Bill of Materials: BASKET STRAINER - for IOCL BARAUNI REFINERY Project

Notes:

SNO	PR	MTL CODE	DESCRIPTION	QTY	SPEC
1	7000098969 7000098980	TC9767575014	BASKET STRAINER CS 36'"#150RF NACE+HIC	2.000	TC67575-01
2	7000098981 7000098982	TC9767575022	BASKET STRAINER CS 16'"#150RF NACE+HIC	2.000	TC67575-02

1) **Delivery Required in 90 Days. Supplier to quote the best possible delivery.**
2) **Supplier shall submit offer for Destination. Freight and insurance in supplier scope.**
3) **Third party Inspection (TPI) is in BHEL scope (Charges to BHEL account). However, supplier shall coordinate with BHEL-TPI agency for inspection.**
4) **Suppliers shall submit complete compliance to BHEL specifications in their technical bid. Technical acceptance of the offers/ Bids is subject to end customer approval only.**
5) **Evaluation is on itemwise basis.**
6) **Item shall be delivered to for destination to be delivered to below address.**

TC Stores
BHEL Hyderabad
RC Puram
502032

SPECIAL CONTRACT CONDITIONS (SCC)

Sl. No	Terms & Conditions	Supplier confirmation	Deviations
1	TWO part bid system. Delivery ..... weeks. (The quoted delivery shall be considered from date of approved drawings). Vendor to submit Quality plan & drawings for approval after placement of Purchase order based on the Technical specifications & data sheets. Instructions for preparation of Quality plan are enclosed along with this document.		To be Specified
2	Packing & forwarded charges shall be included in Quoted Price.		Non Deviatable
3	Evaluation shall be on itemwise basis.		Non Deviatable

4	**Technical acceptance of the offers/ Bids is subject to end customer approval only.**		Non Deviatable
5	Third party inspection by BHEL empaneled TPI and inspection charges to BHEL account. Inspections calls shall be raised by supplier in the below portal cqir.bhel.in or mail us at evinodkumar@bhel.in, bnarasimha@bhel.in & nagesht@bhel.in BHEL empaneled inspection agencies as below (i) M/s.TUV SUD (ii) M/s.Bureau veritas India pvt Ltd		Non Deviatable
6	All items are to be supplied in line with BHEL specification. Deviation, if any shall be brought out clearly in the technical offer.		To be Specified
7	All the original documents like CQIR report, Test Certificates, IBRs (if any), in line with Quality plan and signed by TPI must be submitted before dispatch of materials to bnarasimha@bhel.in and evinodkumar@bhel.in originals must be submitted along with the materials.		Non Deviatable
8	Unless otherwise specified, guarantee period shall be 12 months from the date of commissioning or 18 months from the date of supply/replacement whichever is earlier. A guarantee period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery.		Non Deviatable
9	100% payment along with taxes, freight & insurance will be made within 75 days from the date of receipt of complete documentation as per PO. However payment would be done only after receipt of original documents, including site/ Customer acknowledgement on LR (MRC - Material Receipt Certificate at site) /GR clearance at BHEL Stores.For MSEs (covered under MSME Act) which are registered and periodically renewed with BHEL, this period will be 45 days* as prescribed in the relevant act.Adherence to the above time schedule of payment is contingent upon Vendor complying with GST provisions and availment of Input Tax Credit by BHEL before the date of payment.*The taxes and duties that are reimbursed would be the ones applicable as on the contractual Purchase Order delivery date or the amount actually paid whichever is less.In case GST credit is delayed/ denied to BHEL, due to non/delayed receipt of goods and/or tax invoice or expiry of timeline prescribed in GST Law for availing such ITC, or any other reason not attributable to BHEL, GST amount shall be recoverable from Vendor along with interest levied/ leviable on BHEL.		

10	Provide Contact Details for further coordination Name and designation : E-Mail ID : Alternative Email ID : Telephone No : Phone No : Local representative details (If any) :		To be Specified

Note : For PPP MII Govt Notifications Please Go through "https://dipp.gov.in/public-procurements ".

Date: **Signature of the supplier with seal**

Annexure-I

Major Activity timelines shall be considered for indigenous purchases

S No	Activity	Agency	Timeline	Acceptance / Remarks
1	PO acknowledgement	Vendor	04 days from the date of receipt of PO	
2	First submission of Drawings, Data sheets and QP Rev-00	Vendor	15 days from receipt of PO	
3	commented / approved drawings / data sheets and QP to vendor	BHEL/Customer	07 days from the receipt of Rev-00 submission.	
4	Subsequent submission of revised drawings / data sheets and QP	Vendor	07 days from the receipt of commented drawings / data sheets and QP	
5	Subsequent Approved /commented Drawings and QP to vendor	BHEL/Customer	07 days from the date of receipt of revised drawings / data sheets and QAP.	
6	Raising of Inspection Call	Vendor	07 days before the proposing inspection date. (BHEL will provide approved QP before raising inspection call)	
7	Inspection completion	BHEL Third party inspection agency / Customer	07 days from inspection call date.	
8	Despatch Instructions	BHEL	07 days from the date of receipt of final approved inspection report to BHEL.	
9	Receipt of Material at BHEL stores/ site	Vendor	15 days from Despatch instructions	

Absence of this annexure in NIT will entail non processing of delivery extension cases in case of delay in supplies of goods owing to reason attributable to BHEL.

Vendor's Signature

Annexure - III

Proforma for self-certification by Supplier for minimum local content on their letter head for tender value less than Rs 10 Crore

"We _____ (Name of Manufacturer) undertake that we meet the mandatory minimum Local Content (LC) requirement i.e. _____ (to be filled as notified in the policy) for claiming Purchase Preference linked with Local Contents under the Govt. policy against tender no. _____."

Note: As per GOI circular, the bidders offering Imported items falls under the category Non-Local Supplier. They can't claim as Class I Local Supplier/Class II Local Suppliers by claiming the services as transportation, Insurance, Installation, Commissioning & training and after sales service support like AMC/CMC etc as local value addition

Auditor's certification with respect to minimum local content on the letter head of Statutory Auditor for tender value above Rs.10 crore

"We _____ the statutory auditor of M/s _____ (name of the bidder) hereby certify that M/s_____ (name of manufacturer) meet the mandatory Local Content requirements of the Goods and/or Services i.e. _____ (to be filled as notified in the policy) quoted vide offer No._____ dated _____ against BHEL's tender No._____ by M/s _____ (Name ofthe bidder)."

Note: As per GOI circular, the bidders offering Imported items falls under the category Non-Local Supplier. They can't claim as Class I Local Supplier/Class II Local Suppliers by claiming the services as transportation, Insurance, Installation, Commissioning & training and after sales service support like AMC/CMC etc as local value addition

ANNEXURE IV

Proforma for self-certification by Supplier for Compliance to below Clause

Clause: Any Bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with competent authority. https://www.mea.gov.in/ to be referred for latest details of competent authority and exemptions.

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and I certify that M/s_____**(Name of firm)**

(Tick the Appropriate)

- ☐ **Is not from such a country**
- ☐ **Is from such a country and has been duly registered with the Competent authority.**

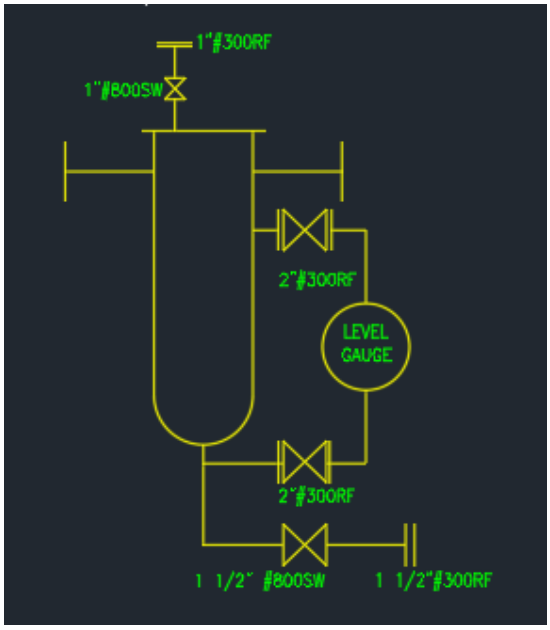
I hereby certify M/s _____ **(Name of firm)** fulfills all requirements in this regard and is eligible to be considered (where applicable, valid registration by the competent authority shall be attached)

Sd/-
Authorized Signatory with Stamp

BASKET-TYPE STRAINER – NACE+H_2 SERVICE+HIC+SOUR GAS REQUIREMENT

SCOPE OF SUPPLY:

The scope of supply is Basket TYPE STRAINER with flanged ends with level gauge and level gauge isolation valves, vent and and drain connections as per the below snap shot.



Vendor has to design the strainer suitably as per the PR requirement.

2. SIZES AND DIMENSION:

Size, rating and schedule shall be as per Variant table.

3. Material of Construction

Body: ASTM A 234 GR WPB UPTO 14" AND ASTM A 234 GR WPB-W for 16" and above
Cover: ASTM A 105
Strainer Mesh: SS316L
Stud: A193-B7
Nut: A194-2H

MOC and applicable standards for Valves

Gate Valve SW Female Ends, -,

API 602, Seat Leakage as per API 598, ASTM A105 + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/ Graphite, Packing: Graphite, -, AISI 316L Hard faced, Renewable Seats, Solid Wedge, NACE MR0103, Fugitive Emission as perISO 15858 Part 1: Tightness Class C

Gate Valve Flanged Ends

Gate Valve Flanged Ends, -, API 600, Seat Leakage asper API 598, ASTM A216 Gr.WCB + Sour Service, 300
Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet,A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite,
Packing: Graphite, -, AISI 316L Hardfaced, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, HO, NACE MR0103, Fugitive Emission as per ISO 15858 Part 1: Tightness Class C

Level gauge:

Level Gauge shall be as per Annexure-5.

4. General Requirements

4.1 strainer shall be provided with 8 mesh screen for normal operation and 20mesh screen for startup. Vendor to design the mesh support in such away that mesh is mechanically suitable to withstand a pressure drop of 5 kg/cm2.

