

 	PROJECT		Standby SRU & Additional Tanks		
	CLIENT		IOCL Paradip Refinery		
INSPECTION AND TEST PLAN FOR INSTRUMENTATION		Project No. 080557C001	Document No. 080557C-000-ITP-1500-001	Rev. No. B	Page 1 of 17

INSPECTION AND TEST PLAN FOR INSTRUMENTATION

B	10.12.2019	ISSUED FOR QUOTATION	SGR	GM	SS	JMC
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REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED

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1. INTRODUCTION

INDIAN OIL CORPORATION LIMITED (IOCL) has awarded Fax of Acceptance (FOA) dated 29th August 2019 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for overall project management, FEED Review / FEED, Detailed Engineering, Procurement & expediting services, Tendering & award, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for installation of a Standby SRU of 525 TPD capacity and execution of Additional tanks for Paradip Refinery, Odisha, India.

2. SCOPE

This specification intends to define the minimum technical requirements for Inspection and Test requirement for Instrumentation. However, Contractor / Manufacturer shall develop and submit the detailed QAP / ITP with additional scope requirement inline with technical specifications / drawings / datasheets / relevant codes and standards for PMC/Owner approval. Any other instrumentation item not categorized here shall be separately categorized.

3. GENERAL ABBREVIATIONS

Abbreviation	Definition /Expanded form
IOCL/ CLIENT	Indian Oil Corporation Limited
PMC/ CONSULTANT	Technip India Limited
LICENSOR	Party selected by IOCL for process technology ownership for any UNIT
CONTRACTOR	Party whose services are obtained for performing the works specified as part of LSTK / packages.
EPCM	Engineering, Procurement & Construction Management Services.
LSTK	Lump Sum Turn Key portion of the work to be executed by CONTRACTOR
FEED	Front End Engineering Design
AUTHORISED REPRESENTATIVE	IOCL's/ CONSULTANT's representative authorized to act for and on behalf of them.
VENDOR	Any third party supplying the equipment/materials for setting up the Plant
PROJECT	Indicates Standby SRU and Additional tanks Project, Paradip Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related
SRU	Sulphur Recovery Unit

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4. TECHNICAL ABBREVIATIONS

BIS	Bureau of Indian Society
CMRI	Central Mining Research Institute
CCOE	Chief Controller Of Explosives
ERTL	Electronics Regional Test Laboratory
FF	Foundation Fieldbus
FAT	Factory Acceptance Test
HART	Highway Addressable Remote Transducer
NACE	National Institute of Chemical Engineers
N.D.E	Non Destructive Examination
NDT	Non Destructive Testing
PESO	Petroleum and Explosives Safety Organisation
WPS	Welding Procedure Specification
PQR	Procedure Qualification Record
WPQ	Welder Performance Qualification

5. CONFLICTS AND DEVIATIONS

The codes standards and guides issued by the organizations listed below should be considered as source of guidance in Instrumentation & Control system and not limited to the following. Applicable national / international standards Design and terminology shall comply, as a minimum, with the latest edition of following codes standard practices and publications. Any statutory and regularity requirement shall be fully complied.

If conflicting statements exist within this document or between this document and Design Basis, other applicable specifications, Standard Drawings, Industry standards, codes, etc., it shall be brought to Owner's / PMC notice for clarification and proper approval shall be obtained before implementation. Decision of Owner / PMC shall be final.

In case of contradiction between licensor specification and this document and Job specification. It has to be brought to the notice of PMC/Owner.

In general, order of priority of the documents shall be as follows,

- Local regulatory and statutory requirement.
- Licensor Requirements (as applicable)
- Project specification and datasheets, wherever applicable.
- This specification and relevant equipment/system specification.
- Codes and standard.

6. REFERENCE NATIONAL / INTERNATIONAL STANDARDS

Refer below document for Codes and standards.

