplings. Concentrate pump shall be electric motor driven, open-drip proof enclosure, 400V/50Hz/3-Phase.
- 3.5 The pressure control (regulating) valve (returning excess foam concentrate back to the storage tank) shall be a pressure sustaining, back-pressure, hydraulically operated, pilot controlled, modulating type arranged to maintain constant upstream pressure in the foam concentrate piping as the flow rate varies. Valve shall be sized to pass the full foam concentrate pump output through it. Material of construction shall be compatible with the foam concentrate type.
- 3.6 The Balance Pressure (BP) Proportioning System shall be a self-contained unit fully assembled and tested at the factory and delivered complete and ready for use. The BP proportioner shall include a Proportioning Controller, integral pressure balancing valve, pressure relief valve, duplex gage, strainer, inlet pressure gage, check valve and manual ball valve with nameplate.
- 3.7 Top Foam Pourers for surface protection are provided on newly constructed Gasoil & Mogas fixed Roof storage tanks. Foam Pourers shall be supplied loose.
- 3.8 Skid piping shall include one flanged inlet connection and one flanged outlet connection similar to Schematic Diagram (attached). End flanges shall be in accordance with ASME B16.5.
- 3.9 All valves supplied shall have provisions for locking in the open and close position.
- 3.10 Operation of the foam proportioning system shall be fully manual.
- 3.11 Skid piping shall include suction side and discharge side drain connections piped to the edge of the skid for maintenance drain down purposes.

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- 3.12 Pipe, fittings, valves, etc., to be used in foam concentrate service shall be of brass or S. Steel whereas it shall be of Carbon Steel in water and foam solution service.
- 3.13 A fine mesh strainer of Brass or S. Steel body and S. Steel screen shall be provided at the inlet of foam concentrate pump.
- 3.14 Pressure gauges shall have 4-inch dial glycerin filled.
- 3.15 Foam Concentrate pump shall be Positive Displacement type.
- 3.16 Foam Concentrate tank shall be supplied loose by the Vendor.
- 3.17 The design and materials of construction for foam concentrate pumps shall be in accordance with NFPA 20.
- 3.18 Special attention shall be paid to the type of seal or packing used. Seals or packing used shall be compatible with the foam concentrate.
- 3.19 A foam concentrate pump shall have the capacity to meet the maximum system demand.
- 3.20 To ensure positive injection of concentrates, the discharge pressure ratings of pumps at the design discharge capacity shall be in excess of the maximum water pressure under any condition at the point of concentration injection.

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4.0 FOAM LIQUID

- 4.1 Foam liquid shall be a mechanical foam solution of the “low expansion” Low viscosity suitable for Mogas and Gasoil fire, containing a stabilizer for the Foam State, and sufficient preservative to prevent decomposition of the liquid in storage. This liquid shall show no sign of non-homogeneity or separation into layers on standing. AFFF type foam shall be used manufacturer to confirm.
- 4.2 Foam liquid shall be compatible with pipeline water (hard) as well as fresh water.
- 4.3 Foam liquid shall be readily miscible with either pipeline water or fresh water without formation of any precipitates.
- 4.4 When mixed with proper proportions of water and air, the foam liquid shall produce stable cohesive foam of satisfactory degree of fluidity for the extinguishment of oil and product fires.
- 4.5 The foam produced shall consist of a mass of small bubbles not easily broken down by intense heat, which will adhere to solid surfaces and float on oil and product surfaces, and will not seriously injure persons or equipment.

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5.0 FABRICATED STEEL SKID

- 5.1 Foam Proportioning package including foam concentrate pump, control valves, pipe fittings, valves, etc., shall be mounted on a rigid structural steel (skid type), coated suitable material for marine environment, base suitable for mounting on a level surface. Foam concentrate, water and electrical connections shall be the only connections for field installation required.
- 5.2 The fabricated steel base shall be supplied with suitable grout holes, if necessary, and shall be of sufficient strength to support all equipment with four points lifting during shipment and transportation to installation site.
- 5.3 Heavy duty lifting lugs and jacking screws shall be provided on the skid.
- 5.4 Skid shall be supplied with a removable weather resistant enclosure constructed of 14 gauge or heavier sheet steel. Supplied enclosure shall be sand blasted and have surface preparation suitable for protection against a corrosive marine environment.
- 5.5 The skid and appropriate parts of the skid shall be painted in accordance with Marine Environment and to be approved by Owner.
- 5.6 The skid and appropriate parts of the skid shall be painted in accordance with Marine Environment and to be approved by Owner.
- 5.7 Foam Concentrate tank equip with all accessories shall be supplied loose. Vendor to provide tank installation drawing complete with anchor size and location, weight of tank, etc. for foundation design.