4.2 The effective area of the screen assembly shall not less than 250 percent of the line cross- sectional area.

4.3 Strainer body shall be provided with bolted top covers for easy removal of strainer elements.

4.4 Strainer body shall be provided with tapped NTP blow –off connection of 1".and drain connection of 1.5" with valve flange and blined flange

4.5 Large capacity (above 6") fabricated strainer shall be provided with their own floor mounting stands.

4.6 In case of temporary strainers the effective area of screen assembly shall not be less than 50 percent of cross sectional area of the pipe. Temporary strainer shall be removed after flushing and start-up of the line.

4.7 Strainers shall be designed to accommodate an acceptable level of clogging.

4.8 Screen specified for strainers shall be in accordance with ASTM E 674 or equal.

4.9 Mesh specified for strainers shall be in accordance with ASTM E 2016 or equal

4.10 End Connection shall be FLGD (Flanged End) : ASME B16.5 for NPS 24 and smaller ASME B16.47 Sr. B for NPS 26 and Larger

4.11 For fabricated strainers, all BW joints shall be fully radio graphed and fillet welds shall be 100% DP/MP checked.

4.12 Flow direction shall be marked (cast or embossed) on the body. Body marking shall be in accordance with MSS –SP-25.

4.13 Specified Heat Treatment for Carbon Steel and Alloy Steels and solution annealing for all Austenitic Stainless Steels shall be carried out again after weld repairs.

4.14 No copper or copper alloy shall be used in any part that comes into contact with process fluid.

4.15 Carbon content for all Carbon Steel piping commodities shall not exceed 0.25% and carbon equivalent (CE) shall be 0.43 maximum.

CE = c% + Mn% / 6 + (CR% + Mo% + V%) / 5 + (Ni% + Cu%) / 15.

4.16 All strainers shall be heat treated in accordance with the applicable national/international standard requirements.

4.17 Strainer shall be stress relived in accordance with table 331.1.1, ASME B31.3.

4.18 For all 1Cr- ½Mo, 1 ¼Cr- ½Mo and 2 ¼ Cr – 1Mo, 5Cr-0.5Mo, 9Cr-1Mo accelerated cooling from the austenitizing temperature is acceptable, where permitted by the applicable product from specification.

4.19 Pressure retaining components for 1Cr- ½Mo, 1 ¼Cr- ½Mo and 2 ¼ Cr – 1Mo, 5Cr-0.5Mo, 9Cr-1Mo (regardless of size, thickness or product form) shall be post weld heat treated (PWHT) in accordance with the requirements of ASME B31.3. No exceptions from heat treatments are permitted.

4.20 For 9Cr-1Mo-V Grade91 hardness, heat treatment and all other special requirement shall be as per API 938 B -2008

4.21 Pressure retaining butt welds shall be full penetration.

4.22 Flame impingement is prohibited at all times.

4.23 Welds of pressure retaining parts shall be made by qualified welders, welding operators and welding procedure qualified in accordance with ASME Sec IX.

4.24 All the welds for pressure retaining parts shall be so identified as to be traceable to the Welding condition, welders and the inspection results.

4.25 As minimum strainer internals shall be stainless steel SS316L.

4.26 I.G.C Test for Stainless Steel

4.26.1 Intergranular Corrosion (IGC) Test shall be conducted as per following for all the grades of Austenitic stainless steels.

ASTM A262 Practice 'B' with acceptance criteria of "60 mils/ year (max)" for casting

OR

ASTM A262 Practice 'E' with acceptance criteria of "No cracks as observed from 20 X Magnification and microscopic structure to be observed from 250X magnification" for other than casting

4.26.2 For IGC test two sets samples shall be drawn from each Solution annealing lot; one set corresponding to highest carbon content and other set corresponding to the highest rating / thickness. When testing is conducted as per Practice "E", photograph of microscopic structure shall be submitted for record.

4.26.3 All austenitic stainless steel grades shall be solution annealed after welding.

4.26.4 All austenitic stainless steel items / parts shall be supplied in solution annealed condition.

5.0 DESIGN BASIS FOR STRAINER

51 Net free area shall be min TWO times of pipes cross section area after taking the 50% clogged condition.

5.2 Strainer element shall be provided with perforated sheet.

5.3 All strainers shall be provided with NPS ¾"Drain connections with valves and flange and blind flange

5.4 Every strainer shall be subjected to all the mandatory tests and checks called in the respective codes / data sheet by BHEL inspection or any third party as approved by the purchaser.

5.4 Devit arrangement shall be provided for cover removal for all strainers

5.5 All the strainers shall be hydrostatically tested at **TWO TIMES** the design pressure.

- Pressure drop across the strainer should not exceed 0.01Kg/Cm2(g) in normal condition and 0.015Kg/cm2 in Maximum flow condition.
- Strainer shall be mechanically suitable to withstand a pressure drop of 5 kg/cm2.
- Technical requirements of pipe fittings flanges, gaskets and studs shall be as per Annexure-2.
- Special requirement of hydrogen service shall be as per Annexure-1.
- All the materials should meet special requirements as per **NACE MR0103**.
- All weld joints shall be 100% radio graphed in accordance with paragraph UW-51 of ASME
- boiler and pressure vessel code, section –VIII, Division1
- All pipes, flanges & fittings having wall thickness 3/8" & thicker shall be normalized.
- Maximum hard ness in the weld joint should be limited to 200BHN
- Post weld heat treatment is required for all the weld joints irrespective of weld thickness.
- Hydrostatic test shall be conducted at 2 times of the maximum working pressure corresponding to the flange class.
- NACE and any other lethal service shall have 100% radiography on weld joints in all class ratings. Castings in these services shall have 100% radiography.
- 1" Drain with flange and blind flange shall be provided
- PMI test shall be performed on the materials as per Annexure-4
  - All items of Alloy Steel, Stainless Steel & Non-Ferrous materials.
- • All Carbon Steel Piping items under NACE or HIC or Hydrogen service
- Customer approved vendor list (Annexure-4) is applicable for all the items

6.0 SPECIAL REQUIREMENTS FOR HYDROGEN AND NACE SERVICE

6.1 NACE MR0103 + HIC requirement as per Annexure-1.

7.0 MARKING, PAINTING AND DESPATCH

7.1 Marking may be in accordance with manufacturer's standard. However, following items shall be inevitably marked on the nameplate, end pipe or flange.

7.1.1 Name or trade mark of the manufacturer

7.1.2 Strainer item number/tag no or special commodity number

7.1.3 Connection Size and class rating.

7.1.4 Flow direction on the body

7.15 special requirements Like "IBR,NACE OR H2 SERVICE" etc. shall also be marked.

7.15 For all strainers MOC and ident code shall be punched on the body.

7.2 Paint or ink for marking shall not contain any harmful metal or metallic salts such as zinc, Lead or copper which cause corrosive attack on heating

7.3 Strainer shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.

7.4 Strainers shall be protected from rust, corrosion and mechanical damage during Transportation Shipment and storage.

7.5 Rust preventive used on machined surfaces to be welded shall be easily removable with the Petroleum solvent and the same shall not be harmful to welding.

7.6 All strainers shall be properly covered by suitable protective means to avoid any damage during transportation. Butt-welding ends of valves shall be capped or properly protected.Machined surface (Flanges, Threads, Bevel end, etc.) shall be coated with a corrosion inhibitor. Un-machined exterior surfaces of the shell are painted Aluminium. Rust protection for inside of valves shall be performed according to the manufacturer's standard.

7.7 Ends shall be suitably protected, and the protectors shall be securely and tightly attached.

7.7.1 Flange face : Wood, metal or plastic cover

7.7.2 Bevelled end : Wood, metal or plastic cover

7.7.3 Plain end : Plastic cap

7.7.4 SW & Screwed end : Plastic cap

7.8 Machined surface (Threads, Bevel end, etc.) shall be coated with a corrosion inhibitor.

7.9 End protectors to be used on bevelled ends shall be securely and tightly attached without belt wire.

7.10 Steel end protectors for galvanized items shall be galvanized.

7.11 All the strainers shall be cleaned at shop and cleaning procedure may be in accordance with manufacturer’s standard. The extent of cleaning shall include the cleaning of shop dirt, filings, loose weld spatter, chips, fluxes, welding flux deposits, etc.

7.12 Each strainer shall be legibly stamped or stencilled showing the specification number, grade, and class. When metal stamping is used it shall be on the long edge of each component as it leaves the mill. Metal stamping on rolled surfaces shall be done with a “low stress” stamp.

7.13 Marking shall be protected from erosion, wear, or other events that may render them Unreadable Guarantee / Warranty, Quality plan, Inspection, Positive material identification (PMI) requirements shall be as per Annexure-3 documentation requirements and others shall be governed by other purchase requirements attached with the material requisition.

8.0Documentation:

5 copies of following test certificates shall be furnished along with each consignment

1) Hydraulic test certificates of the body.
2) Mechanical and chemical certificates for components of strainer.