AERB	Atomic Energy Regulatory Board
CCOE	Chief Controller of Explosives
DGMS	Director General of Mines Safety
PESO	Petroleum and Explosives Safety Organisation

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UPCB	Uttar Pradesh Pollution Control Board
ASME 31.3	Process Piping Guide
ASME B 16.34	Valves-Flanged, Threaded and Welding End
API STD 527	Seat Tightness of Pressure Relief Valves
API 598	Valve Inspection and Testing
BS EN 10204	Metallic products Types of Inspection Documents
ANSI / FCI 70-2	Control Valve Seat Leakage
ASME Sec IX	Welding and Brazing Qualification
ASME Sec V	Non Destructive Examination
ASME Sec VIII Div 1	Rules for Construction of Pressure Vessel
NACE MR0103	Petroleum, Petrochemical and Natural gas Industries-Metallic materials resistant to Sulphide Stress cracking in corrosive Petroleum refining environments
NACE MR0175/	
ISO 15156	Petroleum, Petrochemical and Natural gas Industries-Material for Use in H ₂ S-containing environments in Oil and Gas Production
ISO 5208	Industrial valves-Pressure testing of metallic valves
IEC- 540 & 540A	Test methods for insulation and sheaths of electric Cables
IEC-60331	Testing of Fire Resistant cables.
IEC-60332	Tests on bunched wires and cables.
IEC-794-1-E4/E7	Impact strength cable twist test.
IEC-794-1-F5	Water Penetration test
IEC-794-1-F1	Cable Temperature Cycling Test
IS-10810	Method of test for cables.
• Part 40	Method for testing uniformity of coating on zinc coated articles.
• Part 41	Mass of zinc coating on steel armour
• Part 58	Oxygen Index test
• Part 59	Determination of halogen acid gas evolved during combustion of polymeric material taken from cables
• Part 61	Flame Retardant test
• Part 62	Flame Retardance test for bunched cables
• Part 63	Smoke density of electric cables under fire conditions.

7. REFERENCE DOCUMENTS

This document along with following documents shall be considered as basic guide for overall design of plant instrumentation of new projects.

080557C -000-JSD-1540-001

Design Basis - Instrumentation

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080557C -000-JSD-1540-002	Control & Safety system design criteria
080557C -000-JSS-1574-001	Job Specification for Instrument Cables
080557C -000-JSS-1541-001	Job Specification for Control Valves
080557C -000-JSS-1543-001	Job Specification for On-Off Valves / MOV
080557C -000-JSS-1545-001	Job Specification for Safety Valves
080557C -000-JSS-1560-001	Job Specification for Analysers and Analyser Shelters
080557C -000-JSS-1566-001	Job Specification for Gas detectors
080557C -000-JSS-1566-002	Job Specification for Fire detectors
080557C -000-JSS-1553-001	Job Specification for Electronic Field Transmitter
080557C -000-JSS-1546-001	Job Specifications for Flow Elements
080557C -000-JSS-1547-001	Job Specifications for Flow Instruments
080557C -000-JSS-1547-006	Job Specifications for Coriolis mass flow meters
080557C -000-JSS-1547-007	Job Specifications for Ultrasonic flow meters
080557C -000-JSS-1552-007	Job Specifications for Special Type Level Instruments
080557C -000-JSS-1591-001	Specification of Cable Trays and Ducts
080557C -000-JSD-1300-002	Piping Material Specification
080557C -000-JSD-2300-001	Standard specification for Painting & Coating
080557C -000-JSS-6300-002	Positive Material Identification at Manufacturer's works

