



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

TECHNCIAL SPECIFICATION FOR INSTRUMENT ITEMS



1. List of Applicable Standards

Design and terminology shall comply, as a minimum, with the latest edition prior to the date of purchaser's enquiry with following codes, standard practices and publications:-

ANSI/ASME: American National Standards Institute/American Society of Mechanical Engineers.

B 1.20.1: Pipe Threads General Purpose (Inch)

B 16.5: Pipe Flanges and Flanged Fittings

B 16.20: Metallic Gaskets for pipe Flanges, Ring Joint, Spiral wound and Jacketed.

ANSI/FCI: American National Standards Institute/Fluid Control Institute
70.2: Control valve seat leakage classification

API: American Petroleum Institute

API 520: Sizing, selection and installation of pressure relieving devices in refineries.

Part-I - Sizing and selection

Part-II - Installation

API 521: Guide for pressure relieving and depressurising systems.

API 526: Flanged steel Pressure Relief Valves.

API 527: Seat tightness of Pressure Relief Valves.

API MPMS: Manual of Petroleum measurement standards.

API RP 551: Process Measurement Instrumentation

Part I - Process Control and Instrumentation

API 522: Transmission Systems.

S 2000: Venting Atmospheric and low-pressure storage tank nonrefrigerated and refrigerated.

S 670: Vibration, Axial-Position and Bearing-Temperature Monitoring Systems

ASME: American Society of Mechanical Engineers

ASME: Sec-VIII Boiler and Pressure Vessels Code rules for construction of pressure vessels

ASME: Sec-I Boiler and Pressure Vessels Code. Section-I 'Power Boilers'

ASTM: American Society for Testing and Materials.

BIS: Bureau of Indian Standards

BS: British Standards



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

BS-5308 Part-II: Specification for PVC insulated cables.
BS-7244: Flame Arrestors.

DIN: German Standards
DIN-43760 Temperature Vs Resistance curves for RTDs.

DIN-19234 Electrical Distance Sensors; DC interface for Distance Sensor and Signal Converter.

EN-10204: Inspection Documents for Metallic Products

IBR: Indian Boiler Regulations

IEC: International Electro technical Commission

IEC 60079: Electrical Apparatus for Explosive Gas atmosphere
IEC 60085: Thermal Evaluation and Classification of Electrical Insulation.
IEC 60332: Test on bunched wires or cables.
Part III Cat. A
IEC 60529: Degree of protection provided by enclosures.(IP code)
IEC 60534-2: Industrial Process Control Valves-Flow capacity.
IEC 60584-2: Thermocouple Tolerances
IEC 60751: Industrial Platinum Resistance Thermometer Sensors
IEC 61000-4: Electromagnetic compatibility for Industrial Process measurement and control equipment.
IEC 61158: Foundation Fieldbus Specifications

IS: Indian Standard

IS-5: Colours for ready mixed paints and enamels
IS-319: Specification for free cutting Brass bars, rods and sections
IS-1239: Mild steel tubes, tubulars and other wrought steel fittings.
IS-1271: Specification of Thermal Evaluation and Classification of Electrical Insulation
IS-1554: PVC insulated (heavy duty) electric cables working
Part I -voltage up to and including 1100V
IS-2074: Ready mixed paints, air drying, Red oxide - zinc chrome
IS-13947: Degree of Protection provided by Enclosures for Low Voltage Switchgears and Control gears. Part 1 General Rules.
IS-2148: Flame proof enclosures for electrical apparatus for Explosive Gas Atmospheres – Flameproof Enclosures ‘d’
IS-3624: Specification for pressure and vacuum gauges
IS-5831: PVC insulation and sheath of electric cables.
IS-7358: Specifications for Thermocouples
IS-8784: Thermocouple compensating cables.