Var No.	Size	ANSI rating	Sch	Design Pressure ($kg/Cm^2(g)$)	Design Temp (°C)	Special Requirement	Density of Medium (Kg/m^3)	ViscocitY of Medium ($N\text{-}s/m^2$)	Flow (m3/ Hr)
01	36"	#150RF	XS	2	39.9	NACE+HIC+H2	3.393	$8.878X10^{-6}$	29073
02	16"	#150RF	STD	6.5	39.6	NACE+HIC+H2	10.933	$9.058x10^{-6}$	7381

CAV FOR SUB VENDOR ITEMS

1.86	VALVE GATE CAST		
A	INDIAN BIDDERS		
1.86.1	AMPO VALVES INDIA PVT LTD	INDIA	
1.86.3	ASSOCIATED TOOLINGS INDIA PVT LTD	INDIA	Rev.4: Name Updation
1.86.4	AV VALVES LIMITED	INDIA	
1.86.5	BHARAT HEAVY ELECTRICALS LIMITED	INDIA	
1.86.6	CRI PUMPS PVT LTD (UNIT-VALVES)	INDIA	
1.86.7	EXPERT ENGINEERING ENTERPRISES	INDIA	
1.86.8	FLOWSERVE INDIA CONTROLS PVT LTD	INDIA	Rev.2: Name Change
1.86.9	FLUIDLINE VALVES CO.PVT LTD	INDIA	
1.86.10	FORWARD ALLOYS & CASTINGS	INDIA	
1.86.11	FOURESS ENGG (I) LTD. (AURANGABAD)	INDIA	
1.86.12	GM ENGINEERING PVT. LTD.	INDIA	
1.86.13	HAWA ENGINEERS LTD	INDIA	
1.86.14	INTERVALVE POONAWALLA LIMITED	INDIA	
1.86.15	KSB PUMPS LTD (COIMBATTORE)	INDIA	
1.86.16	L & T VALVES LIMITED	INDIA	
1.86.17	LEADER VALVES LTD	INDIA	
1.86.18	MH VALVES PVT LTD.	INDIA	
1.86.19	MICON ENGINEERS (HUBLI) PVT LTD	INDIA	
1.86.20	NILON VALVES PRIVATE LIMITED	INDIA	
1.86.21	NITON VALVE INDUSTRIES PRIVATE LTD .	INDIA	
1.86.22	NSSL PVT. LTD. (NECO SCHUBERT & SALZER)	INDIA	
1.86.23	OSWAL INDUSTRIES LTD	INDIA	
1.86.24	PANCHVATI VALVES & FLANGES PVT LTD	INDIA	
1.86.25	PEE INDUSTRIAL VALVES PVT. LTD.	INDIA	
1.86.26	SAKHI ENGINEERS PVT. LTD.	INDIA	
1.86.27	SHALIMAR VALVES PVT LTD	INDIA	
1.86.28	SHAYBURG VALVES PVT LTD	INDIA	
1.86.29	STEEL STRONG VALVES INDIA PVT LTD	INDIA	
1.86.30	T.S. PUMPS AND VALVES PVT.LTD	INDIA	
1.86.31	VALTECH INDUSTRIES	INDIA	
1.86.32	VELAN VALVES INDIA PVT LTD	INDIA	
1.86.33	TRILLIUM FLOW TECHNOLOGIES INDIA PRIVATE LIMITED	INDIA	Rev.1: Name Change
1.86.34	XOMOX SANMAR LTD-PACIFIC VALVES DIVISION	INDIA	
1.86.35	NUTECH CONTROLS	INDIA	
1.86.36	FLOTEK INDUSTRIES	INDIA	Rev.1: Addition

1.88	VALVE GATE FORGED		
A	INDIAN BIDDERS		
1.88.1	ASSOCIATED TOOLINGS INDIA PVT LTD	INDIA	
1.88.2	AUTOCAP INDUSTRIES	INDIA	
1.88.3	AV VALVES LIMITED	INDIA	
1.88.4	BHARAT HEAVY ELECTRICALS LIMITED	INDIA	
1.88.5	FLUIDLINE VALVES CO.PVT LTD	INDIA	
1.88.6	G M VALVES PRIVATE LIMITED	INDIA	Rev.3: Name Change
1.88.7	HAWA ENGINEERS LTD	INDIA	
1.88.8	INTERVALVE POONAWALLA LIMITED	INDIA	
1.88.9	KSB PUMPS LTD	INDIA	
1.88.10	L & T VALVES LIMITED	INDIA	
1.88.11	LEADER VALVES LTD	INDIA	
1.88.12	MH VALVES PVT LTD.	INDIA	
1.88.13	MICON ENGINEERS (HUBLI) PVT LTD	INDIA	
1.88.14	NITON VALVE INDUSTRIES PRIVATE LTD.	INDIA	
1.88.15	NSSL PRIVATE LIMITED	INDIA	Rev.4: Name Updation
1.88.16	OSWAL INDUSTRIES LTD	INDIA	
1.88.17	PANCHVATI VALVES & FLANGES PVT LTD	INDIA	
1.88.18	PEE INDUSTRIAL VALVES PVT. LTD.	INDIA	
1.88.19	SHALIMAR VALVES PVT LTD	INDIA	
1.88.20	SHAYBURG VALVES PVT LTD	INDIA	
1.88.21	STEEL STRONG VALVES INDIA PVT LTD	INDIA	
1.88.22	VEE TECH VALVES PRIVATE LIMITED	INDIA	
1.88.23	VELAN VALVES INDIA PVT LTD	INDIA	
1.88.24	TRILLIUM FLOW TECHNOLOGIES INDIA PRIVATE LIMITED	INDIA	Rev.1: Name Change
1.88.25	RASAII FLOW LINES PVT LTD.	INDIA	

6.89	MAGNETIC LEVEL INSTRUMENTS		
A	INDIAN BIDDERS		
6.89.1	ABB INDIA LIMITED	INDIA	Rev.2: Name Change
6.89.2	BLISS ANAND PVT LTD	INDIA	
6.89.3	~~CESARE BONNETTI S.P.A.~~	INDIA	Rev.6: Deletion
6.89.4	GAUGES BOURDON (I) PVT LTD (GEN. INST.)	INDIA	
6.89.5	KROHNE MARSHALL PVT. LTD	INDIA	
6.89.6	LEVCON INSTRUMENTS PVT LTD	INDIA	
6.89.7	LAMTECH SOLUTION LLP	INDIA	Rev.2: Name Change
6.89.8	PRATOLINA INSTRUMENTS PVT LTD	INDIA	
6.89.9	PUNE TECHTROL PVT LTD	INDIA	
6.89.10	SHRIDHAN AUTOMATION PVT LTD	INDIA	
6.89.11	SIGMA INSTRUMENTS COMPANY	INDIA	Rev.6: Name Change
6.89.12	CHEMTROLS INDUSTRIES LTD	INDIA	
6.89.13	CHEMTROLS SAMIL (INDIA) PVT LTD (Old Name: CHEMTROLS INDUSTRIES LTD)	INDIA	
6.89.14	TECHNOMATIC INDIA PVT LTD	INDIA	
6.89.15	CESARE BONNETTI INDIA PVT LTD	INDIA	

ANNEXURE-1

REQUIREMENTS FOR WET H2S/HIC SERVICES (AXN-1, AXN-2, AXN-3 & AXN-4) APPLICABLE TO CARBON STEELS

REQUIREMENTS FOR WET H2S/HIC SERVICES (AXN-1,AXN-2, AXN-3 & AXN-4) APPLICABLE TO CARBON STEELS

1.0 General

This document defines job specific requirements for WETH2S/HIC items under AXN1, AXN2, AXN3 & AXN4 for Carbon Steels.

2.0 Requirements of 'AXN-1', 'AXN-2', 'AXN-3' AND 'AXN-4' items applicable to carbon steels

2.1 All 'AXN-1' Carbon steel items shall meet the following requirements:

a) Requirements as per NACE MR0103
b) Requirements for 'Wet H2S Resistant Materials' as elaborated in this document.

2.2 All 'AXN-2' Carbon steel items shall meet the following requirements:

a) Requirements as per NACE MR0103
b) Requirements for 'Wet H2S Resistant Materials' as elaborated in this document.
c) Special requirements for Hydrogen service as given in Technical Notes for the item or as given in Job Spec B224-6-44-0082 for the item.

2.3 All 'AXN-3' Carbon steel items shall meet the following requirements:

a) Requirements as per NACE MR0103
b) Requirements of 'HIC Resistant Materials' as elaborated in this document.

2.4 All 'AXN-4' Carbon steel items shall meet the following requirements:

a) Requirements as per NACE MR0103
b) Requirements of 'HIC Resistant Materials' as elaborated in this document.
c) Special requirements for Hydrogen service as given in Technical Notes for the item or as given in Job Spec B224-6-44-0082 for the item.

3.0 Welding in wet H2S service

Filler metal and weld deposit shall have diffusible hydrogen content typically below 5mL/100g. Nickel content of filler metal also shall remain below 1 and Manganese content below 1.5 .

Welding Procedure Specification WPS for CS material in wet H2S service shall include PWHT regardless of construction code requirement. PWHT temperature shall not be less than 620 C (1150 F) and minimum 93 C (200 F) preheat temperature should be used for all welding. A hardness survey on preproduction welded coupons to be conducted. Test indentations should be taken on the weld deposit, Heat Affected Zone (HAZ) and base metal, in the cap and root of the weld. Welding Procedure Qualification Record (PQR) shall be documented with hardness survey.

Hardness should be limited to the following after PWHT:

- Base metal: 237HBW (22HRC)
- Weld deposit: 200HBW
- Heat Affected Zone: 237HBW (22HRC)

PWHT shall be applied to welded assemblies for corrosion reasons, and production welds shall be 100 UT tested. Hardness verification of production welds is required. More information on welding practice of CS material in wet H2S service can be found in document NACE SP0472.

4.0 Wet H2S resistant materials

4.1 General requirement for CS materials in wet H2S service

This section applies to 'Wet H2S resistant materials'. In addition to PWHT requirements and hardness limitations of welded assemblies described in clause 3.0, CS supplied under this specification shall comply with the following:

- CS must be fully killed,
- CS products shall be supplied in the Normalized or Quench and Tempered condition regardless of thickness,
- Hardness of CS products (base metal before PWHT) shall be limited below 22HRC (or 237HBW),
- Ni content shall be limited below 1 w,
- Carbon content shall be limited below 0.20 w,
- Carbon Equivalent CE C Mn/6 (Cr Mo V)/5 (Ni Cu)/15 should be limited:

    - Below 0.42% for thickness below 2"
    - Below 0.45% for thickness above 2"

Thermal stress relieving is required for cold worked and cold forged zones, even if not required by the construction code. Cold deformation above 5 may require recovery annealing to restore properties of steels.

In addition to the above points, 'Wet H2S materials' shall have Phosphorous and Sulfur content limited as described in following sections dedicated to different CS product forms.

4.2 Plates, Welded pipes and other products originated from plates

All the specifications given in clause 3.0 and 4.1 are applicable and Impurity level in carbon steel products originated from plates shall be controlled in order to avoid the occurrence of brittle phases during welding:

- Maximum allowable Phosphorus content **0.020 w**
- Maximum allowable Sulfur content **0.015 w**

4.3 Seamless Pipes

Small and medium size process piping shall be of seamless type whenever possible.