8. INSPECTION AND TEST REQUIREMENTS:-

8.1 General

- 8.1.1 The Manufacturer/Contractor must issue a Fabrication and Quality Control Plan for each equipment.
- 8.1.2 The Manufacturer/Contractor's Fabrication and Quality Control Plan is a document which defines in a chronological manner the list of the operations of fabrication, controls and tests in accordance with his own "know-how" and with the requirements specified in Material Requisition.
- 8.1.3 Following information shall be clearly specified against each operation:
- Reference documents (drawings, procedures, etc.)
 - Acceptance criteria (code, etc.)
 - Recording documents for controls and tests
 - Involvement of the Quality Control department of the Contractor and/or his Sub-contractor
- 8.1.4 All instruments and system-oriented items shall undergo factory testing and inspection by authorized Third party representatives (TPIA) / Contractor unless specified otherwise.
- 8.1.5 The inspection and testing shall be carried out as per related specifications, international codes and practices/standards, approved documents and/or any other documents attached along with specifically suggesting testing to be carried out at Contractor's / TPIA works. This is the general guideline which shall give minimum requirement for inspection and testing. However it is contractor responsibility to add inspection and test as per Industry practice, codes and standards.
- 8.1.6 Items, for which 'Witness Inspection' is specifically exempted, Manufacturer / Contractor shall forward the test certificates as desired for review. The material shall be despatched only after obtaining written despatch clearance.

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- 8.1.7 No system or system oriented item shall be despatched without integrated factory testing witnessed by representatives of Third party inspector / Contractor. The testing procedures shall be detailed out, based on testing requirements indicated in individual system specifications
- 8.1.8 Testing and inspection for all items shall be carried out as per Owner/PMC approved factory testing procedures.
- 8.1.9 Performance specifications must be detailed out on each item which shall be verified by third party agency / by Contractor during factory testing.
- 8.1.10 Acceptable criteria for Radiography and other NDT requirements for the instruments / instrument castings shall be inline with those specified in 'Piping Specifications' have been attached elsewhere in this package.
- 8.1.11 IBR certifications shall be provided in the appropriate format duly signed by IBR authority or their authorised agency. Form IIIC shall be submitted.
- 8.1.12 Verification of setpoint of rupture disc shall be part of witness inspection. Testing shall be carried out on the rupture disc, which are part of the actual rupture disc batch of Contract. This shall be in addition to the 3 numbers of spare rupture discs already indicated in the requirements. The testing, in general, shall be as per ASME section VIII Division 1.
- 8.1.13 Inspection and test items, witness inspection items for various kind of instrument at FAT (Factory acceptance test) shall be as shown in **Table A**.
- 8.1.14 Inspection Release Certificate shall be issued by CONTRACTOR, permits the Vendor to proceed with the packing and to notify the shipment

8.2 Visual Inspection

8.2.1 Confirmation items

1. Type and model
2. Tag no.
3. Rating
4. Range, Scale and symbol of unit
5. Set pressure and capacity of safety valves
6. Valve characteristics and CV value of control valves
7. Name of materials
8. Nameplate details
9. Colour of painting
10. Die Marking (nominal size, material of flange and direction of flow)
11. Accessories
12. Quantity

8.2.2 Harmful defects

- Defect such as cracks, deformation and flaws shall not be found in the casting, forging and machined surface of the pressure rating part.
- Defect such as inside surface weld protrusion; lack of fusion and incomplete penetration shall not be found in welded places of pressure retaining part.

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8.2.3 The instrument shall be in rugged design and assembly of all components within the enclosure fixed firmly to avoid loosening or falling-off of any parts.

8.2.4 Painting shall be done inline with painting scheme. Painting of instrument's surface shall be such that there is no defect or lack of uniformity.

8.3 Dimensional Inspection

- ☒ Main parts
- ☒ Flange to Flange Dimensions (Valves, Level gauges, Displacer Level Inst, Flow Inst)
- ☒ Actuator Dimensions.

Check and confirm to the requirement of Specification, approved drawings or applicable code and standards.

8.4 Material Inspection

8.4.1 Mill test certificates

Contractor shall submit the mill test certificates complying to EN 10204 type 3.1 for all pressure parts

Mill Test certificates shall be submitted complying to EN 10204 type 3.1 for following Instrument parts and not limited to

- | | | |
|-------|--------------------------------------|---|
| I. | Temperature Instruments | : ☒ Flange and Thermowell |
| II. | Displacement type liquid level meter | : ☒ Chamber and Flange |
| III. | Glass Gauge , Magnetic LG | : ☒ Body and Flange |
| IV. | Transmitter Diaphragm | : ☒ Body and Flange |
| V. | PG/DPG | : ☒ Body and Flange |
| VI. | Condensate pot | : ☒ Body |
| VII. | Gas eliminator | : ☒ Body |
| VIII. | Gaskets | : ☒ Body |
| IX. | Fasteners | : ☒ Studs, Nuts, washers etc. |
| X. | Springs | : ☒ Body |
| XI. | Electrical & Instrumentation Items | : ☒ Body |

8.5 Non-Destructive Examination & Heat Treatment

1. Control valve, On-Off valve and safety valve
Following Par. 8.5.2 and 8.5.3

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2. Other instruments
Shall be carried out in accordance with Manufacturer/Contractor's standards.