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

ISA:	International Society of Automation
S-5.2:	Binary logic diagrams for process operations.
S-7.3:	Quality standard for instrument air
S-75.01:	Flow equations for sizing control valves.
ISO 5167:	Measurement of fluid flow by means of orifice plates, nozzles and venture tubes inserted in circular cross-section conduits.
NACE:	National Association of Corrosion Engineers
NEC:	National Electric code
NEMA:	National Electrical Manufacturer's Association
ICS-6:	Enclosures for Industrial control and systems.
NFPA:	National Fire Protection Association
NFPA-496:	Purged and pressurized enclosures for electrical equipment.
OSHA:	Occupational Safety and Health Authority.
SAMA:	Scientific Apparatus Maker's Association

2.Design Philosophy/Criteria – General

- 2.1 All instruments and equipments shall be suitable to be used for specified site climatic conditions and industrial environment in which corrosive gases and/or chemicals may be present. As a minimum, all instruments and enclosures in field shall be dust proof and weatherproof to IP-65 as per IEC-60529/ IS-13947 and secure against the ingress of fumes, dampness, insects and vermin. All external surfaces shall be suitably treated to provide protection against corrosive plant atmosphere.
- 2.2 The design of electronic instruments shall be in compliance with the electromagnetic compatibility requirements as per IEC 61000-4 'Electromagnetic compatibility for Industrial Process measurement and Control equipment'.
- 2.3 Material of construction and end connection rating shall be as per piping material specification as a minimum.
- 2.4 Smart transmitters wherever used shall be with an accuracy of $\pm 0.075\%$ of span with a rangeability of 100:1 unless specified otherwise. Hand held communicator shall be supplied for smart transmitters and fieldbus transmitters. All transmitters shall have minimum static pressure rating of 100 kg/sq.cm.g.



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

2.5 Threaded end connections shall be to NPT as per ANSI B 1.20.1. Flanged end connections shall be as per ANSI B 16.5.

2.6 All instrument installation shall be remote type except where close coupled is specifically required for a particular service.

2.7 All cable entries to junction boxes shall be from bottom.

2.8 All terminals shall be screwed clamp type of Phoenix, Wago or Weidmuller make.

2.9 Solenoid valves used shall be as per area classification. Solenoid coil shall be rated for continuous operation of the upper limit of supply voltage (i.e. rating shall be 220 V DC continuous). Class H rating for solenoid valves preferable.

3.Design Criteria/Requirements - Specific Applications

3.1 Temperature Instruments

4.1.1 Thermowells

a) Thermowells shall be minimum of SS316 or better material to suit the service conditions. Flange materials shall be as per piping specification. Flange rating shall be minimum 300#.

b) These shall be fabricated from bar-stock.

c) Immersion length of thermowells for different line sizes shall be as follows:-

Line Size	Immersion length (U)
4" to 6"	280 mm
8" and above	320 mm
Vessels	400 mm

Immersion length is based on 200 mm length between flange face and inner wall of pipe or vessel. In vessels where fouling with vessel internals is expected or where the length between flange face and inner wall of vessel is more than 200 mm, the immersion length shall be suitably modified ensuring that minimum 150mm thermowell projection length is available inside the vessel from the vessel inner wall.

d) Built-up thermowells may be considered in low pressure and low velocity services like fired heaters and also where longer thermowell immersion length is required (for greater than or equal to 500 mm).

3.1.2 Thermocouples



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

a) Thermoelectric properties and tolerances shall be as per IEC 60584-2. The elements shall be 18 AWG for simplex thermocouples.

3.1.3 Temperature transmitters shall be provided for all temperature elements in both closed as well as open loops unless otherwise specified. Temperature elements shall be RTD type. Thermocouples may be used where RTDs are not suitable for a process application.

3.1.4 Temperature Gauges

All temperature gauges are to be bimetallic type in general. Case material shall be SS304. Filled type temperatures gauges are envisaged where thermowell length more than 600 mm is required, services with high vibration, gauges located in inaccessible locations and for underground locations. Filled system if used shall be gas filled type.

3.2 Pressure Instruments

3.2.1 Case material for pressure gauges shall be SS304. All pressure gauges with ranges 0 to 100 kg/cm²g and above shall have safety type, solid front case. Dial size for gauges shall be 150 mm.

