

BUYERS SPECIFIC ADDITIONAL TERMS & CONDITIONS**ITEM NAME:** Seal Steam Supply Valve with Pneumatic Actuator along with Spares**PROJECTS:** Sipat, Koderma Unit-1 & 2, Singareni and Korba West Unit-1 & 2**SCOPE OF ENQUIRY:** E-bids on GeM portal are invited from bidders for the supply of Seal Steam Supply Valve with Pneumatic Actuator along with Spares for Sipat, Koderma Unit-1 & 2, Singareni and Korba West Unit-1 & 2 projects as per requirement mentioned below:

Sl. No.	Material Code & Item Description	Total Qty.	LOT Quantity & Delivery schedule
1.	W90313239398 DRG: 21323952000 REV: 02 SEAL STEAM SUPPLY VALVE WITH PNEUMATIC ACTUATOR	6 Set	Sipat: 1 Set -12/05/2027
			Singareni: 1 Set-07/12/2027
			Korba West Unit-1 : 1 Set-03/03/2028
			Korba West Unit-2 : 1 Set-03/09/2028
			Koderma Unit-1: 1 Set-30/07/2027
			Koderma Unit-2: 1 Set-27/11/2027
2.	WS9013239005 DRG: 31323952200 REV:00 SPARES FOR SEAL STEAM VALVE	2 Set	Korba West Unit-1 : 1 Set-14/11/2027
			Koderma Unit-1: 1 Set-03/08/2028
3.	WS9013239030 DRG: 41323952500 REV:00 SPARES FOR SEAL STEAM VALVE	1 Set	Singareni: 1 Set-31/03/2028
4.	ST9718102094 DRG: 41810250002 REV:00 POSITIONER WITH POSITION TRANSMITTER WITH LINK ASSEMBLY FOR SEAL STEAM VALVE AS PER ADDENDUM NO.- 41810250002	5 No.	Singareni: 1 No.-31/03/2028
			Korba West Unit-1 : 2 No.-03/05/2028
			Koderma Unit-1: 2 No.-14/11/2027

1. Project Detail with consignee address:

[A]	Project Name	SIPAT STAGE-III (1X800 MW)
	Consignee Address	Head of Project Sipat Super Thermal Power Project, Stage-III (1X800 MW) P.O.: Ujjwal Nagar, District: Bilaspur Chhatisgarh - 495555
[B]	Project Name	1X800MW SINGARENI TPP SCCL
	Consignee Address	The Project Manager, 1x800mw Singareni Thermal Power Plant Stage-2, Pegadapally (Village), Jaipur (Mandal), Mancherla (Dist), 504216 Telangana
[C]	Project Name	2X800MW KODERMA TPS PH-II DVC
	Consignee Address	THE CGM & HOP DVC, 2x800 MW DVC KODERMA TPS PH II, PO : BANJHEDIH, KODERMA, JHARKHAND – 825421
[D]	Project Name	2X660 MW KORBA WEST CSPGCL
	Consignee Address	EE (Construction Store), 2X660 MW, SCTPP, HTPS, KORBA WEST DISTT- KORBA, Chhattisgarh -495450

3.BUYERS SPECIFIC ADDITIONAL TERMS & CONDITIONS IN ADDITION TO GTC

Sl. No.	Terms	Description	Supplier confirmation
1.	Customer approval requirement	Bidders are requested to submit their credentials along with offer (Credentials should include BHEL P.O.s on vendor for the same rating or higher rating turbines, Experience of vendor with state utilities and major PSU like NTPC, End User Certificate wherever available), in order to take up with end customer for approval Supplier to submit following credentials for arranging Customer approval: - • Company Profile • List of Order Executed/ on hand for Power Sector/Gov. organization of same /similar items • Copy of Major Supply Orders • Performance Certificates for Satisfactory working of System/ Equipment from end users Item. The offer of only those bidders, who meet Pre-qualification requirement (PQR), Technical requirement and approved by the End Customer, will be considered for price-bid opening & RA for the requirement against this enquiry.	
2.	Special Instruction	Please inform 8-digit HSN code for following items.	SEAL STEAM SUPPLY VALVE WITH PNEUMATIC ACTUATOR
			SPARES FOR SEAL STEAM VALVE
			POSITIONER WITH POSITION TRANSMITTER WITH LINK ASSEMBLY FOR SEAL STEAM VALVE
3.	Documents Checklist:	Please submit signed and stamped copy of your offer on each page along with following documents; • Buyer Specific T&C. • Technical PQR & its supportive document. • Technical drawing & purchase specification. • Certificate/self-certification for minimum local content as per PPP-MII order. • Replica of price bid schedule without prices with part-I offer.	
4.	Special Instruction of Technical requirement	AT THE TIME OF OFFER THE VENDOR TO FURNISH THEIR PRICED OFFER AGAINST EACH ITEM MENTIONED IN BHEL DWG NO. 31323900001 FOR NEXT 5 YEARS ORDERING. HOWEVER, KINDLY NOTE THAT THIS COST SHALL NOT BE USED FOR ESTABLISHING L-1 IN CURRENT TENDER	
		AT THE TIME OF OFFER, ALL THE VENDORS TO ENSURE TO FURNISH DULY FILLED CHECK LIST FOR SEAL STEAM VALVE (AS PER ANNEXURE-B) FOR EACH PROJECT SEPARATELY TO CONFIRM BHEL SPECIFICATION REQUIREMENTS.	
		AT THE TIME OF OFFER ALL THE VENDORS TO ENSURE TO FURNISH DULY FILLED ANNEXURE- C FOR EACH PROJECT AND SUBMIT ALL THE DOCUMENTS ACCORDINGLY.	
		VENDOR TO SUBMIT PACKING LIST OF ITEMS FOR BHEL REVIEW AFTER PLACEMENT OF P.O. AND BEFORE DISPATCH.	
		MANDATORY SPARES SHALL BE PACKED IN A SEPERATE GREEN COLOR BOX WITH "MANDATORY SPARES FOR SEAL STEAM VALVE" LABLLED ON IT.	
		THE VENDOR TO PROVIDE 3D MODELS FOR THE SUPPLIED EQUIPMENT ASSEMBLIES (HAVING ALL THE COMPONENTS INCLUDED) COMPLETE WITH ALL CONNECTION POINTS/INTERFACES FOR THE PURPOSE OF 3D POWER PLANT LAYOUT TO BE DONE BY BHEL AS PER CUSTOMER SPECIFICATION REQUIREMENTS. THE FILE FORMAT OF 3D MODELS SHALL BE INFORMED BY BHEL AND THE SAME SHALL BE SUBJECT TO CUSTOMER APPROVAL.	
		IN CASE OF ANY CONFLICT BETWEEN STIPULATIONS IN VARIOUS PORTIONS OF THE SPECIFICATIONS, MOST STRINGENT STIPULATION WOULD BE APPLICABLE FOR IMPLEMENTATION BY THE VENDOR WITHOUT ANY EXTRA COST TO THE BHEL.	
		SPECIAL TOOLS AND TACKLES/ EQUIPMENT FOR THE OPERATION, MAINTENANCE,	

		INSPECTION AND REPAIR OF THE EQUIPMENT SHALL BE SUPPLIED BY THE VENDOR WHICH SHALL BE NEW AND UNUSED. THE SPECIAL TOOLS AND TACKLES/ EQUIPMENT SHALL BE DELIVERED BY THE VENDOR IN LOCKABLE STEEL BOXES AND SHALL BE MARKED FOR IDENTIFICATION PURPOSES ANONGWITH CORRESPONDING TOOL CHART	
		ALL THE SPARES MUST BE PACKED IN SEALED TRANSPARENT PLASTIC BAGS AND CLEARLY MARKED OR LABELLED ON THE OUTSIDE OF THE PACKING WITH ITS DESCRIPTION AND ASSEMBLY PART NUMBERS CORRELATED WITH BHEL APPROVED DRAWING AND BILL OF MATERIALS (BOMs).	
		THE VENDOR SHALL DESIGN THE VALVE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN ANNEXURE-D FOR THE RESPECTIVE PROJECT. COMPLIANCE WITH THE APPLICABLE ANNEXURE-D REQUIREMENTS SHALL BE ENSURED DURING THE DESIGN AND DOCUMENT SUBMISSION STAGE. VENDOR TO CONFIRM.	
		VENDOR SHALL CARRY OUT SURFACE PREPARATION AND PAINTING OF THE VALVE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN ANNEXURE-E OF THE RESPECTIVE PROJECT. VENDOR TO CONFIRM.	
		ADDITIONAL SPECIFICATION FOR SMART TYPE POSITIONER AS PER DOCUMENT NO. 41810250001_REV 05 IS APPLICABLE FOR 800 MW SIPAT PROJECT. THE SAME TO BE COMPLIED BY ALL THE VENDORS	
		ADDITIONAL SPECIFICATION FOR SMART TYPE POSITIONER AS PER DOCUMENT NO. 41810250002 IS APPLICABLE FOR 800 MW KODERMA, 660MW KORBA WEST & 800 MW SINGARENI PROJECTS. THE SAME TO BE COMPLIED BY ALL THE VENDORS.	
5.	Quality Requirement	Vendor to confirm and endorse NTPC/Customer SQP 0000-999-QOI-S-047.	
		Kindly confirm that Valve shall be offered in unpainted condition (Clause “C” of NTPC/Customer SQP) for witnessing.	
		Kindly confirm that inspection shall be done by BHEL nominated inspection agency M/s Quest and NTPC/Customer as per NTPC/Customer SQP 0000-999-QOI-S-047.	
		For Spares: a. Vendor to confirm that Testing/Witnessing/certification will be done as per approved quality plan of main item. b. Vendor to confirm that If item does not appear in approved quality plan then Certificate of compliance will be provided. c. Vendor to confirm that interchangeability certificate will be provided for spares.	
		The Charges for Pre-Inspection would be borne by BHEL. However at least 15 days’ notice is to be provided for arranging Pre-Inspection.	
6.	Guarantee	Kindly confirm that Guarantee shall be provided for a period of “ 24 months from the date of dispatch or 18 months from the date of commissioning, whichever is earlier ”. In case of any failure or trouble reported from site, the supplier should depute their representative immediately to attend the problem and replace the defective component/part if required, without any additional cost to BHEL.	
		Supplier shall be responsible for free replacement of defective equipment / material at our site	
		Please note that offers with guarantee period lesser than above mentioned guarantee period may result in rejection of the offer.	
7.	O&M Manuals	Kindly confirm that in the event of ordering, 22 Sets hard copies (Paper based) and 6 Sets (in CD ROM) of O & M manual shall be furnished containing all drawings and datasheet, catalogues of all instruments and instructions for storage, erection & commissioning, operation and maintenance after approval. Please submit same to BHEL Haridwar within 12 weeks of placement of P.O.	
		Kindly confirm that in the event of ordering, 3 Sets hard copies (Paper based) and 1 Sets (in CD ROM) of O & M manual would be kept inside the dispatch box of Leak Steam Valve & the same shall also be mentioned in your Shipping/Packing List.	
8.	Compliance of GTC on GeM	General Terms and Conditions on GeM 4.0 (Version 1.29) Dtd -25/03/2026 or it’s latest revision on GeM portal shall be applicable against this enquiry. Kindly confirm to compliance the same for this tender.	
9.	Pre-Qualification	The Pre-Qualification Requirements have been compiled. All the bidders should ensure submission of complete details and documents as called for in these requirements. The	