8.5.1 Ultrasonic Examination

- 1 Forging material on Orifice flange and Flow nozzle
☒ ANSI class 900 or above

8.5.2 Radiography Examination

☒ The pressure retaining parts

1. Applicable material and quantity

- Welded parts : ☐ JIS Z 3104, Z 3106
☒ As per Piping Material Specifications / ASTM – ASME 31.3

2. Acceptant standards and grade

- Casting : ☐ JIS G 0581
☒ As per ASME B 16.34

8.5.3 Magnetic Particle or Liquid Penetrant Examination shall be carried out in accordance with Piping Material Specifications.

8.5.4 Preheat/Post Heat weld treatment shall be provided for welds, as per piping material specification.

8.5.5 Manufacturer / Contractor shall submit the WPS/PQR/WPQ for all welding activities as per ASME sec IX for PMC/Owner approval.

8.5.6 Preheat/Post Heat weld treatment shall be provided for welds, as per piping material specification.

8.6 Pressure Test

8.6.1 Control and On-Off Valves

1. Body and Bonnets

☒ Hydrostatic test shall be as per ANSI/ISA-75.19.01

2. Body of special type

☒ Hydrostatic test

Test pressure and Hold time.

☒ Hydrostatic test shall be as per ANSI/ISA-75.19.01

☒ Minimum 5 minutes.

Permanent distortion or Leakage

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☒ shall not be found

8.6.2 Safety Valve or Safety Relief Valve

1. Pressure retaining parts test shall as per ASME (Sec I and Sec VIII) as applicable.

☒ Hydrostatic test before assembling

- i. Test pressure and Hold time.

☒ 1.5 times of Design Pressure / min. 2 kgf/cm²g.

☐ 2.2 times of Design Pressure.

☒ Minimum 5 minutes.

- ii Distortion or leakage

☒ shall not be found

2. The out side parts of enclosed type

☒ Hydrostatic test after assembling

- i. Test pressure and Hold time

☒ 1.5 times. Design Pressure of flange

☐ 2.2 times. Design Pressure of flange

☒ Minimum 5 minutes.

- ii. Defects

☒ Shall not be found

3. Special type valves

☒ Hydrostatic test with the Manufacturer's standards approved by PMC/Owner, where Par. 8.6.2(1) and (2) are not applicable

8.6.3 The pressure retaining parts of instrument

☒ Hydrostatic test or Pneumatic test as per applicable codes and standard

- i Test pressure and Hold time

☒ 1.5 time of Max. Design pressure / Min. 2 kg/cm²g

☒ Min. 5 minutes

- ii Permanent distortion or Leakage

☒ Shall not be found

If the above mentioned test is technically difficult, the test shall be carried out in accordance with the Manufacturer's standards approved by PMC/Owner.

8.7 Pneumatic Test

8.7.1 The pneumatic test for instrument

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- i Test pressure & Hold time
 - ☒ Max. Design Pressure. (Design press.)
 - ☒ Minimum 5 minutes
- ii Permanent distortion or Leakage
 - ☒ Shall not be found

8.8 Seat Leakage Test

- 8.8.1 Control Valve
 - Allowable leakage valve / (code): ☒ ANSI B16.104 (FCI 70-2)
- 8.8.2 Safety valve
 - Allowable leakage valve / (code): ☒ API 527

8.9 Performance Test

For each instruments, the performance test shall be carried out in accordance with procedure approved by Owner / PMC, as a minimum as per specification.
Acceptance standard shall be in accordance with applicable codes & standard, specification, and / or manufacture's standard approved by Own / PMC as a minimum as per specification.