All the specifications given in clause 3.0 and 4.1 are applicable and Impurity level in seamless carbon steel pipes shall be controlled in order to avoid the occurrence of brittle phases during welding:

- Maximum allowable Phosphorus content **0.030 w**
- Maximum allowable Sulfur content **0.010 w**

4.5 Forgings, Castings, Fittings and Accessories

All the specifications given in clause 3.0 and 4.1 are applicable and Impurity level in carbon steel forgings, castings and fittings not originated from plates shall be controlled in order to avoid the occurrence of brittle phases during welding:

- Maximum allowable Phosphorus content **0.025 w**
- Maximum allowable Sulfur content **0.020 w**

Valves internals made from carbon steel shall have hardness limited below 22HRC before PWHT. Other elements not made from carbon steel shall comply with dedicated section of NACE MR0103 if applicable.

5.0 HIC resistant materials

5.1 Plates, welded pipes and other products originated from plates

In addition to all the requirements listed in clause 3.0 (Welding in wet H2S service) and clause 4.0 (Wet H2S resistant materials), HIC resistant material products originated from plates shall comply with the following:

Killed carbon steel plates shall be obtained by vacuum degassing process. Inclusion shape control by calcium treatment (or equivalent process) is also required, and impurity level shall be controlled in order to limit the level of inclusions:

- maximum allowable Phosphorus content **0.010 w**
- maximum allowable Sulfur content **0.002 w**
- maximum allowable Oxygen content **0.0025 w (target 0.0020 w)**

Plates, welded pipes and other products originated from plates shall pass HIC test as per NACE TM0284. Mill test reports shall include the values for the Crack Length Ratio (CLR), Crack Sensitivity Ratio (CSR) and Crack Thickness Ratio (CTR).

HIC test results requirements:
- Average CLR ≤ 5% with CLR □ 7 for each individual section
- Average CTR □ 1.5 with CTR □ 2 for each individual section
- Average CSR □ 0.5 with CTR □ 0.7 for each individual section

The average is the sum of the values obtained on each section divided by the total number of sections examined (arithmetic mean).

5.2 Other product forms not originated from plates

Products that are not originated from plates shall meet the requirements listed in clause 3.0 (Welding in wet H2S service) and clause 4.0 (Wet H2S resistant materials) for the achievement of resistance to HIC related damage mechanisms.

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Contents:

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1 GENERAL

1.1 Unless otherwise specified, pipes shall be supplied in random lengths of minimum 4 meters. Single random length of 4 – 7 meters for any pipe size is acceptable. At the time of supply, quantity tolerance shall be 0 / +1 random length.

1.2 All pipes shall be supplied thoroughly cleaned from inside and with ends plugged properly.

1.3 In case of low temperature carbon steel pipes and fittings, material certificates for impact test as per relevant codes shall be furnished.

1.4 All socket weld and slip-on flanges shall suit pipe O/D as per ASME B36.10M / ASME B36.19M unless specifically asked to suit pipe O/D of IS 3589 pipes.

1.5 Slip-on flanges NS 4" & above shall have 1/8" diameter drilled hole through the hub for venting of gases during welding.

1.6 The surface finish for flanges shall be obtained by cylindrical machining so that no radial tool marks are created on the finish surface during machining.

1.7 All gasket design shall be such that the gasket factor (m) and minimum gasket design seating stress (y) shall conform to the requirements of ASME B16.5.

1.8 Unless otherwise specified, all threaded items shall have NPT threads as per ASME B 1.20.1.

1.9 Welded pipes upto size 36" shall be acceptable only with single seam longitudinal weld. Pipes above 36" can have two longitudinal welds 180 Deg. apart.

1.9.1 All welded CS fittings shall be normalised. All alloy steel items shall be normalised and tempered. Solution annealing shall be done for all stainless steel items.

1.9.2 All welded fittings shall be double welded. Inside weld projection shall not exceed 1.6 mm, and the welds shall be ground smooth at least 25 mm from the ends. For fittings made out of welded pipe, the pipe itself shall be of double welded type, manufactured with the addition of filler material and made employing automatic welding only.

1.9.3 In case of all items (SMLS, Welded, Forged) are with IBR Certificate, the carbon percentage shall be limited to 0.25. Moreover, for IBR flanges, sulphur and phosphorus content shall be limited to 0.05% each.

1.10 **GALVANISED ITEMS :**

1.10.1 Galvanised pipes shall be only hot dip galvanised according to ASTM A53.

1.10.2 For fittings & other items required to be galvanised, the zinc coating shall be in accordance with ASTM A123. Fasteners & washers, if required galvanized, the galvanizing shall be as per ASTM A153.

1.10.3 Items specified to be galvanised shall be completely fabricated prior to application of the hot dip galvanising process.

1.10.4 Items shall not be hot dipped before surface preparation has been carried out in a full and correct manner.

1.10.5 Surfaces shall be free of old paint, oil, grease, weld, slag deposits and laminations; and rolling fabrication defects eliminated prior to hot dipping.

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1.10.6 Coating weight shall comply with ASTM A123.

1.10.7 Repairs : For touch-up of drilled and/or cut edge damage areas of galvanised steel, surfaces shall be hand tool cleaned and painted with one coat of zinc-rich epoxy to a nominal DFT of 60 micron. Major damage shall be re- galvanised in accordance with the above mentioned standard.

1.11 For welded tees (longitudinally welded), set-on type branching is not permissible.

1.12 For all carbon steel pipes, fittings and flanges the carbon equivalent (CE) shall not be greater than 0.42%. This requirement is not applicable for IS1239 / IS3589 pipes. The CE shall be determined based on the following formula.

$$CE = C + (Mn / 6) + (Cr + Mo + V) / 5 + (Ni + Cu) / 15$$

1.13 Where manufacturer's standard is specified, the supplier shall submit four copies of drawing indicating the relevant details along with the offer.

1.14 In case of fasteners where threading is specified to ASME B1.20.1, the first size specified indicates bolt/stud diameter in inches and second dimension indicates length in mm.

1.15 Unless otherwise specified, spiral wound gaskets shall have inner & outer ring construction. Inner ring bore shall be equal to pipe bore. Filler for spiral wound gasket shall not have any colour or dye. Full face gaskets shall have bolt holes punched out.

1.16 All SW flanges & fittings should be as per ASME B16.11.

1.17 All BW ends should be as per ASME B16.25. All BW ends of welded fittings shall be 100% DP/MP tested.

1.18 For stud bolts, rolled / formed threads are only allowed (no cut threads). Nuts shall be made by hot forged process. Stud bolts shall be threaded full length with two heavy hex. nuts.

1.19 For bolts, heat treatment & threading sequence shall be as specified in the applicable codes.

1.20 For Fasteners :

1.20.1 Thread std. (bolt) : ASME B1.1 CL.2A / Thread std. (Nut) : ASME B1.1 CL.2B.
1.20.2 UNC thd. for ≤ 1" dia & UN8 thd. for > 1" dia.
1.20.3 End machining of Studs shall be to DIN 976 Type B / ISO 4753 (chamfered ends).

1.21 For RTJ flanges, spectacle blinds and spade-spacers, min. hardness shall be as follows. Hardness of the groove shall be specified on the test report.

Flange Material	Min. hardness of groove (BHN)
Carbon Steel	140
1% Cr – 5%Cr, ½% Mo	150
SS304, SS316, SS321, SS347	160

1.22 Any conflict between this document and technical specification, the stringent requirement shall be followed in consultation with tkIS (India).

1.23 The technical part of the offer must consist of tkIS (India) Technical Specification for the particular item in which the vendor has to mark clearly 'YES' against each line of the specification sheet under the column "Bidder's Comments", in case the bidder is taking a deviation from tkIS (India) spec. The bidder should clearly state the alternative offered. Deviations indicated anywhere else will not be

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entertained. The sheet must bear the seal and signature of the bidder in the technical specification sheet.

01 1.24 All pipes (seamless as well as welded) shall have uiniform negative wall thickness tolerance of 12.5%.

1.25 Stress rupture test as detailed in ASTM A453 shall be carried out for all for fasteners specified to A453 Gr. 660 Cl.A.

1.26 **NACE requirements:**

All components in NACE service (as indicated on datasheets) shall comply with requirements of NACE MR-0103, with following additional requirements:

a) For carbon steels, hardness of material shall be below 22HRC. Hardness for any weld & HAZ shall be limited to HB 200 max.
b) Carbon steel must be fully killed type.
c) Ni content in CS items shall be less than 1%.
d) Carbon content shall be 0.2% max.
e) Max. Carbon equivalent shall be 0.42%
With Ceq = C + Mn/6 + (Cr +Mo + V)/5 + (Ni + Cu)/15
f) Max. allowable phosphorus content : 0.030%
g) Max. allowable Sulphur content : 0.020% for seamless pipe and 0.025% for fittings and flanges
h) All welds shall be stress relieved.
i) All plates & plate fabricated items including welded pipe and fittings shall be HIC resistant. Steel shall be produced by vacuum degassing. HIC test shall be carried out in accordance with NACE TM0284 by using the acidified test solution 'A' specified in NACE TM0177 with CLR <=5%. Vendor to demonstrate its capacity of producing "Sour Service Pipes/ Fittings" through previous HIC testing data. Additional chemical requirements to be followed for HIC resistant steel are :
    1. Oxygen content less than 0.0025%
    2. Max. allowable Phosphorus – 0.010%
    3. Max. allowable sulfur content – 0.002%

1.27 Items under "HYDROGEN SERVICE/ H2 Service" (as indicated on the data sheet) shall comply with the requirements of doc. no. 6717-PIP-G00-EC-0014. Items under "H2 Service + NACE" shall comply with both NACE requirements as per clause 1.26 above and doc. No. 6717-PIP-G00-EC-0014.

1.28 The stabilised grades of austenitic stainless steel – SS 321, SS 321H, SS 347 & SS 347H shall be supplied in solution heat treated condition, water quenched, followed by thermal stabilization at 900 Deg. C for 4 hours. All "H" grades shall have C content of 0.04% minimum. 01

1.29 Deleted.

1.30 Jack Screws holes along with jack srews shall be provided to facilitate disassembly of RTJ flanged joints. The flange sizes that need Jack screw arrangement is as follows:

Sizes 16" and above for RTJ flanges with rating 900 and above
Sizes 24" and above for RTJ flanges with rating 150, 300 & 600.