	Requirements	Offers submitted by the bidders would be scrutinized with respect to Pre-Qualification Requirements first. Techno-Commercial offer of only those bidders shall be evaluated who meet the Pre-Qualification Requirements.	
10.	Reverse Auction (E-bidding)	BHEL shall be resorting to Reverse Auction (RA) on GEM portal as per GEM functionalities for this tender. RA shall be conducted among the techno-commercially qualified bidders.	
11.	Make in India Clause	"For this procurement, the local content to categorize a supplier as a Class I local supplier/ Class II local Supplier/ Non-local supplier and purchase preference to Class I local supplier, is as defined in Public Procurement (Preference to Make in India), Order 2017 dated 19.07.2024 issued by DPIIT. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of Part-II bids against this NIT". As per Make in India Order, only Class-1 and Class-2 local supplies are eligible to bid in this tender enquiry. For this eligibility criteria, bidders are required to submit certificate of Minimum local content as specified in attached Make In India Declaration format.	
12.	Compliance of Rule 144 (xi) of GFR 2017	Compliance of Restrictions under Rule 144 (xi) of GFR 2017 shall be as per GeM.	
13.	Bid validity/ Validity of offer	Please note that validity of the offer shall be 180 days from the date opening of Techno-Commercial bid (Part-I bid) on GeM portal. Offer of bidder's having validity less than 180 days shall liable to reject. Please confirm. The required validity is considering that offer is complete & clear w.r.t. PQR and all techno-commercial conditions. Vendors need to extend their offer validity for the time taken by them in responding BHEL's comments/clarification sought during techno-commercial scrutiny of the offer. In case regret by any bidder for such validity extension, their offer shall liable to be reject. Please confirm.	
14.	Loading and unloading	Vendor's scope will not cover Loading & Unloading at Final destination of delivery. Unloading at final destination (i.e. BHEL site) is in BHEL 'scope. Loading and unloading at other intermediate places due to any permitted transshipment will be the responsibility of the vendor. Kindly note	
15.	Prices/Basis of Quotation	The offered prices of the items shall remain firm and fixed till the execution of the contract, kindly confirm. Kindly confirm that your quote prices are inclusive of P&F, Freight & GST for Total quantity on GeM portal. Transit Insurance would be arranged by BHEL. Please quote your prices accordingly. Delivery Term shall be Ex-Works with freight Pre-paid up to project destination basis. Bidders can dispatch goods through any Indian Bank Association approved transporters having their branch at HARIDWAR / destination. If material is dispatched through other than Indian Bank Association approved transporter, material to be delivered on door delivery basis. In case of dispatch of material through any other unapproved transporter, payment shall be made only after receipt of material and any additional charges payable to the transporter shall be to the bidder's account. Any demurrage / godown rent payable to the transporter /or to godown's owner due to any delay attributed by the supplier shall be recovered from supplier's account	
16.	Special Instructions:	a) Please inform 8-digit HSN code for SEAL STEAM SUPPLY VALVE WITH PNEUMATIC ACTUATOR. b) 08 DIGIT GST HSN CODE to be provided & mentioned in your invoice & packing list. c) Invoice, GR/LR, packing list, Test certificate are required in original for billing to end user. d) Vendor to ensure submission billing documents in the same month of material despatch. If vendor fail to provide the despatch documents in the same month GST Penalty shall be applicable and bear by vendor as per GST rule.	

17.	Special Instructions:	<u>For Sipat Project</u> a. ORIGINAL (GR/LR , MDCC, PKG LIST) ARE REQUIRED FOR BILLING. b. MATERIAL IS TO BE DESPATCHED ON DOOR DELIVERY BASIS TO SITE. c. BHEL BBU NOS. TO BE MENTIONED IN PACKING LIST BY VENDOR									
18.	Special Instructions:	<u>For Singareni Project</u> a. INVOICE, ORG. GR, MDCC, PKG LIST ALONG WITH E-WAY BILL IS REQUIRED FOR BILLING. b. BHEL ITEM ID & PROJECT NAME/UNIT NO TO BE MENTIONED IN THE PKG LIST & ON PKG. c. MATERIAL FOR UNIT-1 & 2, COMMISSIONING AND MAND. SPARES TO BE PACKED SEPARATELY. d. MATERIAL TO BE DISPATCHED ONLY AFTER RECEIPT OF MDCC AS APPLICABLE. e. WRITE MANDATORY SPARE-HWR IN RED COLOUR ON ALL 4 SIDES OF THE PACKING BOX. f. VENDOR TO DEPUTE THEIR REPRESENTATIVE FOR VERIFICATION OF MAT. WHEREVER REQD. g. EACH ITEM IN BOX MUST BE TAGGED WITH SAME DESC. & QTY. AS IN VENDOR P/LIST. h. PO NO, BBU SN & MAND SPARES SHOULD BE MENTIONED IN VENDER'S PACKING LIST.									
19.	Special Instructions:	<u>For Korba West Project:</u> a. DOCUMENTS (GR/LR, PACKING LIST,MDCC,TEST CERTIFICATES) ARE REQD IN ORIGINAL. b. PO NO & MANDATORY SPARES SHOULD BE MENTIONED IN VENDER'S PACKING LIST. c. STORAGE & PRESERVATION MANUAL, O&M MANUAL, TEST CERTIFICATES, LIFE-TIME OF PACKING MATERIAL MANUALS SHALL BE WITH MATERIALS WHILE DESPATCH.									
20.	Evaluation criteria	Evaluation would be done on the basis of total landed cost for the complete scope/requirement covered in the enquiry.									
21.	Evaluation Currency	The evaluation currency for this tender shall be INR.									
22.	Payment terms:	The payment shall be done after receipt of Material at BHEL respective project site, within no. of days as defined in the below table from the date of receipt of Material at site i.e. MRC date). <table><tr><td>Type of Bidder</td><td>Payment Terms (Number of Days)</td></tr><tr><td>Micro & Small Enterprises (MSEs)</td><td>45 days</td></tr><tr><td>Medium Enterprises</td><td>60 days</td></tr><tr><td>Non MSME</td><td>90 days</td></tr></table> The Payment terms are subject to receipt of non-discrepant document from supplier. Note: This is in supersession of 10 days' time as provided in Clause 12 of GeM GTC and also 45 days from CRAC as provided in the standard format of GeM Bid under Payment Timelines.	Type of Bidder	Payment Terms (Number of Days)	Micro & Small Enterprises (MSEs)	45 days	Medium Enterprises	60 days	Non MSME	90 days	
Type of Bidder	Payment Terms (Number of Days)										
Micro & Small Enterprises (MSEs)	45 days										
Medium Enterprises	60 days										
Non MSME	90 days										
23.	GeM charges	GeM charges if any shall be either side only i.e. buyer's GeM charges shall be in buyer's account and seller's GeM charges shall be on seller's account. Please confirm.									
24.	Contract execution	Bidder's are advised to read GeM related query & clarification carefully on GeM portal. Order shall be executed through GeM.									

25.	Quantity Variation	BHEL reserves the right to cancel tender or reject any or all the quotations without assigning any reasons thereof. BHEL also reserves the right to Increase or decrease the tendered quantities or quantity of individual material code may be dropped as a whole also. Vendors should be prepared to accept order for reduced Quantity without any extra charges. Vendor should also be prepared for giving discount in case of Increase in Quantity. Vendor has to take manufacturing clearance from BHEL before starting manufacturing of material. In case ordered quantity is reduced at the time of manufacturing clearance, then payment shall be made accordingly as per decreased quantity. Kindly confirm.	
26.	Delivery Period	Please note that BHEL's Delivery requirements are mentioned above under heading Scope of Enquiry. Early delivery w.r.t. above lot delivery will be accepted only after written confirmation from BHEL. BHEL reserve right to reject early delivery request of bidders / suppliers. Delivery period indicated in GeM bid is only indicative and final delivery of tender shall be taken as mentioned above. Accordingly bidders to confirm the above deliveries or quote their best possible delivery in no of months / weeks from the date of placement of Purchase order, including all activities like document approval, inspection by TPI time etc.	
27.	Technical Document/ Drawing approval conditions	Drawings/Data sheets/documents/QAP etc. as called for in the specifications shall be submitted by Vendor for BHEL/ Customer approval within 30 days of purchase order. BHEL shall approve these drawings/data sheets/ documents / QAP etc. within 30 days of receipt. Any comments on the documents shall be given by BHEL within 7 days of submission and vendor shall submit revised document / reply to comments, within 7 days of BHEL comments. However, total time for Document submission and approval shall not exceed 30 days for respective party. Delivery is from the date of PO, accordingly, delay in submission / revision of the documents by the vendor will automatically account for to vendor. In case of delay on account of BHEL in comments / approval of the documents, the delivery shall be re-scheduled by the no of days taken by BHEL in excess to 30 days. For delay analysis cumulative no of days (including time taken in comments), shall be considered for delivery extension.	
28.	Liquidated Damages (LD) for late delivery	Liquidated Damages shall be lot wise as per clause no. 15 (iii) of General terms and conditions on GeM 4.0 (Version 1.29) as under: kindly confirm. "If the Seller/Service Provider fails to deliver any or all of the Goods/Services within the original/re-fixed delivery period(s) specified in the contract, the Buyer will be entitled to deduct/recover the Liquidated Damages for the delay, unless covered under Force Majeure conditions aforesaid, @ 0.5% of the contract value of delayed quantity per week or part of the week of delayed period as pre-estimated damages not exceeding 10% of the contract value of delayed quantity without any controversy/dispute of any sort whatsoever". The date of LR would be treated as the date of delivery for penalty purposes.	
29.	MDCC clause	Please note that, material shall be dispatched only after issue of Material dispatch clearance certificate (MDCC) from end customer. For issue of MDCC, vendors are required to submit all test certificates (TC) and inspection report of third party (IR) to BHEL. After review & acceptance of the quality document, BHEL will forward the same to end customer for issuance of MDCC. MDCC shall be issued within 7 days of receipt of complete quality documents / TCs,. In case of delay in issuance of MDCC, only delivery shall be extended by no of days taken by BHEL in excess to 7 days and all other terms and conditions of PO shall remains same & binding. In case any material is dispatched without MDCC and any loss is incurred by Supplier/Vendor for any reason whatsoever, BHEL shall not be responsible in any manner to compensate the supplier in this regard. Kindly confirm.	
30.	BREACH OF CONTRACT, REMEDIES AND	The following shall amount to breach of contract:	