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6.0 INSPECTION & TESTING

- 6.1 Owner shall have the right to inspect the foam protection system and all components at all reasonable times on the Vendor's premises during normal working hours.
- 6.2 Owner shall have the right to inspect preparation of all assemblies for shipment.
- 6.3 Foam proportioning system including the tank shall be given a shop hydrostatic test with water. Hydrostatic test shall be performed after final assembly of the complete packaged system.
- 6.4 Foam proportioning system including the tank shall be given a shop performance test to ensure proper proportioning of foam concentrate and equipment operation.
- 6.5 Vendor shall furnish certified copies of all tests and inspections.

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7.0 SHIPMENT

- 7.1 The complete unit shall be adequately protected for overseas/inland shipment, including the weatherproofing of all instruments. Special attention shall be given to the packing of fragile equipment.
- 7.2 All exteriors machined surfaces and flange faces shall be given a coat of heavy grease or any other commercial rust preventive, which is easily removable by wiping with commercial solvent and rags.
- 7.3 Flange faces shall be protected by heavy wooden or plastic covers securely fastened in place. All openings to internals shall be plugged and temporary plus shall be clearly identified.



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8.0 DESIGN INTERPRETATION FOAM PROPORTIONING UNIT

The foam proportioning unit, will be installed at Port Qasim Bulk Oil Terminal, consists of a foam concentrate storage tank, pump, proportioner, foam pourers and interconnecting piping (schematic drawing shown in **ANNEXURE-I**). The complete skid mounted assembly shall be used in conjunction with firewater pump to provide fire protection to Storage Tank.

In event of fire detection in tank farm area, the operator would manually open the main water valve on the inlet side of the foam proportioning skid, outlet valve and switch-on the foam concentrate pump. The proportioning controller would automatically include the foam concentrate solution into the fire water stream at the appropriate rate for proper concentration of foam concentrate and water. The final solution will be applied to the affected area through surface (top) injection system installed on storage tank.

When the fire is eliminated, the operator shall simply reverse the procedure. After equipment is fully shut down, the foam header line from the proportioner to injection nozzle shall be fully drained, flushed clear of foam solution and then re-pressurised with water.

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9.0 DESIGN DATA:

The unit shall be capable of operating at the following design conditions.

9.1 Foam Concentrate Tank:

Capacity	= 10,000 Liters
Type of Foam Concentrate	= AFFF
Construction	= Vertical Molded high density cross-linked polyethylene
Quantity	= 01 No. (First fill of Foam included)

9.2 Flow Proportioners:

9.2.1 Flow Proportioner:

Foam Solution Rate	=	5870 LPM
Inlet Pressure	=	10.3 Psig
Foam Conc. Induction Rate	=	3%
Quantity	=	01 No.

Flow Inductor should have upstream and downstream Pressure Indicators

9.3 Skid Piping:

Skid piping, valves, fittings, etc. complete in all respect including supply of all material, fabrication, assembling, painting, testing and ready for commissioning.

- Piping material shall be of Brass Sch. 40.
- Tie-in connection at site shall be of flanged ends per ASME B 16.5.
- Epoxy-coated-Red finishes
- Valves Types ; Full Port Ball Valves with lockable handles
- Valves Actuation is manual
- Pressure Sustaining Valve cast iron body with brass trim. Brass pressure control valve shall be provided with bleed line

9.4 Foam Concentrate Pump:

Capacity	= Minimum 176 LPM
Discharge Pressure	= 200 Psig
Material	= Ductile Iron Vane with Internal Relief Valve and Carbon Steel shaft

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Pump Driver = Electric Motor
 Electric Motor Voltage = 3/50/400
 Electric Motor Enclosure = TEFC
 Pump Controller type = NFPA 20, Full Voltage
 Pump Controller Enclosure = Nema 2



Type of Foam Concentrate = AFFF
 Quantity = 01 No.