Each jack screw provided flange shall have a machine bolt mounted in a drilled hole on the flange centre line. Machine bolt shall be regular with one heavy hexagonal nut. A slot 0.06 inch wider than the width across flats of the nut shall be provided in the flange. The depth of the slot shall admit the nut so that there is no interference with the joining of the flanges when bolted together. (Refer Clause No. 8 on page no. 14 for details)

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1.31 RTJ Flanges shall have a flat bottom groove. The intersection between the bottom and the sides of the groove shall be machined to a smooth 0.125 inch (3mm) minimum radius.

2 INSPECTION AND TEST

Vendor / manufacturer shall have and maintain a quality control system which will establish that all specified requirements including raw material control system, manufacturing, heat treatment, NDT and all other tests will be met. Vendor shall submit the QAP to tkIS for approval. Vendor shall offer the products for tkIS / TPIA inspection at manufacturer's place with all necessary gauges and measuring instruments. The following evaluation / inspection shall be carried out.

2.1 For all austenitic SS castings, IGC test shall be conducted as per ASTM A262 practice B with acceptance criteria of 60 MILS/Year (max.).

Or

For all austenitic SS items except castings, IGC test shall be carried out as per ASTM A262 Practice "E", with acceptance criteria of "No cracks observed from 20X magnification". "Microscopic structure to be observed from 250X magnification" – in addition.

IGC tests shall be carried out for at least two sets of samples drawn from solution annealing lot, one corresponding to highest carbon content & another set corresponding to highest wall thickness.

All shop test certificates and records as defined in the technical specification shall conform to the corresponding ASME / ASTM / API / BS / IS / IBR specifications.

2.2 Where corrosion test is specified as a supplementary requirement, it shall be carried out for at least one sample per heat, per lot (Lot is as defined in ASTM A960).

2.3 Review of manufacturing / inspection procedure followed by manufacturer.

2.4 Identification / review of raw material test certificate / records.

2.5 Review of heat treatment procedure & heat treatment charts.

2.6 Review of manufacturer's Test certificates / Reports.

2.7 Verification of marking / stamping on each item.

2.8 100% visual inspection by tkIS / TPIA – Surface of fittings shall be free from rust, rust preventive coating, mill scales etc. C.S. fittings shall be offered in shot blasted condition and S.S. fittings shall be offered after pickling and passivation. Flanges shall be offered in machined condition before applying rust preventive.

2.9 Dimensional inspection: - Manufacturer must ensure that 100% pipes, fittings, flanges, gaskets are dimensionally inspected by them and item wise major dimensions are recorded in an inspection report before offering to tkIS / TPIA. tkIS / TPIA will carry out dimensional inspection. For all items (ordered on manufacturer) tkIS / TPIA shall witness 10%. Fasteners – Inspection with "GO" and "NO GO" gauge -100% inspection by manufacturer & 10% inspection by tkIS / TPIA.

2.10 Review of chemical & witness random Physical / IGC test etc., as per QAP.

2.11 20% of Fittings / Flanges shall be subject to hardness test of CS & AS material.

2.12 Butt weld edge preparation of 20% Fittings / Flanges shall be subject to D.P. test.

2.13 Pipes, Fittings and Flanges shall be subjected to P.M.I. test as per below listed table.

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Sr.no	Scope	Manufacturer	Trader	TPI	Remarks
1	1) Pipes and Fittings – material and welds 2) Flanges 3) Spectacle blinds 4) RTJ Gasket	100%	-	10%*	*In the case of imported items, scope to be decided by Client / tkIS / TPIA.
		-	100%	100%*	
2	Fasteners	Up to 100 lot size : 2% (min. 2) > 100 up to 500 lot size : 1% (min 3) > 500 lot size : 0.5% (min 5)			
Note:- 1) tkIS / TPIA reserves the right to increase the % of Witness based on vendor past performance. 2) In case of failures noticed during witness by tkIS / TPIA, additional sampling shall be in accordance with API 578.					

2.14 Radiography - Extent of radiography shall be as per applicable code / tkIS (India) specification. All RT films shall be reviewed by manufacturer & offered to tkIS / TPIA for review.
UT - If specified, 100% examination must be performed by manufacturer & tkIS / TPIA shall review the UT report.

2.15 Hydro test of Pipes – 100% by manufacturers. For pipes ordered on manufacturer, minimum 10% per pipe tag / size / visit shall be witnessed by tkIS / TPIA. Post / pre order, the % of witness may be increased at discretion of tkIS / TPIA.

2.16 No repair is permitted on the base material.

2.17 Steel Insert Rubber / PTFE gaskets – 100% shall be spark tested at min. 15 Kv.

2.18 Any non-conformity during sampling inspection will lead to rejection of total lot of material offered for inspection.

2.19 100% Pipes, Fittings, Flanges shall be stamped with "tkIS (India)" item codes after satisfactory inspection. In case of Gaskets and Fasteners – Tags to be stamped by tkIS / TPIA.

2.20 Manufacturer's certificate shall be countersigned by tkIS / TPIA after satisfactory inspection.

2.21 IBR approved material must be offered to tkIS / TPIA with Original IBR certificate or IBR endorsed certificate. For IBR items, tkIS / TPIA shall witness 2.9, 2.11, 2.12, 2.13, 2.14 & 2.15 mentioned above.

2.22 Above requirements are minimum and any other purchase order / project specifications requirements must also be fulfilled by the Manufacturer / Vendor.

2.23 For elbows, minimum thickness at the mid-span, intrados, extrados and end tangents shall not be less than specified wall thickness.

2.24 All measuring gauges and instruments shall have valid calibration certificate.

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2.25 Deleted. 01

2.26 Deleted.

2.27 All certification for supplied material shall be in accordance with European Standard EN 10204. Certificates shall be available at the time the materials are ready for inspection. Certificates as a minimum shall provide information as per Table 1. Certificate type 3.1 required for pressure retaining & moving parts, type 2.1 for seals (metallic / soft / non-metallic).

3 RADIOGRAPHY

3.1 For fittings, 10% radiography means 10% of the quantity ordered per size, per heat, per lot & for pipes, 10% radiography means 10% of the running pipe length per lot / per size / per visit.

3.2 100% radiography means entire quantity for all sizes has to be radiographed.

3.3 Where extent of radiography is specified as 300mm per pipe length, it shall be distributed at least two places along the pipe length.

4 HYDROTEST

4.1 Hydrotest for the pipes shall be as defined under Clause 21 of ASTM A530 or clause 22.2 of ASTM A999 as applicable. For hydrotest the chloride content in water shall not exceed 20 ppm for SS items unless otherwise specified. Potable water shall be used for testing CS and AS components.

5 MARKINGS

5.1 Pipes, flanges and fittings shall be furnished with weatherproof marking as per respective technical specification sheets. However, for NS 1" and below the code no. & size shall be minimum specified and other details should be furnished with a metal tag in the packing box.

5.2 As far as possible hard stamping shall be avoided for wall thickness less than 3.2mm. Any other suitable means of identification shall be used instead. Light metals, like Al, Ti, Ni, Monel and Hastelloy should not be hard stamped.

6 PACKING

6.0 All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kind

6.1 Machined surfaces of flanges and all threaded and welding ends shall be protected against damage during transit and storage. For flanges the machined surfaces shall be coated with easily removable rust preventive grease or protective coating and the surface shall then be covered with heavy-duty plastic or wooden or metallic covers.

6.2 Where wood fiber or metal covers are used, plastic sheet shall be placed between the flange and the cover for additional protection.

6.3 Protective coating as per ASTM A700 Table 1, type A shall be applied for pipes, fittings and flanges before delivery.

7 COLOR CODING FOR MATERIAL IDENTIFICATION

7.0 Required markings shall be applied by those methods permitted by the product specification, however, the following limitations apply:

7.1 Hard stamping shall only be applied using "low-stress' (rounded) type die stamps.

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7.2 Ink stamped marks shall be made in suitably prepared areas and such marks shall be protected by clear varnish.

7.3 Any paints, inks or varnish shall be durable and marks shall be capable of remaining legible for at least four years from delivery subject to weather, marine atmosphere and handling. Such marking materials shall not be injurious to the items being marked or during welding, heating and service. In particular, shall be sulphur-free and not contain Halogens, Antimony, Arsenic, Copper, Lead, Mercury, Sodium, Vanadium or Zinc in individual concentrations greater than 0.3% by weight in the dry film. Paint I ink for marking SS items shall be chloride free.

7.4 Pipes, fittings, flanges, gaskets & fasteners shall be marked as follows :

7.4.1 Materials shall be marked as required by the applicable product specification and each item or piece shall be individually marked with the following:

- The maker's name or logo
- Material & Grade
- The cast or heat number which correlates the item to the applicable material certificate(s).
- Method of manufacture (e.g. cast, forged, welded, seamless etc.).
- Size, wall thickness, schedule and/or rating appropriate.
- Colour Coding (Pipes, fittings & flanges - Table 2, gaskets & fasteners - Table 3).

7.4.2 Each item or piece shall also be individually marked with its appropriate requisition number and requisition item number together. Where small size precludes such individual markings, i.e., socket weld/screwed fittings and nipples DN 40 mm and smaller, compression fittings, etc., each box/package containing the same items or pieces shall have the appropriate requisition item number durably marked on it.

7.4.3 Colour codes shall be applied as a continuous stripe along the complete length of each piece. Each stripe shall be as wide as practicable, up to approximately 13mm wide for sizes 2" and below, 25mm wide sizes 3" and larger. For flanges the paint colour code shall fully encircle the flange.