	TERMINATION:	I. Non-supply of material/ non-completion of work by the Supplier/Vendor within scheduled delivery/ completion period as per contract or as extended from time to time. II. The Supplier/Vendor fails to perform as per the activity schedule and there are sufficient reasons even before expiry of the delivery/ completion period to justify that supplies shall be inordinately delayed beyond contractual delivery/ completion period. III. The Supplier/Vendor delivers equipment/ material not of the contracted quality. IV. The Supplier/Vendor fails to replace the defective equipment/ material/ component as per guarantee clause. V. Withdrawal from or abandonment of the work by the Supplier/Vendor before completion as per contract. VI. Assignment, transfer, subletting of Contract by the Supplier/Vendor without BHEL's written permission resulting in termination of Contract or part thereof by BHEL. VII. Non-compliance to any contractual condition or any other default attributable to Supplier/Vendor. VIII. Any other reason(s) attributable to Vendor towards failure of performance of contract. In case of breach of contract, BHEL shall have the right to terminate the Purchase Order/ Contract either in whole or in part thereof without any compensation to the Supplier/Vendor. IX. Any of the declarations furnished by the contractor at the time of bidding and/ or entering into the contract for supply are found untruthful and such declarations were of a nature that could have resulted in non-award of contract to the contractor or could expose BHEL and/ or Owner to adverse consequences, financial or otherwise. X. Supplier/Vendor is convicted of any offence involving corrupt business practices, antinational activities or any such offence that compromises the business ethics of BHEL, in violation of the Integrity Pact entered into with BHEL has the potential to harm the overall business of BHEL/ Owner. Note-Once BHEL considers that a breach of contract has occurred on the part of Supplier/Vendor, BHEL shall notify the Supplier/Vendor by way of notice in this regard. Contractor shall be given an opportunity to rectify the reasons causing the breach of contract within a period of 14 days. In case the contractor fails to remedy the breach, as mentioned in the notice, to the satisfaction of BHEL, BHEL shall have the right to take recourse to any of the remedial actions available to it under the relevant provisions of contract. Remedies in case of Breach of Contract. i) Wherein the period as stipulated in the notice issued under above clause has expired and Supplier/Vendor has failed to remedy the breach, BHEL will have the right to terminate the contract on the ground of "Breach of Contract" without any further notice to contractor. ii) Upon termination of contract, BHEL shall be entitled to recover an amount equivalent to 10% of the Contract Value for the damages on account of breach of contract committed by the Supplier/Vendor. This amount shall be recovered by way of encashing the security instruments like performance bank guarantee etc available with BHEL against the said contract. In case the value of the security instruments available is less than 10% of the contract value, the balance amount shall be recovered from other financial remedies (i.e. available bills of the Supplier/Vendor, retention amount, from the money due to the Supplier/Vendor etc. with BHEL) or the other legal remedies shall be pursued. iii) wherever the value of security instruments like performance bank guarantee available with BHEL against the said contract is 10% of the contract value or more, such security instruments to the extent of 10% contract value will be encashed. In case no security instruments are available or the value of the security instruments available is less than 10% of the contract value, the 10% of the contract value or the balance amount, as the case may be, will be recovered in all or any of the following manners: iv) In case the amount recovered under sub clause (a) above is not sufficient to fulfil the amount recoverable then; a demand notice to deposit the balance amount within 30 days shall be issued to Supplier/Vendor. v) If Supplier/Vendor fails to deposit the balance amount within the period as prescribed in demand notice, following action shall be taken for recovery of the balance amount:	
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		a) from dues available in the form of Bills payable to defaulted Supplier/Vendor against the same contract. b) If it is not possible to recover the dues available from the same contract or dues are insufficient to meet the recoverable amount, balance amount shall be recovered from any money(s) payable to Supplier/Vendor under any contract with other Units of BHEL including recovery from security deposits or any other deposit available in the form of security instruments of any kind against Security deposit or EMD. vi) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against defaulted supplier/Vendor. vii) It is an agreed term of contract that this amount shall be a genuine pre-estimate of damages that BHEL would incur in completion of balance contractual obligation of the contract through any other agency and BHEL will not be required to furnish any other evidence to the Supplier/Vendor for the purpose of estimation of damages. viii) In addition to the above, imposition of liquidated damages, debarment, termination, de-scoping, short-closure, etc., shall be applied as per provisions of the contract. Note: 1) The defaulting Supplier/Vendor shall not be eligible for participation in any of the future enquiries floated by BHEL to complete the balance work. The defaulting contractor shall mean and include: (a) In case defaulted Supplier/Vendor is the Sole Proprietorship Firm, any Sole Proprietorship Firm owned by same Sole Proprietor. (b) In case defaulted Supplier/Vendor is The Partnership Firm, any firm comprising of same partners/ some of the same partners ; or sole proprietorship firm owned by any partner(s) as a sole proprietor.	
31.	Suspension of Business Dealings with Suppliers / Contractors:	The offers of the bidders who are under suspension as also the offers of the bidders, who engage the services of the banned firms / principal / agents, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com. If any bidder / supplier / contractor during pre-tendering / tendering / post tendering / award / execution / post-execution stage indulges in any act, including but not limited to, mal-practices, cheating, bribery, fraud or and other misconduct or formation of cartel so as to influence the bidding process or influence the price or tampers the tendering process or acts or omits in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860(Bhartiya Nyaya Samhita 2023) or any other law in force in India, or does anything which is actionable under the Guidelines for Suspension of Business dealings, action may be taken against such bidder / supplier / contractor as per extant guidelines of the company available on www.bhel.com and / or under applicable legal provisions. Guidelines for suspension of business dealings is available in the webpage: http://www.bhel.com/vender_registration/vender.php.	
32.	Settlement of Dispute, CONCILIATION & ARBITRATION:	Settlement of Dispute If any dispute or difference of any kind whatsoever shall arise between BHEL and the Supplier/Vendor, arising out of the contract for the performance of the work whether during the progress of contract termination, abandonment or breach of the contract, it shall in the first place referred to Designated Officer / IEM for amicable resolution by the parties. Designated Officer / IEM who within 60 days after being requested shall give written notice of his decision to the contractor. Save as hereinafter provided, such decision in respect of every matter so referred shall forthwith be given effect to by the Supplier/Vendor who shall proceed with the work with all due diligence, whether he or BHEL desires to resolve the dispute as hereinafter provided or not. If after the Designated Engineer has given written notice of this decision to the party and no intention to pursue the dispute has been communicated to him by the affected party within 30 days from the receipt of such notice, the said decision shall become final and binding on the parties. In the event the Supplier/Vendor being dissatisfied with any such decision or if amicable settlement cannot be reached then all such disputed issues shall be resolved through conciliation in terms of the BHEL Conciliation Scheme 2018 as per 'CONCILIATION' Clause. CONCILIATION: Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the "Dispute") shall, in the first	

	instance, be attempted to be resolved amicably in accordance with the conciliation procedure as per BHEL Conciliation Scheme 2018. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in - "Procedure for conduct of conciliation proceedings" (as available in www.bhel.com). ARBITRATION: Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided herein above or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, refer the disputes to Arbitral Institution and such dispute to be adjudicated by Sole Arbitrator appointed in accordance with the Rules of said Arbitral Institution. A party willing to commence arbitration proceeding shall invoke Arbitration Clause by giving notice to the other party in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice') before referring the matter to arbitral institution. The Notice shall be addressed to the Head of the Region, Power Sector/ Unit, BHEL, executing the Contract and shall contain the particulars of all claims to be referred to arbitration with sufficient detail and shall also indicate the monetary amount of such claim including interest, if any. After expiry of 30 days from the date of receipt of aforesaid notice, the party invoking the Arbitration shall submit that dispute to the Arbitral Institutions (shall be identified by the contract issuing agency) and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd Judge having considerable experience in commercial matters to be appointed/nominated by the respective institution. The cost/expenses pertaining to the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to a specific Arbitral institution for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged. The fee and expenses shall be borne by the parties as per the Arbitral Institutional rules. The Arbitration proceedings shall be in English language and the seat and venue of Arbitration shall be at the court(s) of Haridwar. Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable. All matters relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at Haridwar , shall have exclusive jurisdiction. Notwithstanding any reference to the Designated Engineer or Conciliation or Arbitration herein, a. the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree. Settlement of Dispute clause cannot be invoked by the Contractor, if the Contract has been mutually closed or 'No Demand Certificate' has been furnished by the Contractor or any Settlement Agreement has been signed between the Employer and the Contractor. It is agreed that Mechanism of resolution of disputes through arbitration shall be available only in the cases where the value of the dispute is less than Rs. 10 Crores. In case the disputed amount Claim, Counter claim including interest is Rs. 10 crores and above, the parties shall be within their rights to take recourse to remedies other than Arbitration, as may be available to them under the applicable laws after prior intimation to the other party. Subject to the aforesaid conditions, provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications or re-enactment thereof as amended from time to time, shall apply to the arbitration proceedings under this clause.	
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		In case, multiple arbitrations are invoked (whether sub-judice or arbitral award passed) by any party to under this contract, then the cumulative value of claims (including interest claimed or awarded) in all such arbitrations shall be taken in account while arriving at the total claim in dispute for the subject contract for the purpose of clause mentioned above. Disputes having cumulative value of less than 10 crores shall be resolved through arbitration and any additional dispute shall be adjudicated by the court of competent jurisdiction.													
33.	Action against Bidders / vendor / supplier / contractor in case of default:	In order to protect the commercial interests of BHEL, BHEL shall take action against supplies / contractors by way of suspension of business dealings, who either fail to perform or are in default without any reasonable cause, cause loss of business/ money/ reputation, indulge in malpractices, cheating, bribery, fraud or any other misconduct or formation of cartels so as to influence the bidding process or influence the price etc. Suspension of Business Dealings could be in the form of "Hold" or "Banning" a supplier/ contractor or a bidder and shall be as per "Guidelines for Suspension of Business Dealings with Suppliers/ Contractors" available at BHEL's website "https://www.bhel.com/guidelines-suspension-business-dealings-supplierscontractors"													
34.	MICRO AND SMALL ENTERPRISES (MSE):	Any Bidder falling under MSE category shall furnish the following details & submit documentary evidence/ Govt. Certificate etc. in support of the same along with their techno-commercial offer. <table border="1"> <thead> <tr> <th>Type under MSE</th><th>SC/ST owned</th><th>Women owned</th><th>Others (excluding SC/ ST & Women Owned)</th></tr> </thead> <tbody> <tr> <td>Micro</td><td></td><td></td><td></td></tr> <tr> <td>Small</td><td></td><td></td><td></td></tr> </tbody> </table> Note: If the bidder does not furnish the above, offer shall be processed construing that the bidder is not falling under MSE category. a) MSE suppliers can avail the intended benefits in respect of the procurements related to the Goods and Services only (Definition of Goods and Services as enumerated by Govt. of India vide Office Memorandum F. No. 21(8)/2011-MA dtd. 09/11/2016 office of AS & DC, MSME) only if they submit along with the offer, attested copies of either Udyam Registration. Date to be reckoned for determining the deemed validity will be the last date of Technical Bid submission. Non-submission of supporting document in GeM portal will lead to consideration of their bids at par with other bidders. No benefits shall be applicable for this enquiry if the above required documents are not uploaded at the time of bid submission. Documents submitted by the bidder shall be verified by BHEL for rendering the applicable benefits.	Type under MSE	SC/ST owned	Women owned	Others (excluding SC/ ST & Women Owned)	Micro				Small				
Type under MSE	SC/ST owned	Women owned	Others (excluding SC/ ST & Women Owned)												
Micro															
Small															
35.	ALL MSME PAYMENTS FOR GOODS OR SERVICES TO BE MANDATORILY SETTLED THROUGH TReDS	"In respect of procurement of goods or services from Micro, Small and Medium enterprises (MSMEs), the settlement of invoice shall be only through any of the TReDS platform (i.e. RXIL, MI xchange, Invoicemart, KReDX, C2FO), authorised by the Reserve Bank of India. Such MSME suppliers to select their preferred TReDS platform before award of contract. They also will have the option to change the TReDS platform from the drop down menu on Suvridha portal of BHEL, at the time of invoice submission. The routing of invoices through the TReDS platform shall not be construed as mandating discounting of such invoices and the MSMEs supplier shall have the option to avail or not avail financing or discounting of its receivables on the TReDS platform. In case discounting is not availed by the supplier on TReDS, the trade receivables will be paid through TReDS as per the payment timelines indicated in the contract."													
36.	JURISDICTION:	This contract shall be governed by the Law for the time being in force in the Republic of India. Subject to clause(s) mentioned above of this contract, the Civil Court having original Civil Jurisdiction at Haridwar shall alone have exclusive jurisdiction in regard to all matters in respect of the Contract.													
37.	Force Majeure	"Force Majeure" shall mean circumstance which is: a) beyond control of either of the parties to contract, b) either of the parties could not reasonably have provided against the event before entering into the contract, c) having arisen, either of the parties could not reasonably have avoided or overcome, and d) is not substantially attributable to either of the parties And Prevents the performance of the contract, Such circumstances include but shall not be limited to: i) War, hostilities , invasion, act of foreign enemies. ii) Rebellion,													

		terrorism, revolution, insurrection, military or usurped power, or civil war. iii) Riot, commotion or disorder by persons other than the contractor's personnel and other employees of the contractor and sub-contractors. iv) Strike or lockout not solely involving the contractor's personnel and other employees of the contractor and sub-contractors. v) Encountering munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the contractor's use of such munitions, explosives, radiation or radio- activity. vi) Natural catastrophes such as earthquake, tsunami, volcanic activity, hurricane or typhoon, flood, fire, cyclones etc. vii) Epidemic, pandemic etc. The following events are explicitly excluded from Force Majeure and are solely the responsibilities of the non-performing party: a) any strike, work-to-rule action, goslow or similar labour difficulty (b) late delivery of equipment or material (unless caused by Force Majeure event) and (c) economic hardship. If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within 15 (fifteen) days after the occurrence of such event. The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended by a period of time equal to period of delay caused due to such Force Majeure event. Delay or non-performance by either party hereto caused by the occurrence of any event of Force Majeure shall not i) Constitute a default or breach of the Contract. ii) Give rise to any claim for damages or additional cost expense occasioned thereby, if and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure. BHEL at its discretion may consider short closure of contract after 1 year of imposition of Force Majeure in line with extant guidelines. In any case, Supplier/Vendor cannot consider deemed short-closure after 1 year of imposition of Force Majeure	
38.	Cartel Formation	The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.	
39.	Order of Precedence:	In the event of any ambiguity or conflict between the Tender Documents, the order of precedence shall be in the order below: - Amendments/Clarifications/Corrigenda/Errata etc. issued in respect of the tender documents by BHEL. - Buyer Added Bid Specific ATC - GeM Bid Technical Conditions of Contract (TCC) - GeM GTC	
40.	Conflict of interest:	A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. The bidder found to have a conflict of interest shall be disqualified. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if: - they have controlling partner (s) in common; or - they receive or have received any direct or indirect subsidy/financial stake from any of them; or - they have the same legal representative/agent for purposes of this bid; or - they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; or - Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties	