8.10 Insulation Resistance Test

- 1. Power supply circuit: 10M Ω or over (instrument panel: 3 M Ω or & alarm circuit over/each panel)
- 2. Signal circuit : 5M Ω or more (instrument panel: 3 M Ω or More per panel)

The test shall be carried out in accordance with the applicable codes & Standards. Due to any technical constraint to measure, this test can be omitted

8.11 High-voltage Test

- 1. A-C power supply and alarm circuits
 - i. Voltage level less than 250 V : ☒ A-C 1500 V
 - ii. Voltage level 250 V and above : ☒ A-C 2E + 1000V

'E' is the rated voltage.
- 2. D-C power supply circuits : ☒ D-C 500V

Test can be omitted in case of any technical constraint.

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8.12 PMI Requirements:

PMI shall be performed for alloy metal as per approved Positive Material Identification Procedure.

8.13 Sour and HIC service / NACE Requirements

In case of Sour and HIC service, the instruments materials must meet the specific requirements hardness, radiography and other testing requirements, as per NACE MR-0103 latest edition.

8.14 Hydrogen Service Requirement

For Instruments used in Hydrogen Service, it must be certified for the use in Hydrogen service, specifically Hydrogen diffusion problems. Reference list, along-with performance feedback shall be furnished.

For hydrogen service the instruments shall meet all the material and testing requirements such as Helium leak test etc.

8.15 Indian Boiler Regulation (IBR) Requirement

For applications involving Steam, the manufacturer must furnish the IBR form IIC certification duly approved by IBR authority tested and certified by IBR. All IBR approved drawings and certificates shall be submitted to owner through PMC.

8.16 Metering systems Requirement

For metering application, contractor shall meet the national Weights & measures codes and regulations control requirement.

8.17 Nuclonic Instruments Requirement

For Nucleonic Instruments, it shall be reviewed and approved by AERB (Atomic Energy Regulatory Board)

8.18 P, H, R, W definaion

H: (Hold) Point

The Manufacturer cannot carry out the specified controls and tests without Inspector attendance. Consequently, the attendance to witnessing is mandatory. The Manufacturer must notify Contractor/PMC/OWNER by email of the dedicated inspection activity at least fifteen (15) days in advance.

The Manufacturer cannot deviate from this rule unless written approval has been given by involved operating center.

W: (Witness)

The Manufacturer must notify to Contractor/PMC/OWNER of the dedicated inspection activity at least fifteen (15) days in advance. OWNER witnessing is not mandatory, but optional. When a percentage value is indicated (i.e. W 10%) the inspection activities will be witnessed on spot

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basis as per percentage indicated.

If Owner do not elect to be present, the Manufacturer/Contractor may proceed with his own inspection, provided controls and tests records are made available to Inspector for review.

R: (Review) - Review of Documents

The Manufacturer/Contractor has either to submit to Inspector for comments the documents required prior to the performance of the dedicated activity or to transmit or make available for the review of Inspector the results of the controls and tests conducted, as the case may be.

P (Perform)

The Manufacturer/Contractor/ Third Party Agency has to perform 100% internal testing of the instruments, and submit the internal test report to PMC/Owner

I Information

The Manufacturer/Contractor/ Third Party Agency has to perform 100% internal testing of the instruments, and provide the MTCs and test reports to PMC/Owner for information

Note (*) – For all sub ordered stainless steel, alloy steel forgings and carbon steel forgings of rating more than 300#, testing shall be witnessed by Contractor/Third Party Agency at sub-suppliers works

Table A : Table of Inspection and Test Items

Kind of Instrument	Inspection and Test Items											MDRB (Documentation)
	Visual Inspection	Dimensional insp.	Material insp.	Non-destructive exam	Pressure test	Pneumatic test	PMI test, if applicable	Performance test	Insulation resistance test	High voltage test	Steam test	
1 Thermocouple	P / W	P / W	—	—	—	—	—	P / W	—	—	—	H
2 Resistance thermometer bulb	P / W	P / W	—	—	—	—	—	R	—	—	—	H
3 Compensating lead wire	P / W	P / W	—	—	—	—	—	R/W	—	—	—	H
4 Bimetallic thermometer	P / W	P / W	—	—	—	—	—	R	—	—	—	H
5 Gas or liquid-filled thermometer	P / W	P / W	—	—	—	—	—	R	—	—	—	H