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Table – 1

	Pipe	Fitting	Plate	Steel Section	Casting	Forging	Stud Bolt	Weld Consumable
STANDARDS								
Material / Design Grade	X	X	X	X	X	X	X	X
Welding Process	X	X		X				
Heat Treatment	X	X	X	X	X	X	X	
IDENTIFICATION								
Mills/Manufacture Name / Symbol	X	X	X	X	X	X	X	X
Certificate Number	X	X	X	X	X	X	X	X
Traceable Numbers	X	X			X	X		
Date of Issue	X	X	X	X	X	X	X	X
Charge / Batch Number	X	X	X	X	X	X	X	X
Service Rating					X	X		
Dimensions (Size/Diam./Sched)	X	X	X	X	X	X	X	
DATA								
Mech. Properties	X	X	X	X	X	X	X	X
Chemical Analysis	X	X	X	X	X	X	X	X
No. of Samples Tested	X	X	X	X		X		
Temperature of Heat Treatment	X	X	X	X	X	X	X	
ORDER REFERENCE								
Purchase Order No./ Item Number	X	X	X	X	X	X	X	X
Quantity	X	X	X	X	X	X	X	X
Purchase Order No./ Item Number	X	X	X	X	X	X	X	X

Notes :

1. When hydrostatic testing, test pressure and test result shall be recorded.
2. Charge number is same as heat numbers for castings. When batch number is indicated, it shall be traceable to the heat / charge number. In case of forgings, the forging number / batch number shall be traceable to the heat number of the base material.
3. The traceable number shall be clearly indicated on the relevant Material Certificate.
4. In compliance with the appropriate AWS filler metal specification.

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TABLE - 2 : COLOR CODING FOR PIPES, FITTINGS, FLANGES		
MATERIAL OF CONSTRUCTION		**COLOUR CODE**
Carbon Steel		
Carbon Steel (non sour service)		Pink
Carbon Steel (NACE+H2)		Pink + Red
Carbon Steel (IBR)		Pink + Green
Carbon Steel (NACE)		Pink + Blue
Carbon Steel (H2 Ser.)		Pink + Yellow
Low Alloy Steel		
1 1/4% Cr – 1/2% Mo (H2 SER.)		Blue + Yellow
1 1/4% Cr – 1/2% Mo (IBR)		Blue + Green
2 1/4% Cr – 1% Mo		Blue + Red
2 1/4% Cr – 1% Mo (NACE+H2)		Blue + Blue
Austenitic Stainless Steel		
18:8	SS 304	Orange
18:8 (H2 SER.)	SS 304L	Orange + Pink
18:8:+ Mo	SS 316	Orange + Blue
18:8:+ Mo (0.03 % C)	SS 316L	Orange + Yellow
18:8:+ Ti (H2 SER.)	SS 321	Orange + Green
18:8:+ Nb (H2 SER.)	SS 347	Orange + Red

TABLE - 3 : COLOR CODING FOR FASTENERS & GASKETS		
Fasteners	**Specification**	**Colour Code**
Ferritic Steel (Cr:Mo)	A193 B7 / A194 2H	None
Ferritic Steel (Cr:Mo)	A193 B7M / A194 2HM	Blue / Blue
Ferritic Steel (Cr:Mo:V)	A193 B16 / A194 4	Yellow / Yellow
Austenitic Steel	A453 Gr.660 Cl.A / A453 Gr.660 Cl.A	Green / Green
Low Tensile	A307 Gr.B / A563 Gr.A	Pink / Pink
Gaskets		
SP WD SS 316L + FLX GRPH	Pink	
SP WD SS316 + FLX GRPH	Blue	
SP WD SS321 + FLX GRPH	Green	
RTJ – SOFT IRON	Identification to be stamped on the ring as per ASME B16.20	
RTJ - SS347		
RTJ - 5%Cr & 1%Mo		

ANNEXURE-3

SPECIFICATION FOR POSITIVE MATERIAL IDENTIFICATION (PMI)

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1 SCOPE

1.1 This specification defines the minimum mandatory requirements for Positive Material Identification (PMI) of metallic materials. It is intended to ensure that the nominal composition of the metallic component and associated welds have been correctly supplied and installed, as specified.

1.2 This specification is applicable for PMI examination to be performed at the Supplier's/Manufacturer's works and Sub-supplier's works before dispatch of materials. This specification is also applicable to Site for field fabrication.

1.3 This specification shall apply to both new and repair or replacement of metallic component and associated welds.

1.4 This specification covers the procedures, methodology, instrument/analyzer to be used, calibration, extent of examination, acceptance criteria, rejection procedure & marking etc.

2 DEFINITIONS

2.1 **Alloy Material:** Any metallic material (including welding filler materials) that contains alloying elements such as Chromium, Nickel, Molybdenum or Vanadium, etc., which are intentionally added to enhance mechanical or physical properties and/or corrosion resistance. Alloy may be ferrous or non-ferrous.

2.2 **Inspection Lot:** A group of items or material of the same type from a common source offered for inspection covered under same size, Heat and Heat treatment lot.

2.3 **Lot size:** The number of items available in the inspection lot at the time a representative sample is selected.

2.4 **Owner/User:** Indian Oil Corporation Ltd. (IOCL).

2.5 **EPCM:** Here EPCM is "Technip India Ltd."

2.6 **Positive Material Identification (PMI):** A physical evaluation or test of a material performed to confirm that the material which has been, or will be placed into service is consistent with what is specified by the owner/user. These evaluations or tests may provide either qualitative or quantitative information that is sufficient to verify the composition.

2.7 **Random:** Selection process by which choices are made in an arbitrary and unbiased manner.

2.8 **Representative sample:** One or more items selected at random from the inspection lot that are to be examined to determine acceptability of the inspection lot.

2.9 **DCI:** Document Control Index, list of documents, as agreed with the contractor/supplier, indicating the documents requiring approval from PMC/OWNER, or submission for information of PMC/OWNER, ,or those requiring no formal submission to PMC/OWNER.

2.10 **Supplier/Manufacturer:** Any Supplier or Manufacturer on whom an order is placed for the supply of referred items. This definition shall also include any sub-Supplier or manufacturer on whom a sub-order is placed by the Supplier.

3 ACCEPTABLE METHODS FOR PMI

3.1 The method used for PMI examination shall provide a quantitative determination of the alloying elements like chromium, nickel, vanadium etc. in metallic alloy materials.

3.2 Instruments or methods used for PMI examination shall be able to provide quantitative, recordable, element composition results for positive material identification of alloying elements present.

3.3 The acceptable instruments for alloy analyser shall be either " Portable X-Ray Fluorescence " or " Optical Emission " type capable of verifying the percentage of alloy elements within specified range. The following methods / instruments are acceptable; - Portable X-Ray Fluorescence Analysers TN Technologies Alloy Analyser 9266, 9277 (The Metallurgist XR) or Metallurgist Pro, Metorex-X-MET 880, X-MET 960 or X-MET 2000, X-MET 5000, X-MET 5100, INNOVX – DELTA CLASSIC, DELTA PREMIUM, NITON – XL2T, XL2 800, XL 3T, XL 3T GOLDD. - Portable Optical Emission Analyser Spectro Port Model TP-07 or TFO-02, Spectro Test F, Metorex ARC-MET 900 or ARC-MET 930 - Similar Equipment may be used.

3.4 Chemical Spot Testing, Magnets, Alloy Sorters and other methods using eddy current testing methods are not acceptable for PMI examination.

3.5 The PMI instrument used shall have the sensitivity to detect the alloying elements in the specified range.

3.6 All PMI instruments shall have been serviced within a 6 months period of time of use to verify the suitability of batteries, sources etc. The data of last service shall be stated on the PMI Report.

3.7 Each analyzer must be calibrated according to the manufacturer's specification at the beginning and end of each shift. Instrument must be checked against known standard for each alloy type to be inspected during the shift.

3.8 Certified samples with full traceability of a known alloy material shall be available for use as a random check on instrument calibration.

3.9 The surface to be examined shall be prepared by light grinding or abrasive paper and solvent cleaner. Evidence of arc burn resulting from examination shall be removed by light grinding or abrasive paper.

3.10 No permanent marks, which are injurious to the usage of product in service, are acceptable.

3.11 RTJ Gaskets of alloy material shall be inspected by using portable X-Ray Fluorescent instrument.

3.12 Testing shall be done as per procedure outlined by the manufacturer of alloy analyser being used. Modification of these procedures must be approved by manufacturer of the alloy analyser.

3.13 The persons performing PMI shall demonstrate their capabilities to the satisfaction of visiting inspector. If the vendor has qualified operator on their rolls, he may perform the examination. Otherwise PMI examination shall be sub – contracted to an independent agency approved by PMC/ Owner.

4 EXTENT OF PMI EXAMINATION

4.1 PMI check shall be done at all three stages for fabrication jobs:

a) At Sub – Vendor Shop.
b) After receipt at Shop.
c) Final Stage before Hydro.

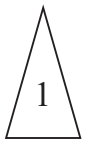
4.2 Following sampling plan in table 1 shall be applicable for PMI examination of various alloy material items: -

TABLE 1 – EXTENT OF PMI EXAMINATION	
Material	**Extent of Examination**
Piping	
Pipe including alloy lined/clad pipe	100 %
Flange/Forging	100 %
Fitting including clad fitting	100 %
Valves	100 %
Expansion Joints and special items	100 %
Pressure Vessel	
Shell	100 %
Heads	100 %
Nozzles	100 %
Flanges	100 %
Fittings	100 %
Alloy lined or Clad component	Min. 1 spot per component
All parts wetted with service fluid	100 %
All Non-pressure, Non-wetted components	Min. Two (2 Nos.) random samples drawn from each Size/Heat/Lot
Heat Exchanger, Heaters & Boilers	
Shell	100 %
Heads	100 %
Nozzles	100 %
Flanges/Forgings	100 %
Fittings	100 %
Tubes	100 %
Tube Sheet	100 %
Expansion Bellows	100 %
Alloy lined or Clad component	100 %
Baffle, Tie rods, Sealing strips etc.	Min. Two (2 Nos.) random samples drawn from each Size/Heat/Lot
All Non-pressure, Non-wetted components	Min. Two (2 Nos.) random samples drawn from each Size/Heat/Lot
Rotating Equipment	
Casing	100 %
Cylinder	100 %
Piston	100 %
Shaft/crank shaft	100 %
Impeller	100 %
All wetted parts with service fluid	100 %
All Non-pressure, Non-wetted components	Min. Two (2 Nos.) random samples drawn from each Size/Heat/Lot
Package	
All Pressure parts	100 %
Orifice Plate	100 %
All non-pressure parts	Min. Two (2 Nos.) random samples drawn from each Size/Heat/Lot