		are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from. one bidding manufacturer in more than one bid; or f) In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/dealer. There can be only one bid from the following: 1. The principal manufacturer directly or through one Indian agent on his behalf; and 2. Indian/foreign agent on behalf of only one principal- or g) A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid- or h) In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business.	
41.	Order Acceptance:	Ink signed order acceptance shall be furnished within 15 days of order placement. In case, order acceptance do not received within 15 days of order placement, PO deemed to be accepted by you.	
42.	Beneficiary of PO	Kindly confirm on whom the PO will be placed in the event of ordering.	
43.	IP Address	The bids received from same IP address shall be outrightly rejected and shall not be considered for further evaluation.	
44.	Dispatch documents	Following dispatch documents to be provided immediately after directly dispatch to BHEL Project site for billing purpose: • Guarantee/Warrantee Certificates • E- Invoice and commercial invoice • GeM invoice • Original consignee copies of GR/LR/RR (Material shall be dispatched on door delivery basis without consignee copy) • Packing list • Original GST compliance certificate • E-way bill • MRC/POD/Receipted LR/RR/GR copy (as per proof of delivery of material at BHEL Project site)	
45.	Additional Conditions for Assessment	BHEL reserves the right to consider / Not-consider the offers based on the evaluation of documents submitted for the Pre-Qualification Criteria (PQR). BHEL also reserves the right to have on-site assessment of the facilities at supplier's works during the bid evaluation.	
46.	Bidder Contact details	Please provide Contact details of your representative for techno-commercial clarifications: Mobile no. & Email id (minimum 2 person)	
47.	"Environmental compliance for transportation vehicles –	In case of award of contract against this NIT, it is to be ensured by seller that all vehicles deployed for transportation of material to BHEL premises/ project sites comply with the applicable emission norms prescribed by the Central/State Pollution Control Authorities and other statutory authorities. The vehicles shall possess a valid Pollution Under Control (PUC) Certificate throughout the period of transportation. BHEL reserves the right to verify the validity of the PUC certificate at the time of entry of the vehicle into the premises. Non-compliance may result in denial of entry of the vehicle and any consequential delay shall be to the seller's account."	

SPECIAL NOTE FOR BIDDERS:

- In the event of our customer order covering this tender being cancelled /placed on hold /otherwise modified, BHEL would be constrained to accordingly cancel / hold / modify the tender at any stage of execution.
- BHEL may negotiate the L1 rate, if not meeting our budget / estimated cost. BHEL may re-float the tender opened, if L1 price is not acceptable to BHEL even after negotiation.
- Any change in applicable rates of Tax or any other statutory levies (Direct / Indirect) or any new introduction of any levy by means of statute and its corresponding liability for the deliveries beyond the agreed delivery date for reasons

not attributable to BHEL will be to vendors account. BHEL will not reimburse the same and any subsequent claim in this respect will be summarily rejected.

- d. BHEL reserves its right to reject an offer due to unsatisfactory past performance by the respective Vendor in the execution of any contract to any BHEL project / Unit.
- e. The offers of the bidders who are under suspension and also the offers of the bidders, who engage the services of the banned firms /principal/agents, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com.
- f. Recovery / deduction as applicable as per Direct and Indirect taxes as notified by Govt. Of India from time to time will be made and information/certificate for such deduction/recoveries shall be provided by BHEL to the vendor.
- g. If the delivery of supply as detailed above gets delayed beyond the delivery period, the Supplier/Vendor shall request for a delivery extension and BHEL at its discretion may extend the Contract. However, if any 'Delivery extension' is granted to the Supplier/Vendor for completion of supply, due to backlog attributable to the Supplier/Vendor, then it shall be without prejudice to the rights of BHEL to impose LD for the delays attributable to the Supplier/Vendor.
- h. In case BHEL increase the quantity during currency of the contract in line with quantity variation clause of GeM bid, delivery extension on pro-rata basis shall be given for supply of these additional quantity.

Following documents are an integral part of this Tender Enquiry and endorsed copies of these documents (duly signed and stamped on each page, as a token of acceptance) are to be submitted/uploaded along with offer on GeM portal against this bid.

- 1. Please submit replica of Price schedule (without prices) showing "quoted" in place of price along with techno-commercial bid (Part-I).
- 2. Please submit signed & Stamped copy (each page) of duly filled of confirmation column of "Buyers Specific Additional Terms & Conditions (ATC)" and its clause wise supporting documents where required.
- 3. Please submit signed & stamped copy (each page) for qualifying PQR with proper filled information and related supporting documents as mentioned in PQR.
- 4. Please submit certificate of Minimum local content as specified in the Make In India Certificate of the tender

PQR FOR SEAL STEAM VALVE FOR 660 MW/800 MW PROJECTS

Clause No.	Pre-qualification requirements	Vender's response
1	The vendor should have experience of designing, manufacturing & supply of control valve that has been used in steam applications of Steam turbines of rating 500 MW or above as per following details: 1.1 Design pressure: 21 bar or above 1.2 Design temperature: 500 deg C or above 1.3 Valve size: 3" or above 1.4 Working medium: steam 1.5 ANSI class of the supplied valves shall be ASME 600 or higher. 1.6 Operating time for full control stroke shall < 3 seconds 1.7 Valve leakage class: Class IV or higher as per ANSI FCI 70-2. 1.8 Actuators of the valve shall be pneumatically operated 1.9 The vendor shall have experience of SMART type positioner.	<u>Yes/No</u>
2	The vendor should have experience of supplying the valve satisfying all the conditions referred at point no. 1 above for at least one steam turbine power plant of rating 500 MW or above, which has been commissioned at least one year as on date of issuance of enquiry. The vendor to submit experience details as per Annexure-A along with relevant documents of supplied valve & its actuator along with accessories like datasheets & drawings etc. to support their claim.	<u>Yes/No</u>

Note: -

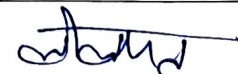
- Against vendor's replies, BHEL reserves the right to ask for more information/documents/clarifications. Vendor's offer shall not be considered if vendor fails to furnish the document/information/clarifications as mentioned above or vendor doesn't meet the above acceptance criteria.

	STE-TG	CIE
Prepared by	<i>[Signature]</i>	<i>[Signature]</i>
Checked by	<i>[Signature]</i>	<i>[Signature]</i>
Approved by	<i>[Signature]</i>	<i>[Signature]</i>

ANNEXURE-A

Experience details for seal steam valve:

SL. No.	Description	Applicable data	
		As per BHEL requirement	As per vendor's experience
1.	Name of power station and its location		
2.	Client name and its address, Fax no. & contact No.		
3.	Name and designation of the responsible person in client's organization /Power plant		
4.	Capacity in MW of unit	500 MW or above	
5.	P.O. no. and date		
6.	Date of commissioning of above project		
7.	Manufactured by		
8.	Evidence of supplying the valve for above mentioned project viz. PO copy/end user certificate (shall not be more than 7 years old as on date of issuance of enquiry)		
9.	Design parameters		
	Design pressure	21 bar (a) or above	
	Design temperature	500 deg C or above	
10.	Size of the valve	≥ 3"	
11.	Operating time of actuators(open/close)	< 3 sec	
12.	Leakage class	Class IV or higher as per ANSI FCI 70-2	
13.	Valve class	ASME 600 or higher	
14.	Type of actuator	Pneumatically actuated	
15.	Working medium	Steam	
16.	Valve type	Control valve	
17.	Type of body	Globe	
18.	Positioner Type	SMART type	

	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC) CONTROL VALVES WITH PNEUMATIC ACTUATORS		STANDARD QUALITY PLAN CONFORMING TO CODE: ASME 16.34				QP NO : 0000-999-QOI-S-047 R1 REV NO :01 DATE: 30.07.2025	REVIEWED BY : S.T.G RAVIKANTH S. P SINHA		S.T.G RAVIKANTH SHRINARAYAN PRASAD SINHA		APPROVED BY: MOHAMMAD KHALIQUZZAMA Digitally signed by MOHAMMAD KHALIQUZZAMA Date: 2025.08.02 16:57:56 +05'30'			
							PAGE: 1 OF 3		Digitally signed by S.T.G RAVIKANTH Date: 2025.07.31 11:22:39 +05'30'		Digitally signed by SHRINARAYAN PRASAD SINHA Date: 2025.07.31 15:53:15 +05'30'				
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		REMARKS		
					M	C/N-E					M	C@	N		
1	2	3	4	5	6	7	8	9	10	D*	**	11	12		
A	Raw Material -Bought out items	List of BOI to be attached													
A.1	CMTR (Certificate of material test report) for valve body & bonnet	a Mechanical & Chemical properties	Critical	Review	01/Heat No	01/Heat No	ASME Material specification	ASME Material specification	MTC	√	V	V	V	IBR form III-F or III-G as applicable	
		b Heat Treatment	Critical	Review	01/Heat No	01/Heat No	ASME Material specification	ASME Material specification	TC	√	V	V	V		
A.2	NDE on body & bonnet	a RT/UT/MT/PT	Critical	Review	100%	100%	ASME 16.34	ASME 16.34	IR	√	V	V	V	As per attached table -1	
A.3	Hydraulic pressure shell test for valve body/ bonnet	a Pressure test	Critical	Review	100%	100%	ASME 16.34	No leakage	IR	√	V	V	V		
A.4	Dimensional & valve body thickness measurement work	a Dimension Check	Critical	Measurement	100%	100%	NTPC Approved data sheet	NTPC Approved data sheet	IR	√	P	V	V		
A.5	Visual Inspection cast body / Bonnet	a Cast surface condition	Critical	Visual	100%	100%	ASME 16.34	MSS-SP-55	IR	√	P	V	V		
A.6	CMTR (Certificate of material test report) for Trim plug, stem, seat ring & body stud/nut	a Physical & Chemical properties	Critical	Review	01/Heat No	01/Heat No	ASME Material specification	ASME Material specification	MTC	√	V	V	V		
		b Heat Treatment	Critical	Review	01/Heat No	01/Heat No	ASME Material specification	ASME Material specification	IR	√	V	V	V		
A.7	NDE on trim	a UT	Critical	Review	100%	100%	ASME 16.34	ASME 16.34	IR	√	V	V	V	If dia > 40mm	
A.8	CMTR (Certificate of material test report) for Reducer	a Mechanical & Chemical properties	Critical	Review	01/Heat No	01/Heat No	ASME Material specification	ASME Material specification	MTC	√	V	V	V		
		b Heat Treatment	Critical	Review	01/Heat No	01/Heat No	ASME Material	ASME Material specification	TC	√	V	V	V		
A.9	Welding Documentation & Inspection														
	Welding Procedure Specification	a Correctness	Critical	Review	100%		ASME IX	ASME IX	Format of IS / ASME	√	P	V	V		
	Procedure Qualification Record	b Qualification records shall be verified	Critical	Review	100%		ASME IX	ASME IX	Format of IS / ASME	√	P	V	V		
	Welder Performance Qualification	c Qualification records shall be verified	Critical	Review	100%		ASME IX	ASME IX	Format of IS / ASME	√	P	V	V		
A.10	Pneumatic Actuator	a Manufacture test report	Critical	Review	01 of each type		NTPC approved datasheet/ Tech spec	NTPC approved datasheet/ Tech spec	IR	√	P	V	V		
A.11	Positioner (Smart / Normal), Solenoid valve, Air filter Regulator, Position Feedback Tx (PFT), E/P Converter	a Manufacture test report	Major	Review	01 of each type		NTPC approved datasheet/ Tech spec	NTPC approved datasheet/ Tech spec	TC	√	P	V	V		
LEGEND/संकेतिका: * Records, identified with "Tick" (√) shall be essentially included by supplier in QA documentation. ** "टिक" (√) के साथ प्रमाणित रिकॉर्ड, कृपया दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा। ** M: Manufacturer / Sub Supplier निर्माता / उप-आपूर्तिकर्ता, C: Main Supplier मुख्य संविदाकार/ Nominated Inspection Agency, N/E: NTPC एनटीपीसी / Employer, P: Perform निष्पादन, W: Witness गवाह and V: Verification as appropriate सत्यापन (जैसा उपयुक्त हो), "CHP/सोएचपी" NTPC shall identify in column "N" As "W"/ एनटीपीसी खंड "N" में "W" के रूप में करेगा। ADS - NTPC ** M: MANUFACTURER / SUB-SUPPLIER / निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सोएचपी: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W": एनटीपीसी खंड "N" में "W" के रूप में करेगा।															
FORMAT NO.: QS-01-QAI-P-07A/F3-R1 1/1															