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Kind of Instrument	Inspection and Test Items											MDRB (Documentation)
	Visual Inspection	Dimensional insp.	Material insp.	Non-destructive exam	Pressure test	Pneumatic test	PMI test, if applicable	Performance test	Insulation resistance test	High voltage test	Steam test	
6 Multipoint temp Element	P / W	P / W	—	—	—	—	—	R	—	—	—	H
7 Skin type T/C	P / W	P / W	—	—	—	—	—	R	—	—	—	H
8 Thermowell	P / W	P / W	R	R	R	—	W	—	—	—	—	H
9 Differential pressure flow meter	P / W	P / W	—	—	R	—	—	R	—	—	—	H
10 Differential pressure transmitter	P / W	P / W	—	—	R	—	—	R	—	—	—	H
11 Bourdon gauge	P / W	P / W	—	—	R	—	—	R	—	—	—	H
12 Draft gauge	P / W	P / W	—	—	R	—	—	R	—	—	—	H
13 Differential pressure gauge	P / W	P / W	—	—	R	—	—	R	—	—	—	H
14 Pressure transmitter / switch	P / W	P / W	—	—	R	—	—	R	—	—	—	H
15 Displacement type level indicator, controller	P/W/ R/H	P/W/ R/H	R	R	P/W/ R/H	—	W	P/W/ R/H	P/W/R	P/W/ R	—	H
16 Chamber for displacement type level meter	P/W/ R/H	P/W/ R/H	R	R	P/W/ R/H	—	W	—	—	—	—	H
17 Glass gauge	P / W	P/W/ R	R	R	P/R	—	—	—	—	—	—	H
18 Magnetic Level gauge	P / W	P/W/ R	R	R	P/W/ R	—	W	—	—	—	—	H
19 Float type level meter,	P/W/ R	P/W/ R	P/W/R	R	R	—	—	P/W/ R	P/W/R	P/W/ R	—	H
20 Differential pressure type level meter	P/W/ R	P/W/ R	P/W/R	—	R	—	—	P/W/ R	P/W/R	P/W/ R	—	H
21 Purge type level meter	P/W/ R	P/W/ R	—	—	—	—	—	P/W/ R	—	—	—	H

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Kind of Instrument	Inspection and Test Items											MDRB (Documentation)
	Visual Inspection	Dimensional insp.	Material insp.	Non-destructive exam	Pressure test	Pneumatic test	PMI test, if applicable	Performance test	Insulation resistance test	High voltage test	Steam test	
22 Radar / Ultrasonic / Servo type level meter	P/W/R/H	P/W/R/H	P/W/R	—	—	—	—	P/W/R/H	P/W/R	P/W/R	—	H
23 Capacitance type level meter	P/W/R/H	P/W/R/H	P/W/R/H	—	—	—	—	P/W/R/H	P/W/R	P/W/R	—	H
24 Conductivity type level meter	P/W/R/H	P/W/R/H	P/W/H	—	—	—	—	P/W/R/H	P/W/R	P/W/R	—	H
25 Instrument panel	P/W/R/H	P/W/R/H	—	—	H	H	—	P/W/R	P/W/R	P/W/R	—	H
26 Instrument desk	P/W/R/H	P/W/R/H	—	—	—	—	—	P/W/R/H	P/W/R	P/W/R	—	H
27 Gauge board	P/W/R	P/W/R	—	—	H	H	—	P/W/R/H	P/W/R	P/W/R	—	H
28 Gas chromato-graph	P/W/R	P/W	—	—	—	P/W/R	—	P/W/R/H	P/W/R	P/W/R	—	H
29 Mass spectro-meter	P/W	P/W	—	—	—	P/W/R	—	P/W/R/H	P/W/R	P/W/R	—	H
30 Infrared type gas analyzer	P/W	P/W	—	—	—	P/W/R	—	P/W/R/H	P/W/R	P/W/R	—	H
31 Magnetic type gas analyzer	P/W	P/W	—	—	—	P/W/R	—	P/W/R/H	P/W/R	P/W/R	—	H
32 Thermal conductivity type analyzer	P/W	P/W	—	—	—	P/W/R	—	P/W/R/H	P/W/R	P/W/R	—	H
33 Combustion type gas analyzer	P/W	P/W/R	—	—	—	P/W/R	—	P/W/R/H	P/W/R	P/W/R	—	H
34 Density type gas analyzer	P/W	P/W	—	—	—	—	—	P/W/R	P/W/R	P/W/R	—	H
35 Photo-electric type analyzer	P/W	P/W	—	—	—	—	—	P/W/R	P/W/R	P/W/R	—	H
36 RVP Analyser	P/W	P/W	—	—	—	—	—	P/W/R	P/W/R	P/W/R	—	H
37 Moisture analyzer	P/W	P/W	—	—	—	—	—	P/W/R	P/W/R	P/W/R	—	H
38 pH meter	P/W	P/W	—	—	—	—	—	P/W/R	P/W/R	P/W/R	—	H