3.2.2 All transmitters shall have an integral display. Remote mounted meters may be provided for specific applications.

3.2.3 Diaphragm seal element (Teflon coated) with capillary shall be used for congealing, corrosive and highly viscous services.

3.2.4 Dial markings and colours shall be as per the following:

0 to 30%	:	Yellow
31 to 70%	:	Green
71 to 100%	:	Red

3.3 Level Instruments

3.3.1 Magnetic Gauge glasses for level gauging at field shall be used. Multiple level gauges shall be used for visible lengths more than 1470 mm.

3.3.2 Guided wave radar level transmitter shall be used for level monitoring in DCS for each tank.

3.3.3 Level standpipe philosophy



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

a) The usage of standpipe shall be considered for clean, non-viscous and non-crystallizing services. The size of standpipe shall be 2" NB minimum. Separate isolation valves to be considered for standpipe unless otherwise specified.

b) Standpipe shall be used if there are more than 4 nozzles required for level instruments.

3.4 Flow Instruments

3.4.1 Primary Devices

The primary element shall generally be thin plate, square-edge concentric orifices plate mounted between a pair of weld-neck type orifice flanges with flange taps. The minimum pressure rating of flanges shall be 300 lb ANSI.

Eccentric and Segmental type of orifice plates shall be used for specific applications. Quadrant edge or conical entrance orifice plates shall be used for services with low Reynolds number.

3.5 Control Valves

3.5.1 General

a) Control valves shall normally be globe type.

b) All on-off type valves shall be ball type valves.

3.5.2 Trim Designs

Material used for Trim shall be minimum 316L SS withstalliting. Special cases may require other materials like Hastelloy, Monel etc.

3.5.3 Actuators

a) Diaphragm actuators shall generally be used with 0.2 - 1.0 kg/cm² g spring range. For larger DP shut offs, higher spring range/higher areas shall be considered.

b) Piston actuators can be considered for severe pressure drop services.

3.5.4 Limit switches

All limit switches shall be proximity type only as per NAMUR (DIN 19234).

3.5.6 Smart positioner shall be required.

3.5.7 SS tube of 6 mm shall be required for tubing purpose.



3.5.8 For on-off valve 220VDC SOV rating shall be required.

3.6 Electrical Field Wiring

3.6.1 Instrument electronic signal, control cables, single pair as well as multipair shall be 1.5 mm² twisted in pair shall be individually and overall shielded (in case of multipair) with aluminium Mylar tape with drain wire and armoured.

3.6.2 Multicore extension cables for Thermocouples, wherever applicable, shall be 20 AWG single conductor twisted pairs, armoured, individual pair and overall aluminium mylar shielded with over all drain wire. Single pair extension cables shall be armoured cable with 16 AWG single conductor wire.

3.6.3 Power supply cables to field instruments shall be minimum 2.5 mm² armoured.

3.6.4 All cable glands shall be of nickel-plated brass and they shall be of double compression type suitable for armoured cables.

3.6.5 Generally PVC insulated cables shall be used. Insulation type shall be verified by respective vendor during detailed engineering and selected as required.

3.6.6 For longer distances conductor sizes shall be selected based on voltage drop.

3.7 Cable Trays And Cable Ducts

3.7.1 All cables on the main pipe rack shall be laid in Aluminium cable duct / tray with cover.

3.7.2 All branch cables shall run on cable trays. The Ladder trays and Angle trays shall be of Aluminium type.

3.7.3 Cable tray laying to take care of the necessary clearances for fire proofing of structures.

3.8 Speed probes

All speed probes shall be 4-20mA type. The same shall be configured to DCS.

4. Bidder's Scope of Supply/Works

4.1 General

Vendor shall be responsible for implementation of complete instrumentation and controls on turnkey basis with scope of work as listed below, but not limited to the following:



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

- Design and Engineering.
 - Procurement, Supply, Fabrication, Factory testing and Acceptance, Transportation, Storage and Construction.
 - Installation, field calibration/testing, commissioning and site acceptance.
- Supply of all the instruments for local indication & Instruments required for interlock & controls. Vendor shall provide Junction boxes , all types of cables for wired instruments upto DCS & PLC located at 400 Metres from the Steam turbine

The descriptions and requirements contained in this specification are concise by necessity and cannot include all details. However, it is the responsibility of the vendor to execute the job on a turnkey basis in accordance with the specifications and internationally recognized good engineering practices for smooth and successful operation.