	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.) : CONTROL VALVES WITH PNEUMATIC ACTUATORS		STANDARD QUALITY PLAN CONFORMING TO CODE: ASME 16.34			QP NO : 0000-999-QOI-S-047 R1 REV NO :01 DATE: 30.07.2025	REVIEWED BY : S.T.G RAVIKANTH S.T.G RAVIKANTH Digitally signed by S.T.G RAVIKANTH DN: cn=S.T.G RAVIKANTH, c=IN, cn=NTPC LTD, o=NTPC Ltd, email=sravikanth@ntpc.co.in Date: 2025.07.31 11:22:49 +05'30'		APPROVED BY: MOHAMMAD KHALIQUZZAMA MA Digitally signed by MOHAMMAD KHALIQUZZAMA Date: 2025.08.02 16:58:51 +05'30'				
						PAGE: 2 OF 3		S. P SINHA SHRINARAYAN PRASAD SINHA Digitally signed by SHRINARAYAN PRASAD SINHA Date: 2025.07.31 15:54:14 +05'30'					
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		REMARKS
					M	C/N-E					M	C@	N
1	2	3	4	5	6	7	8	9	10	D*	**	11	12
B	In Process inspection												
B.1	Magnetic partical testing (MT) or Liquid penetrant testing (PT) for all accessories Internal,external surface of casating body / bonnet/ butt weld end parts	a MT or PT	NDE	Review	100%		ASME B16.34	ASME B16.34	IR	√	P	V	V
C	Final Inspection												
C.1	Type Test	Review of type test clearance from NTPC engg											
C.2	Visual Inspection	a Make ,Model no , Tag & marking	Critical	Visual	100%		NTPC approved datasheet/ Tech spec	NTPC approved datasheet/ Tech spec	IR	√	P	W	W
		b Dimention Check	Critical	Measurement	100%		NTPC approved datasheet/ Tech spec	NTPC approved datasheet/ Tech spec	IR	√	P	W	W
C.3	Hydraulic pressure shell test for valve body/ bonnet	a Pressure test	Critical	Visual	100%		ASME B16.34	No leakage	IR	√	P	W	W
C.4	Seat leakage test	a Pressure test	Critical	Visual	100%		ANSI/FCI 70-2	No leakage	IR	√	P	W	W
C.5	Actuator leakage test	a Air leakage test	Critical	Visual	100%		NTPC approved datasheet/ Tech spec	NTPC approved datasheet/ Tech spec	IR	√	P	W	W
C.6	Functional test	a Hand wheel operations	Physical	Visual	100%		NTPC approved datasheet/ Tech spec	NTPC approved datasheet/ Tech spec	IR	√	P	W	W
		b Valve travel	Physical	Visual	100%								
		c Hysterisis	Physical	Visual	100%								
		d Linerity	Physical	Visual	100%								
		e Repetability	Physical	Visual	100%								
		f Fail safe operation	Physical	Visual	100%								
		g Stroke time (Open/Close)	Physical	Visual	100%								
LEGEND/संकेतिका: * Records, Identified with "Tick" (√) shall be essentially included by supplier in QA documentation. * " टिक" (√) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा। ** M: Manufacturer / Sub Supplier निर्माता / उप-आपूर्तिकर्ता , C: Main Supplier मुख्य संविदाकार/ Nominated Inspection Agency, N/E: NTPC एनटीपीसी / Employer, P: Perform निष्पादन, W: Witness गवाह and V: Verification as appropriate सत्यापन (जैसा उपयुक्त हो) , "CHP/सीएचपी" NTPC shall identify in column "N" As "W"/ एनटीपीसी खंड "n" में "W" के रूप में करेगा। ADS - NTPC													
** M: MANUFACTURER / SUB-SUPPLIER / निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो) , CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W": एनटीपीसी खंड "N" में "W" के रूप में करेगा।													
FORMAT NO.: QS-01-QAI-P-07A/F3-R1 1/1													



ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.) :
CONTROL VALVES WITH PNEUMATIC ACTUATORS

STANDARD QUALITY PLAN

CONFORMING TO CODE: ASME 16.34

QP NO :

0000-999-QOI-S-047 R1

REV NO :01

DATE: 30.07.2025

REVIEWED BY :

S.T.G RAVIKANTH

S. P SINHA

APPROVED BY:

MOHAMMAD KHALIQUZZAMA

MA

Digitally signed by MOHAMMAD KHALIQUZZAMA

Date: 2025.08.02 16:59:32 +05'30'

SL. NO.

COMPONENT & OPERATIONS

CHARACTERISTICS

CLASS

TYPE OF CHECK

QUANTUM OF CHECK

M

C/N-E

REFERENCE DOCUMENT#

ACCEPTANCE NORMS

FORMAT OF RECORD

D*

AGENCY

M

C@

N

REMARKS

1

2

3

4

5

6

7

8

9

10

D*

**

11

12

D

Painting

a

Appearance (Paint shade)

Physical

Visual

100%

NTPC approved datasheet/ Tech spec

NTPC approved datasheet/ Tech spec

IR

✓

P

V

E

Packing and Shipping

a

As Per Mfr Standard Procedure

Valve size NB in mm	ANSI Class upto 300	ANSI Class ABOVE 300 upto 600	ANSI Class above 600 below 900	ANSI Class 900 & above & below 4500
Less than 50	Visual	Visual	Visual	MPI
50 & above but below 100	Visual	Visual	MPI	MPI & RT (on 10% of valves on 100% area)
100 & above but less than 300	Visual	MPI	MPI & RT (on 10% of valves on change of section & weld ends)	MPI & RT (on 100% area)
300 and above	MPI	MPI	MPI & RT (on of valves on change of section & weld ends)	MPI & RT (on 100% area)

Note :

For body and bonnet forgings, UT with MPI may be adopted in place of RT

For austenitic steel MPI may be replaced by LPI.

LEGEND/संकेतिका: * Records, identified with "Tick" (✓) shall be essentially included by supplier in QA documentation. * " टिक" (✓) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा। ** M: Manufacturer / Sub Supplier निर्माता / उप-आपूर्तिकर्ता, C: Main Supplier मुख्य संविदाकार/ Nominated Inspection Agency, N/E: NTPC एनटीपीसी / Employer, P: Perform निष्पादन, W: Witness गवाह and V: Verification as appropriate सत्यापन (जैसा उपयुक्त हो), "CHP/सीएचपी" NTPC shall identify in column "N" As "W"/ एनटीपीसी खंड "n" में "W" के रूप में करेगा। ADS - NTPC ** M: MANUFACTURER / SUB-SUPPLIER / निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W".: एनटीपीसी खंड "N" में "W" के रूप में करेगा।

FORMAT NO.: QS-01-QAI-P-07A/F3-R1 1/1

PROJECT: 250 /500/660/700/800 MW PROJECT

DATE: 28.02.2025, REV05

ITEM: SMART POSITIONER FOR SEAL STEAM & LEAK STEAM CONTROL VALVE

ADDENDUM TO DRAWING NO:

APPLICATION: STEAM TURBINE

ADDITIONAL SPECIFICATION:

1.0 **SCOPE:** This specification is intended to cover the requirements of Smart positioner for Pneumatic actuator of control valve.

2.0 **ELECTRICAL:**

- 2.1 Input signal shall be 4-20 mA from control system with Hart signal super- imposed.
- 2.2 Power supply: loop powered.
- 2.3 Valve position sensing to be provided, non-contact type, 4-20 mA for control system.

3.0 **ENVIRONEMENT:**

- 3.1 Operating temp shall be 0 to 70 degree C.
- 3.2 Humidity: 0-95%
- 3.3 Protection class shall be IP-65 minimum.

4.0 **SOFTWARE CONFIGURATION DIAGNOSTIC:**

- 4.1 Windows 2000/NT based software. Software shall meet the requirement for configuration, diagnostics, calibration and testing of the actuator. However, Software package for advanced diagnostic features is not required.
- 4.2 It shall be SMART and should have advanced diagnostic features like Travel Counter on line partial closure test, valve signature analysis, step response test, valve friction/jamming detection. The Positioner shall be advanced diagnostic compatible.
- 4.3 Factory valve signature tests reports (PR vs valve travel and Travel vs IP signal shall be provided.

5.0 **CONFIGURATION/OPERATING MODES:**

- 5.1 Calibration: Remote calibration, auto & manual calibration shall be possible.
- 5.2 Operating range: Full range & split range signal range.
- 5.3 Valve action: Direct & reverse valve action.
- 5.4 Flow characterization possible to fit valve linear, equal percentage.

6.0 FAIL SAFE

6.1 In case control signal 4 – 20 mA DC fails, (Pneumatic supply in OK condition, the valve will move to the default Fail safe position (Fail Close --- for Leak as well as seal steam valves).

In case Pneumatic signal fails, control signal (4 – 20 mA DC) in OK condition, then Air inside the Actuator will be Locked by Air Lock Relay, thus Fail Lock condition will be achieved i.e. Last Position hold prior to Failure of Air supply.

7.0 PERFORMANCE:

7.1 Characteristic deviation shall be $\leq 0.5\%$ of SPAN.

7.2 Ambient temp. effect shall be $\leq 0.01\%$ Deg. C or better.

8.0 ACCESSORIES:

8.1 In built operator panel display with push buttons for configuration and display on the positioner itself (password/hardware Lock).

8.2 Air filter regulator to be provided.

8.3 Press Gauge Block for supply & output pressure, filter regulator other accessories shall be provided as on required basis for making system complete.

8.4 Junction Box to be provided. Junction Box Specification -18 Ways, ½” NPT 3 Nos. Cable entry. Weather Proof IP 65 Min.

8.5 Cable glands to be provided. Cable gland specification-Double Compression SS 304(Weather Proof IP 65)

8.6 Position transmitter whether integral part of positioner or not: To be specified by vendor.

9.0 DOCUMENTS TO BE PROVIDED:

9.1 Datasheet including positioner model and make, Hook –up diagram to be complete input/output signals duly terminated onto JB.

10.0 PACKING:

10.1 The positioner shall be loosely supplied in the main package with proper identification along with all fittings for mounting on the main valve and cables for termination to the Junction Box.

10.2 The Packing should be seaworthy (with silica gel) to avoid ingress of Moisture.

- 10.3 The positioner shall be packed in separate wooden box/compartment to avoid breakage.
- 10.4 Proper Labeling such as item name “Positioner”, “P.O.” etc. shall be clearly indicated on the wooden Box for identification in case of misplacement.
- 10.5 Two sets of Mounting and Calibration Instruction manual shall be sent along with the positioner.
- 10.6 O&M manual for mounting and calibration of positioner shall be submitted along with the offer.

Prepared:
(Mudit Jain) Sd/-
(CIE)

Checked:
(Saswati) Sd./-
(CIE)

Approved:
(Vinod Kumar) Sd./-
(CIE)

PROJECT : 250 /500/660/700/800 MW PROJECT
Date:25.05.2026 , REV00
ITEM : SEAL STEAM POSITIONER WITH LINK ASSEMBLY
ADDENDUM TO DRAWING NO:
APPLICATION : STEAM TURBINE
MATCODE: ST9718102094

ADDITIONAL SPECIFICATION:

- 1.0 SCOPE:** This specification is intended to cover the requirements of SMART positioner for Pneumatic actuator of SEAL STEAM control valve.

The positioner is to be supplied along with link assembly containing link rod, mounting bracket etc.

2.0 ELECTRICAL:

- 2.1 Input signal shall be 4-20 mA from control system with HART signal super-imposed.
- 2.2 Power supply: loop powered.
- 2.3 Valve position sensing to be provided, non-contact type, 4-20 mA for control system.

3.0 ENVIRONMENT:

- 3.1 Operating temp shall be 0 to 70 degree C.
- 3.2 Humidity: 0-95%
- 3.3 Protection class shall be IP-65 minimum.

4.0. SOFTWARE CONFIGURATION DIAGNOSTIC:

- 4.1 Latest Windows based software. Software shall meet the requirement for configuration, diagnostics, calibration and testing of the actuator. However, Software package for advanced diagnostic features is not required.
- 4.2 It shall have advanced diagnostic features like Travel Counter on line partial closure test, valve signature analysis, step response test, valve friction/jamming detection. The Positioner shall be advanced diagnostic compatible.
- 4.3 Factory valve signature tests reports (PR vs valve travel and Travel vs IP signal shall be provided.