9.5 Foam Pourers:

9.5.1 Tank No. = **T-0301**
 Tank Size = Ø 42.672 m x Ht. 19.0 m
 Product = Mogas
 Protection = Surface
 Design Code = NFPA 11
 Nos. of Foam Pourer required = 3 Nos.
 Foam solution flow rate per pourer = 1957 LPM
 Operating Pressure = 60 Psig (4.0 barg)
 Foam Induction Rate = 3%
 Foam Expansion Ratio = 4:1
 Type of Foam = AFFF
 Chamber/Foam Maker Body = Carbon Steel
 Orifice plate and Internals = Stainless Steel
 Air inlet Screen = Stainless Steel
 Strainer = Stainless Steel
 Frangible Disc = Glass
 Inlet / outlet connection = Ø 4" / Ø 8" (Vendor to Confirm)

Foam Pourers shall be supplied with Foam Seal, frangible under low pressure, Foam Chamber and Foam Deflector plate.

The Strainer and other parts shall be removable for inspection and cleaning.

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9.5.2 Tank No.	=	T-0303
Tank Size	=	Ø 42.672 m x Ht. 19.0 m
Product	=	Mogas
Protection	=	Surface
Design Code	=	NFPA 11
Nos. of Foam Pourer required	=	3 Nos.
Foam solution flow rate per pourer	=	1957 LPM
Operating Pressure	=	60 Psig (4.0 barg)
Foam Induction Rate	=	3%
Foam Expansion Ratio	=	4:1
Type of Foam	=	AFFF
Chamber/Foam Maker Body	=	Carbon Steel
Orifice plate and Internals	=	Stainless Steel
Air inlet Screen	=	Stainless Steel
Strainer	=	Stainless Steel
Frangible Disc	=	Glass
Inlet / outlet connection	=	Ø 4" / Ø 8" (Vendor to Confirm)

Foam Pourers shall be supplied with Foam Seal, frangible under low pressure, Foam Chamber and Foam Deflector plate.

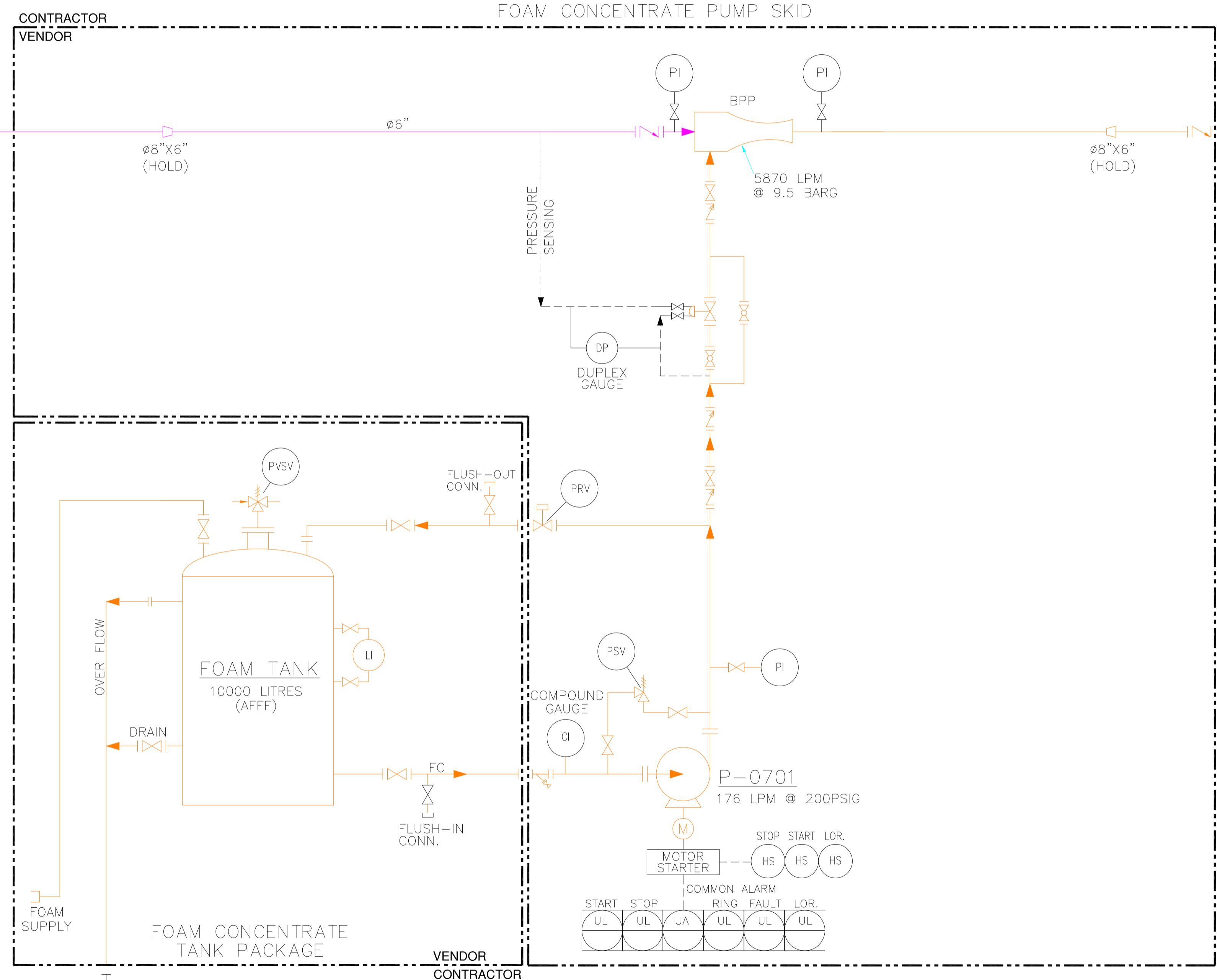
The Strainer and other parts shall be removable for inspection and cleaning.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