4.2 Scope of supply

Supply of all items related to instrumentation and control system is in the scope of Vendor. The scope of supply shall include but will not be limited to the following:

4.2.1 Hydraulic governors shall be used for steam turbine MOP. Vendor to supply suitable Hydraulic governors.

4.2.2 All types of field instrumentation including Transmitters, Pressure and Temperature Gauges, Guided wave Level transmitters, Level Gauges, Self actuated Pressure control valves, Thermowells, Thermocouples, Orifice assemblies, Solenoid Valves, all types of Control Valves & shutdown valves with accessories, speed probe, vibration probe, Cables, JBs, Gland, Cable trays and any other special instruments required as per finally approved P&IDs and other documents generated by vendor as required to complete the job in all respect.

4.2.3 All installation and erection materials such as impulse piping, pipe fittings, valves and valve manifolds, tubing, tube fittings, cable tray, duct, RCC trenches and tray, duct/tray supports, all types of consumables and accessories for mounting all instruments, instrument air supply distribution, steam tracing etc. and instrument supports, prefabricated canopies/ sunshields for all field mounted instruments and panels/cabinets as required to complete the job in totality.

4.2.4 All type of indoor & outdoor cables such as signal, control, thermocouple extension, RTD, Power cable, including special cables (like System cables, Serial cables etc.), fibre optic cables etc. including all required accessories between:

- i) Individual Instruments to field Junction Boxes.
- ii) Equipment/ instrument to local panel.
- iii) Local panel to junction box
- iv) Field junction boxes to Central control room.



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

- v) Power distribution boards in Central control room to field instruments/local panels
- vi) All earthing cables and strips (Cu) for items including junction boxes, thermocouple head, field instruments etc.
- ix) All types of cables between Vendor supplied equipments inside the Central control room including those between cabinets shall be in the Vendor's scope.

4.2.5 Junction boxes and cable glands for different types of signals such as intrinsically safe and non-intrinsically safe 4-20 mA, thermocouple, RTD, shutdown (for solenoid valves), switch contacts alarm, power etc shall be in Vendor's scope.

4.2.6 Local control panel/local gauge boards and accessories.

4.2.7 Copper earthing strip & earthing cables for earthing of all instrumentation items including junction boxes, thermocouple head, field instruments etc., to existing earthing strip shall be in vendor's scope.

4.2.8 Any other erection material necessary for installation and commissioning of other special instrument systems or equipment, if any shall be in vendor's scope.

4.2.9 Supply of commissioning spares for all instrumentation.

4.2.10 Supply of drawings and documents as listed elsewhere.

4.2.11 Additional speed probes for local & control room indication along with cables ,Jbs etc.

4.2.12 Insulation & painting requirements for instruments, impulse lines and sample lines.

4.2.13 Vendor shall supply 3 nos of spare speed probes for future use.

4.2.14 For all trip interlocks 3 separate instruments shall be used in field. Vendor shall supply all such instruments along with cable, JB etc upto control room.

4.2.15 Any special tools or tackles required for instrumentation items.

4.2.16 Only DCS/PLC hardware is in owners scope of supply. DCS engineering shll be done by owners engineers

4.3 Installation, Field testing/calibration& Commissioning

4.3.1 Installation

Vendor shall carry out installation of all instruments as per document Job Standard specification for instrumentation work, and other standard specifications included in the Bid Package.