5.0 CONFIGURATION/OPERATING MODES:

- 5.1 Calibration: Remote calibration, auto & manual calibration shall be possible.
- 5.2 Operating range : Full range & split range signal range.
- 5.3 Valve action : Direct & reverse valve action.
- 5.4 Flow characterization possible to fit valve linear, equal percentage.

6.0 FAIL SAFE

- 6.1 In case control signal 4 – 20 Ma DC fails, (Pneumatic supply in OK condition, the valve will move to the default Fail safe position (Fail Close).

In case Pneumatic signal fails, control signal (4 – 20 ma DC) in OK condition, then Air inside the Actuator will be Locked by Air Lock Relay, thus Fail Lock condition will be achieved i.e Last Position hold prior to Failure of Air supply.

7.0 PERFORMANCE:

- 7.1 Characteristic deviation shall be $\leq 0.5\%$ of SPAN.
- 7.2 Ambient temp. effect shall be $\leq 0.01\%$ Deg. C or better.

8.0 ACCESSORIES:

- 8.1 In built operator panel display with push buttons for configuration and display on the positioner itself (password/hardware Lock).
- 8.2 Air filter regulator to be provided.
- 8.3 Press Gauge Block for supply & output pressure, filter regulator other accessories shall be provided as on required basis for making system complete.
- 8.4 Junction Box to be provided. Junction Box Specification -18 Ways, ½” NPT 3 Nos. Cable entry. Weather Proof IP 65 Min.
- 8.5 Cable glands to be provided. Cable gland specification-Double Compression SS 304(Weather Proof IP 65)
- 8.6 Position transmitter whether integral part of positioner or not- To be specified by vendor.

9.0 DOCUMENTS TO BE PROVIDED:

- 9.1 Datasheet including positioner model and make, catalogue of positioner, Hook –up diagram to be complete input/output signals duly terminated onto JB.

10.0 PACKING:

- 10.1 The positioner shall be loosely supplied in the main package with proper identification along with all fittings for mounting on the main valve and cables for termination to the Junction Box.

OR

The positioner to be supplied mounted on the valve and packed with sea worthy packing (with silica gel) for long term storage at site and to avoid ingress of Moisture.

- 10.2 The positioner shall be packed in separate wooden box/compartment to avoid breakage.
- 10.3 Proper Labeling such as item name “Positioner”, “P.O.” etc. shall be clearly indicated on the wooden Box for identification in case of misplacement.
- 10.4 Two sets of Mounting and Calibration Instruction manual shall be sent along with the positioner.
- 10.5 O&M manual for mounting and calibration of positioner shall be submitted along with the offer.

Prepared:
(Mudit Jain) Sd/-
(CIE)

Checked:
(Saswati) Sd./-
(CIE)

Approved:
(Vinod Kumar) Sd./-
(CIE)

00029-62331-2

DRAWING No.

TABLE-1: VALVE DATA:-

OPERATING PARAMETERS	OPERATING CONDITION		
	CASE-1	CASE-2	CASE-3
INLET PRESSURE bar(a)	18	16	13
INLET TEMPERATURE (°C)	240	290	320
FLOW RATE (Kg/sec.)	1.13		
OUTLET PRESSURE bar(a)	1.048		
FLUID	STEAM		
DESIGN PRESSURE bar(a)	21 bar(abs)		
DESIGN TEMPERATURE (°C)	550		

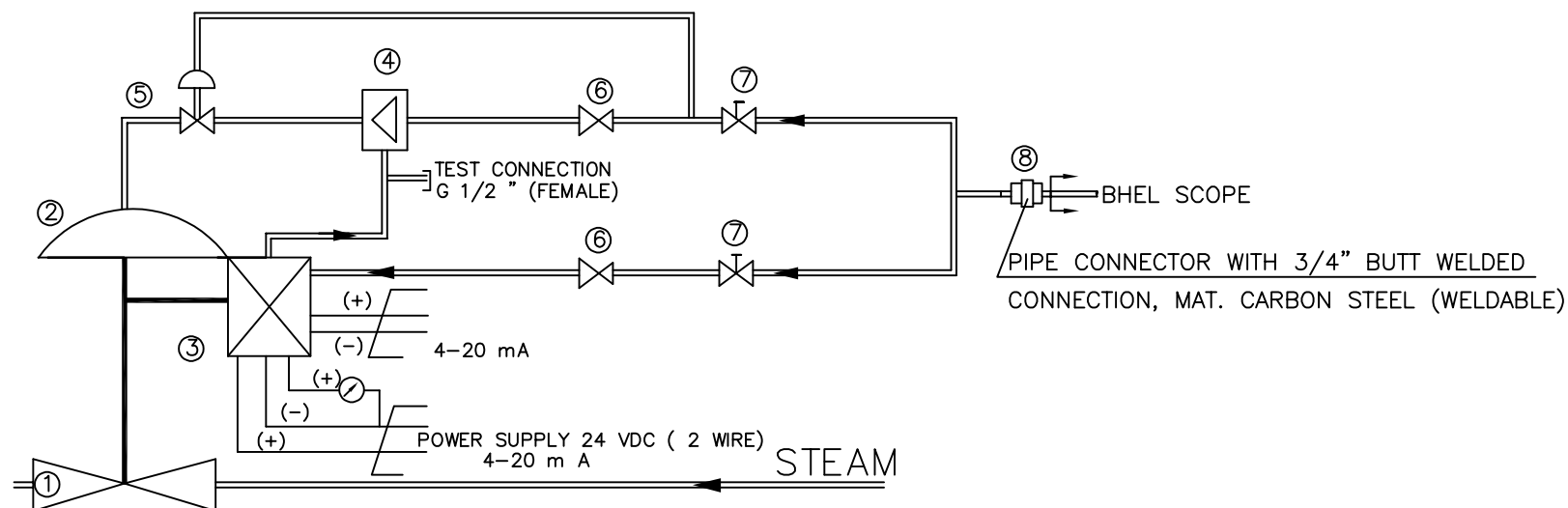


FIG.1: SCHEMATIC DIAGRAM FOR SEAL STEAM SUPPLY VALVE

TABLE-2: ACTUATOR DATA:-

TYPE	ELECTRO-PNEUMATIC
INPUT SIGNAL	4 TO 20 mA.
OPERATING TIME FOR FULL CONTROL STROKE	<3 sec.
ΔP ACTUATOR	2 bar
TYPE OF DRIVE	DIAPHRAGM
FAILURE MODE	STAYPUT
PRESSURE OF CONTROL AIR SUPPLY AHEAD OF ACTUATOR (MAX/MIN.)	10/5 bar(g)
PNEUMATIC CONNECTION	3/4" BUTT WELDED
POSITIONER	I/P - POSITIONER (SMART TYPE)
ELECTRONIC POSITION FEEDBACK TRANSMITTER FOR BHEL USE	2 WIRE TYPE 4~20 mA OUTPUT, 24 V DC

TABLE-4:

ITEM DESCRIPTION
1. CONTROL VALVE FUNCTION: AIR TO OPEN SPRING TO CLOSE.
2. PNEUMATIC ACTUATOR: SPRING-DIAPHRAGM TYPE
3. I/P-POSITIONER
4. AIR VOLUME BOOSTER
5. BLOCKING VALVE
6. FILTER AND REDUCING STATION
7. STOP VALVE
8. 1/2" PIPE CONNECTOR

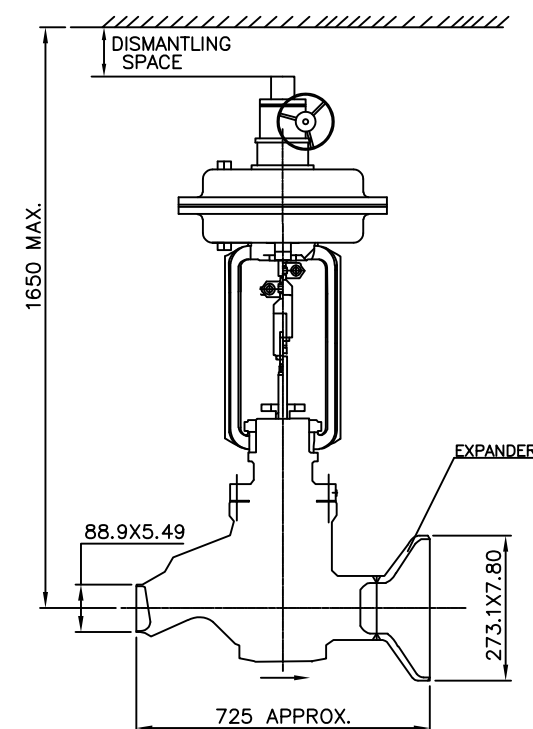


FIG.2: PROPOSED ARRANGEMENT OF SEAL STEAM SUPPLY VALVE (REFER SH.2, T.R. 1.3)

MAT. CODE : W90313239398

TABLE-3: END CONNECTION DETAIL (REFER SH.2, T.R. 1.3):-

END CONNECTION	NOMINAL DIA.	SIZE			TYPE OF CONNECTION	WELD FIG./ FORM
		OUTER DIA.(mm)	WALL THICKNESS(mm)			
INLET	3"	88.9	5.49	FOR ALL PROJECTS	BUTT WELDED	FIG.4 AS PER ASME B16.25
OUTLET	10"	273.1	6.35	FOR OTHER PROJECTS	BUTT WELDED	FIG.4 AS PER ASME B16.25
			7.80	FOR MAITREE & ONWARDS PROJECTS		

				GMS No./ CBOM No.		STATUS OF DRG U	
GRADE OF UNTOL.DIM				AGREED DEPT	NAME	SIGN	DATE
M/CG.- C /M/ F AA0230208				CIE	SASWATI	-SD-	05.12.23
WELDING- A /B/ C / D AA0621104							
GAS CUTTING-'T3'AA0621101							
REV	DATE	ALTERED	H.SINGH -SD-	REV	DATE	ALTERED	H.SINGH -SD-
02	06.08.26	CHECKED	L.P.SINGH -SD-	01	11.03.25	CHECKED	L.P.SINGH -SD-
	CHANGES MADE ONLY IN DRG. SHEET NO.2 AS PER C/A NO. STE-26-F0123.				CHANGES MADE ONLY IN DRG. SHEET NO.2 AS PER C/A NO. STE-25-F0067.		

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		STEAM TURBINE					
 BHARAT HEAVY ELECTRICALS LTD. RANIPUR, HARDWAR			NAME	SIGN	DATE	No. of VAR — 73 7	
		DRN	H.SINGH	— sd —	01.12.23		
		CHD	L.P.SINGH	— sd —	04.12.23		
		APPD	V.SRIVASTAVA	— sd —	05.12.23		
DEPT STE		SCALE N.T.S.	WEIGHT (KG) —	REF. TO ASSY. DRG. —		ITEM No. —	No. of ITEMS 75 7
CODE 4011							
TITLE : SEAL STEAM VALVE WITH PNEU. ACTUATOR			CARD CODE	DRAWING NO. 2-13239-52000 7			— 22 23 2
			SHEET No. 01		No. OF SHEETS 02		

4.4 THE SUPPLIER SHALL BEAR FULL RESPONSIBILITY FOR COMPLIANCE OF ALL THE PARTS & COMPONENTS SUPPLIED IN PURSUANT TO THIS SPECIFICATION WITH THE FULL SCOPE OF SAFETY REGULATIONS OF THE COUNTRY.

02

				GMS No./ CBOM No. -				STATUS OF DRG U		TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT STEAM TURBINE															
GRADE OF UNTOL.DIM				AGREED DEPT		NAME		SIGN		DATE															
M/CG.- Q /M/ F AA0230208				CIE		SASWATI		-SD-		05.12.23															
WELDING- A /B/ Q / D AA0621104																									
GAS CUTTING- T 3AA0621101																									
REV 02		DATE 06.08.26		ALTERED H.SINGH -SD-		REV 01		DATE 11.03.25		ALTERED H.SINGH -SD-															
				CHECKED L.P.SINGH -SD-						CHECKED L.P.SINGH -SD-															
CHANGES MADE ONLY IN DRG. SHEET NO.2 AS PER C/A NO. STE-26-F0123.				CHANGES MADE ONLY IN DRG. SHEET NO.2 AS PER C/A NO. STE-25-F0067.																					
5				4				3				DEPT STE				SCALE N.T.S.		WEIGHT (KG) -		REF. TO ASSY. DRG. -		ITEM No.		NO. OF ITEMS	
												CODE 4011													
TITLE : SEAL STEAM VALVE WITH PNEU. ACTUATOR										CARD CODE -		DRAWING NO. 2-13239-52000						-							
												SHEET No. 02						No. OF SHEETS 02		22 23 24					
												73 74													

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21323913000
Ref.Drawing No

Sign & Date

Inventory No.