<table>
<tr><th>Material</th><th>Extent of Examination</th></tr>
<tr><td colspan="2">Table 1 contd.</td></tr>
<tr><td colspan="2">Instrumentation</td></tr>
<tr><td>Control Valve</td><td>100 %</td></tr>
<tr><td>Safety Valve</td><td>100 %</td></tr>
<tr><td>Valve Trim</td><td>100 %</td></tr>
<tr><td>All types of Gauges and Transmitters</td><td>100 %</td></tr>
<tr><td>Thermowell</td><td>100 %</td></tr>
<tr><td>Thermocouples</td><td>100 %</td></tr>
<tr><td colspan="2">Bulk material including Spares</td></tr>
<tr><td>Fasteners/ Bolting</td><td>For Flange Rating Classes >= 900 – 100%.
For Flange Rating Classes < 900 – Sample as per Table 2 below.
Valve Bonnet bolting for Flange rating classes >= 900 – 100%.
Valve Bonnet bolting for Flange rating classes < 900 – Sample as per Table 2 below.
<table>
<tr><td colspan="2">Table 2</td></tr>
<tr><td>Number of units in a lot</td><td>Representative Sample</td></tr>
<tr><td>1 - 5</td><td>100%</td></tr>
<tr><td>6 - 199</td><td>5 Units or 5%, whichever is greater</td></tr>
<tr><td>>= 200</td><td>10 Units or 3% whichever is greater.</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>RTJ Gaskets</td><td>100%</td></tr>
<tr><td>Solid metal or jacketed metallic gaskets for flange rating classes >= 900</td><td>100%</td></tr>
<tr><td colspan="2">Welding</td></tr>
<tr><td>Pressure retaining welds (Circumferential welds, including valve body to flange and valve body to bonnet welds, Longitudinal Welds)</td><td>Each Weld, with 1 test per weld seam for automatic and semi-automatic welding processes, and 1 test per weld seam 1 test per 450 mm weld length thereafter for manual welding processes. (Note 3)</td></tr>
<tr><td>Repair Welds</td><td>1 test on excavated weld to ensure incorrect material fully removed; thereafter 1 test per 450 mm repair weld length.</td></tr>
<tr><td>Weld overlay</td><td>Min. Two (2 Nos.) random spot on each weld overlaid component</td></tr>
<tr><td>Welding Consumable</td><td>Min. one (1 No.) random consumable/classification/Lot</td></tr>
</table>

Notes: -

1) For welded pipes and fittings, PMI shall be performed on base metal as well as weldments.
2) Whenever any sample drawn to PMI test on the basis of percentage selection above, fails to meet specification requirements, 100% of items of lot shall be tested for PMI.
3) For all welds, PMI shall be performed on the completed weld capping pass (both internal and external, where access permits) and the base material on either side.
4) If all units of the representative sample are acceptable, the inspection lot shall be acceptable.

5 ACCEPTANCE CRITERIA 

5.1 Materials tested by an approved analysis method shall contain the amounts of alloying elements specified in the requisite material grade / Material specification

5.2 Elements to be determined during PMI shall be as per Table 3.

6 REJECTION PROCEDURE

6.1 If the PMI testing results fall outside the acceptable range as defined in cl. 5, below shall be complied:

a. NCR shall be issued by the concerned inspector to determine the root cause, corrective and preventive actions.

b. Replacement of the part/component which failed the PMI examination shall be replaced at Supplier's/Contractor's own cost.

c. After written approval by the PMC/Owner, the part which failed the PMI examination may be sent to an independent laboratory, for conducting detailed chemical analysis, at Supplier's/Contractor's own expense in a time bound manner (say within 15 days of rejection). The independent testing lab shall be accredited to respective suppliers country's statutory calibration body.

6.2 If any unit from the representative sample is found to be unacceptable, the remainder of the lot shall be examined 100%. If the remainder of the lot is found acceptable, the sampling technique in Table 2 shall be resumed. The unacceptable unit(s) shall be replaced and the replacements examined 100%.

6.3 If a lot is found unacceptable, the next two lots, of the same material product and from the same source shall be examined 100%. If both lots are acceptable, the sampling technique in table 2 shall be resumed.

6.4 If any of the lots examined in (6.3) above is found unacceptable, the remaining material product from the same source shall be examined 100%. Any unacceptable unit(s) shall be replaced and the replacements examined 100%.

6.5 When the material markings are incomplete, preventing positive correlation between the material requisition, purchase order and a material test certificate, the material shall be rejected.

6.6 If any component or weld is found unacceptable, supplier will replace it on his own cost and the replacement shall be verified in accordance with this specification.

6.7 There should be a proper procedure to ensure that rejected components are segregated and properly identified to prevent reuse.

7 MARKING

All alloy materials tested by PMI shall be identified using following methods:

A) Bar Code/Hologram Sticker
B) A low stress stamp marking
C) Vibro-etching
D) Color Coding

7.1 All verified materials with an acceptable method shall be marked with “PMI” using one of the above methods A,B & C. For all material having thickness less than 6 mm for ferrous material and less than 13 mm for non- ferrous material shall be marked by Bar Code/Hologram Sticker or Vibro-etching only.

7.2 All components and welds that are found unacceptable shall be marked (by method D) immediately with red color ”X” or “R” , rejected, removed and segregated from the lot.

7.3 When heat treatment is performed after PMI, the identification marking must be recognizable after heat treatment also.

8 RECORDING AND DOCUMENTATION

8.1 The Result of PMI examination to be recorded in a Report Format (suggestive) enclosed with this procedure.

TABLE – 3: ELEMENTS TO BE DETERMINED DURING PMI

MATERIALS (Note – 1)	ELEMENTS TO BE DETERMINED
1 Cr - 0.5 Mo	Cr, Mo
1.25 Cr - 0.5 Mo	Cr, Mo
2.25 Cr - 1 Mo	Cr, Mo
5 Cr - 0.5 Mo	Cr, Mo
9 Cr - 1 Mo	Cr, Mo, V
12 Cr (Type 410S/405)	Cr
12 Cr	Cr
17 Cr	Cr
304 (L)	Cr, Ni, Mo, Nb (Cb), Ti
310	Cr, Ni, Mo, Nb (Cb), Ti
309 (L)	Cr, Ni, Mo, Nb (Cb), Ti
309 Nb	Cr, Ni, Mo, Nb (Cb), Ti
316 (L)	Cr, Ni, Mo, Nb (Cb), Ti
321	Cr, Ni, Nb (Cb), Ti
347	Cr, Ni, Nb (Cb), Ti
Inconel 182/82	Ni, Cr
Inconel 625	Ni, Cr, Mo, Nb (Cb) + Ta, Ti
Inconel 600	Ni, Cr
Incoloy 800	Cr, Ni, Al, Ti, Cu
Incoloy 825	Cr, Ni, Mo, Ti
Admiralty Brass	Cu, Sn, As
Aluminium Brass	Cu, Al, Zn
Cupro-nickel (70-30)	Cu, Ni
Cupro-nickel (90-10)	Cu, Ni
Monel 400	Cu, Ni
Titanium	Ti

Note: (1) List of Material is not exhaustive, and shall not be construed as limiting the alloy materials subject to PMI.

SUGGESTIVE REPORT FORMAT

POSITIVE MATERIAL IDENTIFICATION REPORT BULK MATERIALS							Page of
Project:	Client						Job No.
PMI Report No.	Supplier/Sub-Supplier						
Purchase Order No.	Testing Agency						
Purchase Requisition No:	Place of Inspection:						
Bulk Item Type (as per Requisition)							
Material Specification/Grade Number of items in Lot							
Requisition Item no. / Description	Major content, Weight Percent						Remarks Accept/Reject
Element	Cr	Ni	Mo	V	Ti	Cb / Nb	
Specified Range							
Actual observations 1.							
2.							
3.							
4.							
5.							
6.							
Instrument Type / ID Calibration standard block ID Last Service Date	Inspection Agency						Witnessed By

Note: Elements can be changed based upon the Material to be check.

SPECIFICATION FOR MAGNETIC LEVEL GAUGES

1.0 SCOPE:

This specification covers the requirement of Magnetic Type Level Gauges.

2.0 TECHNICAL REQUIREMENTS:

a) Magnetic type level gauges shall be of the magnetic-coupled level indicator type.
b) Floats shall be bottom-inserted type.
c) Float shall be designed to operate at vessel design pressure & Temperature.
d) Float stops shall be provided both at Top & Bottom of the gauges to restrict movement of float beyond the limits.
e) Float Failure (wafer colour: Blue) indication is required.
f) All level gauges shall be provided with 3/4" flanged connection for vent and drain, drain and vent valve with blind flange to be supplied.
g) Ingress protection of IP-67 AS PER IEC-60529 is required.
h) Nuts/ bolts shall be Min SS316.
i) SS Tag plate shall be provided.
j) IGC is required.
k) PMI (Positive material identification) test is required & procedure shall be followed as per Specification for Positive Material Identification, "Doc No: 081757C001-000-PP-509 Rev 01"
l) **Proven Track Record (PTR) Requirement**- The instruments as being offered/ supplied should have been operating satisfactorily in a hydrocarbon industry like refinery, petrochemical and gas processing plant under similar process conditions for at least 8000 hours."
m) Inspection and Test Plan shall be as per the following documents attached.

- ITP for Magnetic Level Gauges: 081757C001 701 ITP 1552 022 A
- ITP for Instrumentation: 081757C001 701 ITP 1500 001 B .

2.1 Spares for Magnetic Level Gauge (Material Code: TC9765634021) :

- 20% of Bi-color rollers for each gauge
- 20% (subject to min 1 no.) of Float of each type.

Variant Table-1

Var. No.	Centre- Centre Distance(mm)	Process Connection	Mat of tube, float, flanges, chamber etc.
01	To be decided by vendor	2'' 300RF	SS316

Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad 502032, India

Ref # TCEL/PQC/STRAINERS/01 Dt: 24/02/2021

Pre- Qualifying criteria for the vendors participating in "Open Tender for enquiry no _____ – Reg.

Considering BHEL customers' requirement, offers from Chinese manufacturers / Chinese manufactured items are not allowed.