4.3.1.1 This activity shall include but will not be limited to installation of all field mounted instruments/ items, including sub-package items, installation of local panels, junction boxes, gauge boards, interconnection between instrument & junction boxes, fabrication, laying of



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

cables trays & ducts, fabrication & laying of cable trenches, laying of all types of cables single pair & multi-pair from field to Control rooms / local panels / inside the control rooms system cable termination within Central Control room, tagging, ferruling, glanding & Pair/core identification of all the field cables. Painting of cable trays & ducts shall only be provided wherever it is unavoidable due to any welding carried out at site.

4.3.1.2 Insulation of instruments, impulse lines, sample lines if required.

4.3.2 Testing and Calibration

Testing of all items & systems at site including impulse lines, instrument air lines, pneumatic signal tubes and instrument cables including special instruments/items if any, and calibration of all instruments shall be carried out as per the requirements in various specifications in the Bid Document & vendor recommendation.

4.3.3 Commissioning

The co-ordination and assistance for start-up, commissioning and stabilization of plant, with IOCL and vendors of various items shall be the total responsibility of Vendor.

In case of special instrument items, the installation shall be done under the supervision of that system/ instrument vendor's personnel. It is the responsibility of vendor to co-ordinate and to make available the specialist's services from vendors at the time of installation, testing and commissioning. Vendor's scope of work shall include loop checking & pre-commissioning of completely integrated instrumentation & control system including sub-package system items supplied by vendor in line with requirement specified elsewhere in this package.

Vendor shall make all modifications and/or changes, found necessary, during loop testing/pre-commissioning/commissioning. All such changes shall be certified by the IOCL representative as per the procedure set up at site by Engineer-in-charge. All change found necessary in the /interlock logics & Pre-commissioning/loop testing/Commissioning shall be certified by vendor package sub-supplier, machinery supplier, IOCL operator-in-charge. Any change in logic shall be carried out by existing DCS/PLC vendors. Vendor shall contact and line up existing DCS/PLC vendor for the same.

4.3.4 System Acceptance at site

In case of system oriented items, vendor shall be fully responsible to demonstrate to IOCL all functional requirements specified in this document including their performance in the actual plant environment. This activity shall be coordinated by vendor with other vendors, as necessary.

4.3.5 Guarantee



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

5.4.6.1 The Vendor shall guarantee that all equipment and components supplied by him shall be new and of first quality and performance shall be as per specification, approved drawings and documents and shall possess all the features as claimed in their manuals.

5.4.6.2 Vendor should also post one Service Engineer at site till the satisfactory performance of the system is established by trial runs & handing over system to Owner.

5.4.6.3 Performance guarantee will be inline with the one submitted for entire system

5.4.6.4 In case the vendor is not the original equipment manufacturer for the supplied system, then the Warranty and Guarantee provided by the vendor has to be supported with a back-up Warranty and Guarantee certificate from the Original Equipment manufacturers agreeing to all the clauses under the Warranty and Guarantee as given above. Hard copy certificates against the same has to be produced by the vendor.

5. Jobs Specifications

5.1 General

The Vendor's scope includes Design, Engineering (including residual engineering), procurement, supply, shop and field-testing, installation/erection, commissioning, supply of spares, documentation, etc. on a turnkey basis for its successful commissioning and operation for the entire unit with all associated works, complete field instruments including all packages, control and interlock system.

5.2 Design Requirements

This design requirement is in addition to Instrumentation Engineering Design attached. Wherever there is a contradiction, these design requirements including various Specifications/ Standards referred shall take precedence.

5.2.1 Area Classification

All field Instrumentation including junction boxes and cable glands shall be weatherproof and suitable for safe area. However, all analog inputs / outputs to the existing DCS shall be provided with external isolators by the Vendor. Also, all Digital inputs/ outputs including those to Substation/Switchgear/MCC shall be provided with relay isolation by Vendor.

Vendor shall select the isolators based on the following requirements (for all the control systems to be supplied by vendor)

- i) The isolators shall be of latest/ enhanced available versions of makes selected.
- ii) The model no. selected should be well proven as per the criteria specified.



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

- iii) The isolators selected should have back-up support and representative available locally.
- iv) The isolators shall be of MTL/ P&F. Approval of actual model number shall be obtained from Owner representative before proceeding.