10000-68281-8
DRAWING No.

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

FORM DG 38(B)

TABLE-1 SPARES FOR SEAL STEAM SUPPLY VALVE

S.NO.	ITEM DESCRIPTION	QTY.	
01	COMPLETE SET OF INTERNALS (EXCEPT OUTER BODY& BONNET ALONG WITH ACTUATOR)	1 SET	
02	GUIDE BUSHINGS	1 SET	
03	PLUG AND STEM ASSEMBLY	1 SET	
04	CAGE	1 NO	
05	SET OF O RINGS	1 SET	
06	SEALING RINGS	1 SET	
07	SET OF GASKETS	1 SET	
09	BONNET SEAL	1 SET	
10	SET OF PACKING	1 SET	
11	SEAT RING	1 NO	
12	GLAND PACKING	1 SET	
13	RETAINER RING	1 NO	

TABLE-2 SPARES FOR SEAL STEAM SUPPLY VALVE ACTUATOR

S.NO.	ITEM DESCRIPTION	QTY.	
01	COMPLETE ACTUATOR ASSEMBLY ALONG WITH ACCESSORIES	1 SET	
02	POSITIONER ALONG WITH POSITION TRANSMITTER	1 NO	
03	ACTUATOR DIAPHRAGM	1 NO	
04	ACTUATOR STEM	1 NO	
05	SEALS/GASKETS	1 SET	
06	O RINGS	1 SET	
07	AIR LOCK RELAY	1 NO	
08	VOLUME BOOSTER	1 NO	
09	AIR FILTER & RELIEF VALVE	1 NO	
10	AIR SET	1 NO	
11	PILOT RELAY	1 NO	

TECHNICAL REQUIREMENTS :-

1. INTERCHANGEABILITY OF THE MENTIONED ITEMS ARE FOR REPLACEMENT WITH THEIR PARTS FOR WHICH SUPPLY IS TO BE MADE AGAINST MAIN OFFER
2. ALL THE SPARES MUST BE PACKED IN SEALED TRANSPARENT PLASTIC BAGS AND CLEARLY MARKED OR LABELLED ON THE OUTSIDE OF THE PACKING WITH ITS DESCRIPTION & ASSEMBLY PART NUMBERS.
3. QUALITY CHECKS & TESTING NORMS/REQUIREMENTS AS PER AGREED QUALITY PLAN (QP) SHALL ALSO BE APPLICABLE FOR ALL THE SPARES AS LISTED.
4. ALL THE RELEVANT ASSEMBLY DRGS. SHALL BE FURNISHED BY THE VENDOR MARKING ALL THE OFFERED ITEMS.

GMS No./ C B O M				STATUS OF DRG
AGREED DEPT	NAME	SIGN	DATE	
CIE	SASWATI	-SD-	03.01.16	

TYPE OF PRODUCT
OR
NAME OF CUSTOMER/PROJECT

STEAM TURBINE



BHARAT HEAVY ELECTRICALS LTD.
RANIPUR, HARDWAR

	NAME	SIGN	DATE	NO. OF VAR — 73 74
DRN	HARENDRA	SD/-	01.01.16	
CHD	AKS/NN	SD/-	02.01.16	
APPD	P.K.BANSAL	SD/-	03.01.16	

DEPT STE		SCALE NTS	WEIGHT (KG) —	REF. TO ASSY. DRG.	ITEM No. —	NO. OF ITEMS — 75 77
CODE 4011						

TITLE :
 OPTIONAL SPARES —
SEAL STEAM VALVE

CARD CODE	DRAWING NO. 3-13239-00001	— 22 23 24
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SHEET No. 1 No. OF SHEETS 1

SIZE A3

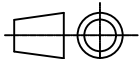
DRAWING NO.

NOTES:—

SL. NO.	CUSTOMER SPEC. CLAUSE NO. KODERMA	CUSTOMER SPEC. CLAUSE NO. KORBA WEST	DESCRIPTION	QTY	MATERIAL CODE
01	C.1.XIII/1	HB.C.1.XIII.1	GLAND STEAM SUPPLY VALVE (COMPLETE ASSEMBLY ALONG WITH ACTUATOR & ACCESSORIES)	1 NO.	WS9713239008
02	7.1/15	HB.7.00.00.1.6	PNEUMATIC ACTUATOR FOR GLAND STEAM SUPPLY VALVE ALONG WITH ACCESSORIES – COMPLETE ASSEMBLY	1 NO.	WS9713239059
03	7.2/1	HB.7.00.00.2.1	DIAPHRAGMS / PISTON (WITH SPINDLE), O-RINGS, SEALS ETC. FOR ACTUATOR OF GLAND STEAM SUPPLY VALVE (ONE SET MEANS QUANTITY REQUIRED FOR COMPLETE REPLACEMENT IN ONE ACTUATOR)	5 SETS	WS9713239067
04	7.5/1	HB.7.00.00.5.1	AIR FILTER REGULATOR FOR GLAND STEAM SUPPLY VALVE (EACH TYPE, MAKE & RATING)	2 NOs.	WS9713239083
05	7.6/1	HB.7.00.00.6.1	AIR LOCK RELAY FOR GLAND STEAM SUPPLY VALVE (EACH TYPE, MODEL AND RATING)	1 NO.	WS9713239113

1. ALL THE MANDATORY SPARES SPECIFIED ABOVE SHALL BE MANUFACTURED EXACTLY SAME AS AGAINST MAIN SUPPLY.
2. INTERCHANGEABILITY OF THE MENTIONED ITEMS ARE FOR REPLACEMENT WITH THEIR PARTS FOR WHICH SUPPLY IS TO BE MADE AGAINST MAIN OFFER.
3. ALL THE SPARES MUST BE PACKED IN SEALED TRANSPARENT PLASTIC BAGS AND CLEARLY MARKED OR LABELED ON THE OUTSIDE OF THE PACKING WITH ITS DESCRIPTION & ASSEMBLY PART NUMBERS.
4. QUALITY CHECKS & TESTING NORMS/ REQUIREMENTS AS PER AGREED QUALITY PLAN (QP) SHALL ALSO BE APPLICABLE FOR ALL THE SPARES AS LISTED.
5. IF ANY ITEM IS NOT APPLICABLE THAN EQUIVALENT ITEM TO BE SUPPLIED BY THE VENDOR.
6. ALL MANDATORY SPARES ARE TO BE PACKED IN GREEN COLOUR BOX WITH " MANDATORY SPARES FOR SEAL STEAM VALVE" LABELED ON IT.

MAT. CODE: WS9013239005

			CBOM NO.		STATUS OF DRG.		TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT				STEAM TURBINE				
GRADE OF UNTOL. DIM.:—			AGREED DEPT.	NAME	SIGN	DATE									
M/CG— V/Ⓢ/M/Ⓢ AA 0230208															
WELDING—A/B/Ⓢ/D—AA0621104															
GAS CUTTING—'T3'AA0621101															
REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED		DEPT. STE			SCALE	WEIGHT(Kg.)	REF. TO ASSY. DRG.		ITEM NO.	NO.OF ITEMS
							CODE 4011			— —	— —	— — — — —		—	—
						TITLE			1 3		DRAWING NO.				
						SPARES FOR SEAL STEAM SUPPLY VALVE			—		3—13239—52200		—		
											SHEET NO.01		NO.OF SHEETS 01		

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OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

DRAWING NO.
3-13239-52600SPARES APPLICABLE FOR SEAL STEAM VALVE WITH PNEUMATIC ACTUATOR

SL. NO.	CUSTOMER SPECIFICATION CLAUSE NO.	DESCRIPTION	QUANTITY	MATERIAL CODE
01	BT.2.1.A.U.B.01	PNEUMATIC ACTUATOR FOR GLAND STEAM SUPPLY VALVE (ALONG WITH ACCESSORIES)	1 NO.	WS9713239059
02	BT.BB.2.1.18	AIR FILTER FOR GLAND STEAM SUPPLY VALVE ACTUATOR (ONE SET MEANS QUANTITY REQUIRED FOR COMPLETE REPLACEMENT IN ONE ACTUATOR)	1 SET	WS9713239164
03	BT.BB.2.1.32	O-RINGS / SEALS FOR GLAND STEAM SUPPLY VALVE (ONE SET MEANS QUANTITY REQUIRED FOR COMPLETE REPLACEMENT IN ONE VALVE)	1 SET	WS9713239172
04	BT.BB.2.1.33	O-RINGS / SEALS FOR ACTUATOR OF GLAND STEAM SUPPLY VALVE (ONE SET MEANS QUANTITY REQUIRED FOR COMPLETE REPLACEMENT IN ONE ACTUATOR ASSEMBLY)	1 SET	WS9713239180
05	BT.1.00.16.A.A.01	STEM PACKING FOR GLAND STEAM SUPPLY VALVE	1 SET	WS9713239199
06	BT.1.00.16.A.B.01	MOULDED RUBBER DIAPHRAGMS / PISTON FOR GLAND STEAM SUPPLY VALVE ACTUATOR	2 NO.	WS9713239202
07	BT.1.00.16.A.C.01	DIAPHRAGMS / PISTON, O-RINGS AND RUBBER GASKETS, SEALS FOR EACH TYPE, MAKE ETC. FOR GLAND STEAM SUPPLY VALVE	1 SET	WS9713239210
08	BT.1.00.16.A.C.02	DIAPHRAGMS / PISTON, O-RINGS AND RUBBER GASKETS, SEALS FOR EACH TYPE, MAKE ETC. FOR ACTUATOR OF GLAND STEAM SUPPLY VALVE	1 SET	WS9713239229
09	BT.1.00.16.A.G.01	VALVE TRIMS (SUCH AS PLUG, STEM, SEAT RING / CAGE, GUIDE BUSHING, STEM LOCK PIN, PACKING RETAINING RING, ETC) FOR GLAND STEAM SUPPLY VALVE	1 SET	WS9713239237
10	BT.1.00.16.A.H.01	PNEUMATIC ACTUATOR FOR GLAND STEAM SUPPLY VALVE ALONG WITH ACCESSORIES - COMPLETE ASSEMBLY	1 NO.	WS9713239059
11	BT.1.00.16.A.K.01	AIR FILTER REGULATOR FOR TURBINE GLAND STEAM SUPPLY VALVE	2 NOS.	WS9713239083
12	BT.1.00.16.A.K.03	AIR LOCK RELAY FOR TURBINE GLAND STEAM SUPPLY VALVE	2 NOS.	WS9713239113

NOTES:-

1. ALL THE MANDATORY SPARES SPECIFIED ABOVE SHALL BE MANUFACTURED EXACTLY SAME AS AGAINST MAIN SUPPLY.
2. INTERCHANGEABILITY OF THE MENTIONED ITEMS ARE FOR REPLACEMENT WITH THEIR PARTS FOR WHICH SUPPLY IS TO BE MADE AGAINST MAIN OFFER.
3. ALL THE SPARES MUST BE PACKED IN SEALED TRANSPARENT PLASTIC BAGS AND CLEARLY MARKED OR LABELED ON THE OUTSIDE OF THE PACKING WITH ITS DESCRIPTION & ASSEMBLY PART NUMBERS.
4. QUALITY CHECKS & TESTING NORMS/ REQUIREMENTS AS PER AGREED QUALITY PLAN (QP) SHALL ALSO BE APPLICABLE FOR ALL THE SPARES AS LISTED.
5. IF ANY ITEM IS NOT APPLICABLE THAN EQUIVALENT ITEM TO BE SUPPLIED BY THE VENDOR.
6. ALL MANDATORY SPARES ARE TO BE PACKED IN GREEN COLOUR BOX WITH " MANDATORY SPARES FOR SEAL STEAM VALVE" LABELED ON IT.