Clause wise response of vendor is necessarily to be submitted for technical evaluation of technical bid

Sl. No.	Description	Vendor's Response	Details of Documents enclosed, if any
1.1. General Requirements			
1.1.1	Offers from traders (for the purpose of this tender, any agency who is keeping /buying/supplying martials from different manufacturers under the same company's name, will be treated as trader) will not be considered.		
1.1.2	The offer shall be accompanied with relevant list of the in-house manufacturing and testing facilities & their capacities / ranges etc. Company catalogue or website address which included these details may be provided as an alternative.		
1.1.3	Vendors to confirm that they will meet all the requirements of BHEL specification provided with the enquiry. In case of any dispute/contradictions with the requirement of Pre-qualification criteria (this document) with the specification, the requirements of Pre-qualification criteria will be applicable.		
1.1.4	The vendor must have experience of manufacturing and supplying strainers of the corresponding standards and grades as mentioned in the enquiry. Test Certificates shall be submitted as evidence of experience. At least two copies (one for minimum size and class/rating and other for maximum size and class/rating) manufacturer test certificates (TC in IBR form for CS/AS items) for the same or similar grade supplied by them to other customers shall be submitted along with the offer. a) The date of the issue of "Test certificate" shall not be older than 3 years from the NIT date.		

	b) The mill test certificate shall include the results / reports for all the tests like Chemical, Mechanical and NDT etc., as required by BHEL Specification applicable to the present enquiry. c) The test certificates submitted as an evidence of the past experience of the manufacturer must include test requirements as stipulated in BHEL specification.		
1.1.5	Evaluation of Experience Evidence: The experience will be evaluated against the test certificate provided by the vendor with respect to BHEL technical requirement of the specification.		
1.1.6	Prior to dispatch of the material, Test Certificates (English language only) shall be send to BHEL for review and dispatch clearance by BHEL. The photographs of the material with the traceability/ marking and condition of the material before dispatch may be provided for dispatch clearance.		
1.1.7	As per "Ministry of Steel Order (latest as applicable)," if any of the enquiry items fall under "List of Steel Products under Mandatory Bureau of Indian Standards Certification," BIS certificate is to be provided mandatorily. The BIS certificate submitted by the vendor shall be valid till the delivery of material. In case the BIS certificate is expiring before the material delivery date, Vendor shall confirm the renewal of the certificate in advance so that the timely supply of the material to BHEL is ensured.		
1.2 Additional Technical Requirements for strainers			
1.2.1	The technical requirements as per EIL Spec 6-44-0067 Rev 1 (Technical Notes for Strainers) are to be met for strainers.		

Vendor's Name & Address:	**VENDOR MANUFACTURING QUALITY PLAN**		QP. No.:	
	Customer : BHEL, HYDERABAD -32 Project : Product :	BHEL P. O .No.: P.O.Date : BHEL Spec : Rev :	Rev.:	Date :
			Page 1 of 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**SURFACE PREPARATION & PAINTING**												
5.0	**PRESERVATION & PACKING**												

Notes:

1. Drawing / Data Sheet / Specification shall prevail over Quality Plan in case of any contradiction.
2. Latest revision of Drawing / Specification shall be applicable.
3. All Manufacturing equipment, inspection equipment, heat treatment furnace / equipment shall be calibrated with applicable validity on the date of manufacture / inspection.

VENDOR TO NOTE (DO NOT SHOW THIS IN QP) THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: **P** : PERFORM, **W** : WITNESS, **V** : VERIFICATION. INDICATE 1 : BHEL / BHEL NOMINATED INSPECTION AGENCY , 2 : VENDOR , 3 : SUB-VENDOR , 4 : BHEL'S CUSTOMER / CONSULTANT AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P W & V. * FOR ITEMS MARKED ✓ (TICK) UNDER COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY	REVIEWED BY	APPROVED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP		CUSTOMER'S SIGNATURE & STAMP

Vendor's Name & Address:	**VENDOR MANUFACTURING QUALITY PLAN**		QP. No.:	
	Customer : BHEL, HYDERABAD -32 Project : Product :	BHEL P. O .No.: P.O.Date : BHEL Spec : Rev :	Rev.:	Date :
			Page 1 of 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS

Annexure – I

Notes:

1. PRE-DESPATCH INSPECTION PHOTOGRAPHS OF THE EQUIPMENT/ITEM SHALL BE INCLUDED IN QUALITY DOCUMENTATION.
2. LATEST VERSION OF STANDARDS/DRAWINGS /TOLERANCES ETC TO BE MENTIONED IN QUALITY PLAN/DRAWING. THIS QP SHOULD BE READ ALONG WITH BHEL SPEC, BHEL DRAWINGS / APPROVED DRAWINGS, DATA SHEET, BOM AND PO.
3. DRAWING / DATA SHEET/ SPECIFICATION SHALL PREVAIL OVER QUALITY PLAN IN CASE OF ANY CONTRADICTION.
4. BHEL RESERVES THE RIGHT FOR CONDUCTING REPEAT TEST, IF REQUIRED.
5. BHEL APPROVED INSPECTION ENGINEERS TO BE DEPLOYED FOR INSPECTION.
6. ONLY LEVEL II & ABOVE QUALIFIED PERSON IN RESPECTIVE NDE TO VERIFY OR WITNESS THE NDT TEST REPORT/RESULTS.
7. INSPECTION TO BE OFFERED ONLY AFTER ENSURING THAT ALL DOCUMENTS (QUALITY PLAN, DRAWINGS, DATA SHEET, PURCHASE SPECIFICATIONS, ETC) ARE AVAILABLE AS PER PURCHASE ORDER.
8. VENDOR TO OFFER ORIGINAL TEST CERTIFICATES ISSUED BY THIRD PARTY LABORATORIES OR SUPPLIERS.
9. VENDOR TO ENSURE WITH TPIA THAT A NOTE 'COMPARED WITH ORIGINAL TEST CERTIFICATE. REVIEWED, VERIFIED AND FOUND IN ORDER' SHALL CONTAIN WITH EVERY INSPECTION REPORT.
10. ONLY VALID AND CALIBRATED MEASURING INSTRUMENTS AND EQUIPMENT SHALL BE USED – TPIA TO VERIFY.
11. VENDOR TO ENSURE WITH TPIA THAT MATERIAL TEST CERTIFICTAE & TRACEABILITY RECORDS ARE AVAILABLE FOR USE OF CORRECT MATERIAL.
12. QUALIFICATION OF EQUIPMENT, PROCESS & PERSONNEL FOR SPECIAL PROCESSES LIKE WELDING, BRAZING, PAINTING & METAL COATING ETC. (AS APPLICABLE AS PER PO) SHALL BE ENSURED.
13. VENDOR TO ENSURE THAT ALL CERTIFICATES ARE ENDORSED BY TPIA WITH COMMENTS (WITNESSED OR VERIFIED) AS PER QUALITY PLAN.
14. VENDOR SHALL OFFER LOG SHEETS CONTAINING ACTUAL MEASURED VALUES INSTEAD OF SAYING OK/NOT OK TO TPIA.
15. VENDOR SHALL SUBMIT COMPLETE INSPECTION AND TEST DOCUMENTATION WHICHEVER IS IDENTIFIED WITH (v) UNDER COLUMN 'D' OF APPROVED QULAITY PLAN SHALL BE ENCLOSED WITH THE INSPECTION REPORT.
16. VENDOR SHALL SUBMIT ORIGINAL COPIES OF ALL INSPECTION AND TEST DOCUMENTS AUTHENTICATED BY TPIA.

LEGEND: **P** : PERFORM, **W** : WITNESS, **V** : VERIFICATION. INDICATE 1 : BHEL / BHEL NOMINATED INSPECTION AGENCY , 2 : VENDOR , 3 : SUB-VENDOR , 4 : BHEL'S CUSTOMER / CONSULTANT AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P W & V. * FOR ITEMS MARKED ✓ (TICK) UNDER COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY	REVIEWED BY	APPROVED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP		CUSTOMER'S SIGNATURE & STAMP

Guidelines to vendors for preparation of Quality Plan

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.
2. Each page of QAP shall contain the following information.

   a) Vendor's name & address.
   b) Customer : BHEL, Hyderabad.
   c) Project : as indicated in P.O.
   d) BHEL Product Standard Number/revision number as indicated in P.O.
   e) BHEL Purchase Order Number & Date. LOI Ref. No. is not acceptable.
   f) Product : as per P.O. description.
   g) QAP Number (shall be unique & shall not repeat) / Revision number / date.
   h) Page number and number of pages
   i) Vendor signature & stamp

3. QAP shall contain four parts / stages as follows.
   a) Raw materials and bought out items.
   b) In-process Control / Inspection.
   c) Final assembly, Inspection & Testing.
   d) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).
5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc), Hydrostatic test, calibration check etc.)
6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.
7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)
8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)
9. Under 'Reference document' and 'Acceptance norms', appropriate National / International standards, BHEL standards, approved drg references etc should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practise etc". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.
10. Under 'Format of record', indicate appropriately supplier's Test certificate, calibration certificate, lab report, inspection report etc.
11. Please refer 'Agency' in QAP format.
    "Under P: Perform, W: Witness, V: Verify
    Indicate against each characteristic 1: (BHEL / BHEL Nominated inspection agency), OR 2: (Vendor / Sub-Vendor)
    Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code 1
12. Under 'D' please put (✓Tick) against each characteristic where vendor proposes to submit test certificate / report etc OR as required as per BHEL Spec.
13. Vendor's signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only in line and relevant to the Specification & Approved Drgs.

15. The following operations / characteristics / check points may be included (**As Appropriate)**

    a) Visual check
    b) Dimensional check
    c) Mechanical and Chemical properties.
    d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc as the case may be.)
    e) Painting check for shade, finish, Dry Film Thickness (DFT), Adhesion / peel-off test etc.
    f) Check for correctness for all components mounted as per General arrangement Drg, Bill Of Materials (BOM), etc for range, rating, make, colour, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.
    g) Verification of test certificate for protection class for the enclosures.
    h) Mechanical functioning of switches.
    i) Continuity of earthing and provision of earth points.
    j) Colour coding of wiring, size, tightness & dressing of wiring.
    k) Review of test certificates of assembled items, raw materials, internal test reports etc.
    l) Witness of functional checks, which may include mechanical run & electrical run, H.V. test, IR measurement, Electrical and Mechanical tests etc.
    m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.
    n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc)
    o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests.
    p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Preece Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)
    q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
    r) Packing and Preservation.