5.2.2 Instrumentation Design Philosophy

The type of instruments shall be as per the requirements of process schemes and P&IDs. Engineering Design Basis, design selection criteria for instruments and the process requirements and various specifications, standards enclosed with this bid specification shall also be followed by vendor.

5.2.3 Multi Cables

All multicore cables between field / control rooms shall be as per requirements. All the cabling (branch & multicore) is in vendor's scope.

5.2.4 Junction Box:

Separate junction boxes shall be used for the following:

- a) 4-20 mA DC signals
- b) Thermocouples, wherever used
- c) RTDs, wherever used
- d) Contact signals (push buttons etc.)
- e) Interlock and shutdown signals (Solenoid valves)
- f) Power supply to various instruments

5.2.5 Installation Standards:

- i) All process hook-ups for instruments shall be in line with the typical installation standards attached along with this package. For the instruments, where installation standards are not available in this package, Vendor shall develop the same in-line with typical installation standards attached along with this package. The instrument purging and flushing shall be carried out by Vendor as per requirement of P&IDs or as required due to process condition.
- ii) After installation of instrument seal welding shall be provided as per instructions of Owner at site in addition to the requirement of piping material specification. Based on installation standards for each type of instruments, Vendor shall prepare Bill of Material (BOM), which shall indicate the requirement of various installation materials required for installation of each instrument. For impulse piping of pressure gauges full threaded coupling instead of union is to be used.
- iii) All transmitters, instruments and instrument connections should generally be accessible from the ground or permanent platforms. Vendor to note that all isolation valves and vent/ drain valves shall be gate valves even though globe valves are indicated in typical standards attached.



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

- iv) Vendor to consider 1/4" OD SS tubes and fittings such as male connectors etc.

6 TECHNICAL SPECIFICATIONS

6.1 Instruments

Vendor to note that Engineering Design Basis shall be followed primarily for the specifications for instruments, however the following points also have to be read in conjunction while procuring the instruments:-

6.2 Control Valves

In case multiple valves are required to be installed because of controllability or rangeability requirement, the same shall be provided by vendor irrespective of representation shown in the P&ID.

6.3 Smart Positioner

For control valves, Smart positioners with HART protocol shall be used. The smart positioners shall be provided with necessary hardware/ software for maintenance, advanced diagnostics, programming etc. While selecting the make and model no. of the positioner, Vendor must ensure the provenness of positioner and control valves meeting PTR requirements as specified in this package.

Vendor shall provide smart positioners from any one of the following makes only:-
Fisher, Metso, Dresser.

6.4 For DP transmitter, integral valve manifold shall not be co-planer type. Conventional type valve manifold shall be provided.

6.5 Local Indicators

Turbine speed shall be made available at control room. However local indicators shall also be provided to display speed in field.

6.6 Auto logic

Instrumentation system for any Auto start of motor shall be 1002. There shall be 2 nos. of instruments for auto start logic. Logic shall be configured in PLC for 1002.

6.7 Trip logic

Instrumentation system for any trip shall be 2003. There shall be 3 nos. of instruments for trip logic. Logic shall be configured in PLC for 2003.

6.8 Drain and Emergency oil Tank level



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

2 nos of guider wave radar level instruments and one no of level gauge shall be installed in each tank.

7 LOOP CHECKING

Vendor is totally responsible for all the work related to loop checking including cable laying, dressing, identification, ferruling & tagging, termination, calibration, loop testing. The detailed procedure is as outlined in standard specification for instrumentation works and other Standard specifications. Vendor shall follow the same for all control systems being supplied by vendor. The termination and identification of field cables, checking of interconnection between instrument/equipments inside control room and performing loop checking for control system supplied by vendor shall be in vendor's scope. Loop testing shall be conducted to check the functional performance of all elements of loop, thereby ensuring proper interconnection and operation.

Before proceeding for loop checking, the calibration results of individual elements shall be recorded on Vendor's supplied Performa, which shall be approved by Owner for correctness of installation, measurement and calibration results. After loop testing is complete, vendor shall connect back any termination and connection removed for loop checks out at the field end.