A B C D E F G H I J K

FROM FIRE PUMPS ø12" FIREWATER NETWORK

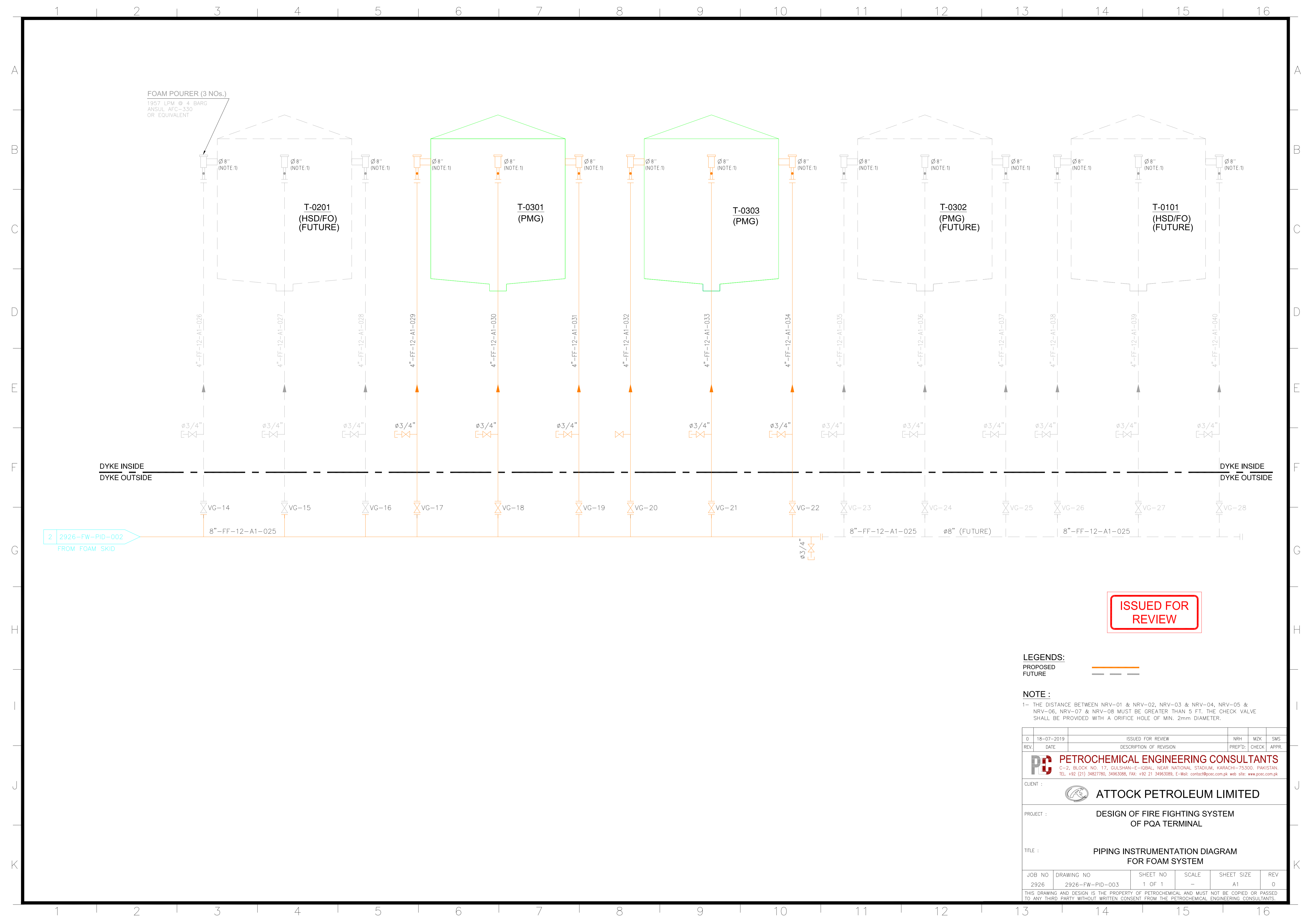
8"-FW-12-A1-022



ISSUED FOR REVIEW

0	18-07-2019	ISSUED FOR REVIEW	NRH	MZK	SMS
REV.	DATE	DESCRIPTION OF REVISION	PREP'D	CHECK	APPR.
PETROCHEMICAL ENGINEERING CONSULTANTS <small>C-2, BLOCK NO. 17, GULSHAN-E-IOQBAL, NEAR NATIONAL STADIUM, KARACHI-75300, PAKISTAN. TEL: +92 (21) 34827780, 34963088, FAX: +92 21 34963089, E-Mail: contact@pcec.com.pk web site: www.pcec.com.pk</small>					
CLIENT : ATTOCK PETROLEUM LIMITED					
PROJECT : DESIGN OF FIRE FIGHTING SYSTEM OF PQA TERMINAL					
TITLE : PIPING INSTRUMENTATION DIAGRAM FOR FOAM SYSTEM					
JOB NO	DRAWING NO	SHEET NO	SCALE	SHEET SIZE	REV
2926	2926-FW-PID-002	1 OF 1	-	A1	0
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16



FOAM POURER (3 NOs.)
1957 LPM @ 4 BARG
ANSUL AFC-330
OR EQUIVALENT

T-0201
(HSD/FO)
(FUTURE)

T-0301