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 TechnipFMC		 IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery		
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	Visual Inspection	Dimensional insp.	Material insp.	Non-destructive exam	Pressure test	Pneumatic test	PMI test, if applicable	Performance test	Insulation resistance test	High voltage test	Steam test	
39 Turbidity analyzer Water quality analyzer	P/W	P/W	—	—	P/W/R	—	—	P/W/R	P/W/R	P/W/R	—	H
40 Density meter	P/W	P/W	—	—	P/W/R	—	—	P/W/R	P/W/R	P/W/R	—	H
41 Conductivity meter	P/W	P/W	—	—	P/W/R	—	—	P/W/R	P/W/R	P/W/R	—	H
42 Flame detector	P/W	P/W	—	—	—	—	—	P/W/R	P/W/R	P/W/R	—	H
43 Gas detector	P/W	P/W	—	—	—	—	—	P/W/R	P/W/R	P/W/R	—	H
44 Manual Call Point	P/W	P/W	P/W/R	—	—	—	—	P/W/R	—	—	—	H
45 Nuclonic Instruments	P/W	P/W	—	—	—	P/W/R	—	P/W/R	P/W/R	P/W/R	—	H
46 Sounder / Beacon	P/W	P/W	P/W/R	—	—	—	—	P/W/R	—	—	—	H
47 Cables	P/W	P/W	P/W/R	—	—	—	—	P/W/R	—	—	—	H
48 Junction Box / Gland	P/W	P/W	P/W/R	—	—	—	—	—	—	—	—	H
49 Cable Tray / Duct	P/W	P/W	P/W/R	—	—	—	—	—	—	—	—	H
50 Tube and Fittings	P/W	P/W	P/W/R	—	—	—	—	—	—	—	—	H

9. NOTES:

1. Type test Certificates for Fire safety test of valves shall be submitted before order for approval.
2. Helium or Equivalent Leak test shall be performed for Welding on case to case basis
3. Surface preparation and painting shall be done for each type of material i.e. CS, LTCS, SS, Super Duplex etc. in accordance with Painting Scheme.
4. Selection of material shall be as per piping material specifications.
5. In case of any conflict only stringent references and acceptances, standards & codes shall be applicable.
6. Tests for painting shall be done as per painting specifications.

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7. For cryogenic service selection of paint system shall be approved by PMC/OWNER
8. Owner may take raw material sample randomly during manufacturing to confirm specification requirement, if material found not complying with requirement then client will have authority to reject the all relevant item regardless of any progress stage of relevant item.
9. Procurements shall be done directly from manufacturer by Contractor, purchase through traders will only be entertained in case of imported material only.
10. Manufacturer/Contractor shall submit the internal test reports, type test reports, statutory approval certificates to PMC/OWNER for review/information.