Vendor shall complete all entries of loop sheet related to field Instrumentation including, installation check, interconnection of tubing/cabling, hydro testing, etc. And get them approved by Owner. All loop sheets duly filled and signed shall be handed over to Control System Vendor for records. Vendor's scope shall also include Coordination with OWNER for serial linking of vendor's supplied PLC to OWNER supplied DCS.

6.7.1 Vendor List

Vendor List for Instrumentation items is provided in these specifications. Vendor shall consider the instrument supplier as identified in the Vendor List. Vendor list provided in the package is for the Make only, and not for any specific Model. For any instrumentation item, the offered model for the same must meet the specification and proven track record (PTR) requirement. All instrumentation items as per approved vendor list shall be supplied according to enlistment for sizes, ratings, material etc.

6.7.2 Electrical-Control & Instrumentation Interface

Instrument electronic signal (non FF), control& alarm cables, single pair as well as multipair shall be 1.5 mm² twisted in pair shall be individually and overall shielded (in case of multipair) with aluminium Mylar tape with drain wire and armoured.

6.7.3 Instrument process data may or may not be available in full or part in the Package. Vendor shall prepare Process datasheets for all instrumentation in extreme case where no data is available for any instrument, and complete instrument process data sheets where data is partially available. Based on the same, instrument data sheet/ specification shall be prepared. Sizes for Control Valves and Pressure Relief Valves if provided in the P&IDs are indicative



MATHURA REFINERY
MECHANICAL MAINTENANCE
TECHNICAL SPECIFICATION

REF:
TPS/MM

December 18, 2017

only. Vendor to verify all Sizes and procure or carry out detailed engineering based on the same. Vendor shall size where these are not provided. For all Flow Instruments, particularly Orifices, if any change in line size is required, the same shall be carried out by Vendor after approval from Owner. The increase/decrease of line size/instrument is in vendor's scope. Vendor shall execute the project based on specifications/Standards, etc. in this bid document. In carrying out so there will be some differences from the P&ID. As a part of residual engineering, Vendor shall correct/update the P&IDs as procured/engineered. Wherever there is a change in the P&IDs due to various specifications, the same shall be incorporated in the as-built P&ID by Vendor.

6.7.4 Vendor to note that the design of thermowells shall be as per drawings / documents attached in the package. However the selected thermowell design must have the proven track record for use in similar applications of UFS. Vendor shall carry out the vibration analysis of the thermowells as per ASME PTC 19.3 standard and shall provide suitable design for the thermowells wherever necessary.

6.7.5 Routing, laying and supply of all cables between vendor supplied equipments inside the Central Control Room including those between PLC/DCS Consoles, Power supply cabinets, MCC, Switchgear etc. shall be in the Vendor's scope. All perforated trays shall be provided with cover.

6.7.6 All field instruments and junction boxes shall be provided with prefabricated canopy made of GI sheet with bolted construction.

6.7.7 Slipper type PVC sleeves shall be used over cable glands for all cable entries in junction boxes to avoid water entry in junction boxes.

8 COMMISSIONING SPARES

Commissioning spares shall be supplied as required for commissioning the plant. The same shall be included in Vendor's Bid. Vendor shall procure these spares as per recommendation of Vendors/Suppliers and these shall be available at the time of commissioning. These shall include all instrumentation and control items including sub-package items.

9 DRAWING/DOCUMENT APPROVAL FOR FACTORY ACCEPTANCE

All the drawing/document submitted by Vendor shall be for review or for record as detailed elsewhere in Drawings / Documents requirement section. For an individual item when inspected at shop shall be based on drawing/ documents marked with review code and approved by Vendor.

DOCUMENTATION & SOFTWARE TO BE PROVIDED BY VENDOR

1. All Drawings and Documents to be furnished by the vendor both in hard and soft copies. Soft copies of drawings/documents shall be in MS Office 2007 package, Autocad 2010.
2. Drawings / documents shall be provided by vendor as per following breakup:-