(PMG)

T-0303
(PMG)

T-0302
(PMG)
(FUTURE)

T-0101
(HSD/FO)
(FUTURE)

DYKE INSIDE
DYKE OUTSIDE

DYKE INSIDE
DYKE OUTSIDE

2 2926-FW-PID-002
FROM FOAM SKID

ISSUED FOR REVIEW

LEGENDS:
PROPOSED
FUTURE

NOTE :

1- THE DISTANCE BETWEEN NRV-01 & NRV-02, NRV-03 & NRV-04, NRV-05 & NRV-06, NRV-07 & NRV-08 MUST BE GREATER THAN 5 FT. THE CHECK VALVE SHALL BE PROVIDED WITH A ORIFICE HOLE OF MIN. 2mm DIAMETER.

REV.	DATE	DESCRIPTION OF REVISION	PREP'D	CHECK	APPR.
0	18-07-2019	ISSUED FOR REVIEW	NRH	MZK	SMS

PG PETROCHEMICAL ENGINEERING CONSULTANTS
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CLIENT : **ATTOCK PETROLEUM LIMITED**

PROJECT : **DESIGN OF FIRE FIGHTING SYSTEM OF PQA TERMINAL**

TITLE : **PIPING INSTRUMENTATION DIAGRAM FOR FOAM SYSTEM**

JOB NO	DRAWING NO	SHEET NO	SCALE	SHEET SIZE	REV
2926	2926-FW-PID-003	1 OF 1	-	A1	0

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