MAT. CODE: WS9013239048

INVENTORY NO. SIGN & DATE REF. DRG NO.

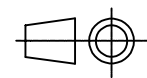
GRADE OF UNTOL. DIM.:--			CBOM NO.		STATUS OF DRG.	
M/CG- V/5/M/R AA 0230208			---		---	
WELDING-A/B/5/D-AA0621104			AGREED DEPT.		NAME SIGN DATE	
GAS CUTTING-T3'AA0621101			---		---	
REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	

TYPE OF PRODUCT OR
NAME OF CUSTOMER/ PROJECT

STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

DEPT. STE



SCALE

WEIGHT(Kg.)

CODE 4011

TITLE

SPARES FOR
SEAL STEAM SUPPLY VALVE

DRN	NAME	SIGN	DATE	NO.OF VAR.
CHD	LEELPAT SINGH	—SD—	04.08.26	—
APD	N.NIRALA	—SD—	05.08.26	73, 74

REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
— — — — —	—	—
	75, 77	

DRAWING NO.		3-13239-52600		—	
SHEET NO.01		NO.OF SHEETS 01			

REV	DATE	ALTERED	REV	DATE	ALTERED	GMS No./ C.B.O.M.- NO.			STATUS OF DRG U
		CHECKED			CHECKED	—			
ZONE					AGREED DEPT		NAME	SIGN	DATE
					—		—	—	—
GRADE OF UNTOL.DIM		M/CG. — AA0230208 m		WELDING-CLASS 'B' OF AA0621104		GAS CUTTING-TABLE 3 OF AA0621101			

SPARES APPLICABLE FOR SEAL STEAM VALVE WITH PNEUMATIC ACTUATOR

SL.NO.	CUSTOMER SPECIFICATION CLAUSE NO.	DESCRIPTION	QUANTITY	MATERIAL CODE
01.	C.1.XIII.1	GLAND STEAM SUPPLY VALVE (COMPLETE SET OF INTERNALS REQUIRED TO FORM ONE VALVE ASSEMBLY EXCEPT OUTER BODY)	01 NO	WS9713239121

NOTES:—

1. ALL THE MANDATORY SPARES SPECIFIED ABOVE SHALL BE MANUFACTURED EXACTLY SAME AS AGAINST MAIN SUPPLY.
2. INTERCHANGEABILITY OF THE MENTIONED ITEMS ARE FOR REPLACEMENT WITH THEIR PARTS FOR WHICH SUPPLY IS TO BE MADE AGAINST MAIN OFFER.
3. ALL THE SPARES MUST BE PACKED IN SEALED TRANSPARENT PLASTIC BAGS AND CLEARLY MARKED OR LABELED ON THE OUTSIDE OF THE PACKING WITH ITS DESCRIPTION & ASSEMBLY PART NUMBERS.
4. QUALITY CHECKS & TESTING NORMS/ REQUIREMENTS AS PER AGREED QUALITY PLAN (QP) SHALL ALSO BE APPLICABLE FOR ALL THE SPARES AS LISTED.
5. IF ANY ITEM IS NOT APPLICABLE THAN EQUIVALENT ITEM TO BE SUPPLIED BY THE VENDOR.
6. ALL MANDATORY SPARES ARE TO BE PACKED IN GREEN COLOUR BOX WITH " MANDATORY SPARES FOR SEAL STEAM VALVE" LABELED ON IT.

Inventory No.	DEPT STE		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM No.	NO. OF ITEMS
	CODE 4011		—	—	—	—	—
Sign & Date	BHARAT HEAVY ELECTRICALS LTD. RANIPUR, HARDWAR				MAT. CODE: WS9013239030		
					NAME	SIGN	DATE
Ref.Drawing No>	DRN	LOKESH	—sd—	03.08.26	—		
	CHD	L.P.S/L.S.	—sd—	04.08.26			
	APPD	V.MALHOTRA	—sd—	05.08.26			
TITLE :		CARD CODE		DRAWING NO.			
SPARES FOR SEAL STEAM SUPPLY VALVE				4-13239-52500			
				7 22 23 24			
				SHEET No. 01		No. OF SHEETS 01	

PROJECT NAME:**ANNEXURE-B****Check –List for Seal steam supply valve**

SL No.	BHEL SPECIFICATION REQUIREMENT	Vendor's confirmation/ Remark
1	Valve body material: ASTM A217WC9	
2	Counter Flange material: ASTM A182 Gr. F22	
3	Valve Class: 600	
4	Valve Characteristics: Equal %	
5	Counter flange End connection details: i. Inlet : 88.9X5.49, Butt welded as per fig.4 of ASME B16.25 ii. Outlet : 273.1X7.80, Butt welded as per fig.4 of ASME B16.25	
6	Controllable range of Cv	
7	Hand wheel for manual operation shall be provided. Cast iron is not acceptable.	
8	Manual vent valve shall be provided.	
9	Following commissioning spares shall be provided: i. Packing & gaskets 1 set. ii. washers for flange: 1 complete set for each flange connection.	
10	Valve shall be IBR approved.	
11	Testing of valve as per cl. no. 2.2 of BHEL specification.	
12	Paint as per cl. no. 4.2 of BHEL specification or equivalent	
13	End connection in actuator for air supply: 3/4" pipe connector (CS, weldable) to be supplied by the vendor	
14	Failure mode: stay put	
15	Cv test reports/ certificates/ results submission after placement of P.O.	
16	Operating time < 3 sec	
17	Weight of complete assembly of valve along with actuator <300 Kg	
18	Valve leakage class-V as per ANSI FCI 70-2	
19	Function of Actuator: Air to open, Spring to close	
20	Type of actuator: Spring diaphragm/Piston	
21	Recommended quality and quantity of air	
22	Required supply air pressure (Max/Min- 10/5 bar g)	
23	Documents submission for BHEL approval within 4 weeks after placement of P.O. as per cl. no. 3.2 of BHEL specification.	
24	O & M Manual: Submission of 25 Hard copies (3 copies along with equipment to the site & remaining 22 to BHEL, Hardwar within 12 weeks of placement of P.O.).	
	Vendor shall submit the duly filled and signed Annexure separately for each project, in accordance with the respective project requirements.	

SUB-SECTION – IIIC-08

CONTROL VALVES AND ACTUATORS

KODERMA THERMAL POWER STATION PHASE-II (2X800MW)
EPC PACKAGE
BID DOC NO.: DVC/C&M/Engineering/KTPS(2X800
MW)/EPC/IPHB

TECHNICAL SPECIFICATIONS
SECTION – VI, PART-B

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	CONTROL VALVES, ACTUATORS & ACCESSORIES		
1.00.00	CONTROL VALVES, ACTUATORS & ACCESSORIES		
1.01.00	General Requirements		
1.01.01	The control valves and accessories equipment furnished by the Bidder shall be designed constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the “Federal Occupational Safety and Health Standards, USA” or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.		
1.01.02	All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves. Ceramic lined control valves shall be provided as per standard and proven practice of QFGDM.		
1.01.03	For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, HP Bypass System refer to the corresponding mechanical sections.		
1.01.04	Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.		
1.02.00	CONTROL VALVE SIZING & CONSTRUCTION		
1.02.01	The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.		
1.02.02	The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer’s approval during detailed engineering.		
1.02.03	Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished. For flashing services, valve with hardened trim shall be provided.		
1.02.04	Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP circulation control valve shall have permissible leakage rate as per leakage Class V. All other		
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS								
	control valves shall have leakage rate as per leakage Class-IV as per ANSI / FCI /70.2,2006 or equivalent.								
1.02.05	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers except for few cases as per contractor's standard and proven practice subject to employer's approval.								
1.02.06	Control valves for steam and water application shall be provided with rangability of 30:1 for all services except for applications wherein control valves are envisaged to be operated in lower range like Reheater spray and superheater spray system wherein control valve with rangability of 50:1 shall be provided								
2.00.00	VALVE CONSTRUCTION								
2.01.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.								
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.								
2.03.00	Cast Iron valves are not acceptable.								
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.								
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.								
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing or with extra deep gland packing, which shall be equipped with lantern rings to admit pressurized water for gland sealing.)								
2.07.00	Valve characteristic shall match with the process characteristics.								
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.								
2.09.00	Flanged valves shall be in accordance to ANSI B 16.5.								
3.00.00	VALVE MATERIALS								
	<table><tr><th>Sr. No.</th><th>Service</th><th>Body material</th><th>Trim Material</th></tr><tr><td>1</td><td>Non-corrosive, non-flashing and non-cavitation service except DM water</td><td>Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C</td><td>316SS stellited with stellited faced guide posts and bushings.</td></tr></table>	Sr. No.	Service	Body material	Trim Material	1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stellited with stellited faced guide posts and bushings.
Sr. No.	Service	Body material	Trim Material						
1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stellited with stellited faced guide posts and bushings.						
<table><tr><td>KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE</td><td>TECHNICAL SPECIFICATION SECTION-VI, PART-B</td><td>SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES</td><td>PAGE 2 OF 5</td></tr></table>		KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 2 OF 5				
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 2 OF 5						

CLAUSE NO.	TECHNICAL REQUIREMENTS
4.00.00 5.00.00 6.00.00 6.01.00	2. Severe flashing/cavitation services Alloy steel ASTM-A217 Gr. WC9 440 C 3. Low flashing/cavitation on service Alloy steel ASTM-A217 Gr. WC6 17-4 PH SS 4. DM water service 316 SS 316 SS NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34. (b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank. However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval. END PREPARATION Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body. VALVE ACTUATORS All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type).The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously. Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified. The travel time of the pneumatic actuators shall not exceed 10 seconds. CONTROL VALVE ACCESSORY DEVICES All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B
SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 3 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS			
7.00.00	Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.			
	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER			
	1	Environment	a) Protection class.	IP-65 Minimum
	2	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
	3	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
7.01.00			Hand Held Calibrator	(i) Universal HART Calibrator to be provided for conventional positioners. (for quantity, refer Part-A. Contract quantities of the specification). (ii) Fieldbus compatible calibrator to be provided for fieldbus based positioners. (for quantity, refer Part-A)
	POSITIONER WITH INTRINSIC PARTIAL STROKE TEST (PST) FACILITY FGD Bypass Damper is very critical for the safe evacuation of flue gas when FGD is not in operation. Normally it shall be in CLOSED condition most of the times when FGD is in operation. But during emergency need, if it fails to OPEN, it can lead to high furnace pressure and subsequent MFT. Therefore, a PARTIAL STROKE TEST for the Bypass damper to be carried out in AUTO at regular intervals. A timer is set to conduct partial stroke test weekly (programmable). When timer is due, an alarm message is sent to both Main Unit Control Room and FGD Control Room: "FGD PARTIAL STROKE TEST SCHEDULED". A soft Push Button is to be provided in the Main Control Room only. Once the Operator presses the PB, the timer is reset and "FGD PARTIAL STROKE TEST INITIATED "message should flash in both Main Unit CR and FGD CR. An analog output command shall be sent to the FGD Bypass Damper for programmable opening. Once the Damper OPENS to the predetermined Set Point, a close command is issued to close the damper (approx. 10% opening PFT SP is to be given and for CLOSE Limit switch is to be used). After getting, the close feedback "FGD PARTIAL STROKE TEST SUCCESSFUL" message is flashed. This test should complete successfully within a scheduled time. If it does not, "FGD PARTIAL STROKE TEST FAIL" alarm shall be flashed in both Unit CR and FGD CR. Scheme shall be finalised during detailed engineering. Contractor shall provide positioner with intrinsic Partial Stroke Test (PST) facility to achieve the above functionalities for the FGD Bypass Damper with all suitable pneumatic and electrical connections.			
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 4 OF 5				

CLAUSE NO.	TECHNICAL REQUIREMENTS		
8.00.00	All other or better specifications of Positioners shall be applicable to PST positioners as mentioned in Section – VI, Part-B, Control Valves, Actuators & Accessories, Sub-Section- IIIC-08, Clause 7.00.00. TEST AND EXAMINATION All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following: 8.01.00 Non Destructive Test as per ANSI B-16.34. 8.02.00 Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test. 8.03.00 Valve closure test and seat leakage test in accordance with ANSI-B 16.34/ FCI 70.2 standard and as per the leakage class indicated above 8.04.00 Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position. 8.05.00 CV Test: Please refer CI No. 1.00.00 & 3.00.00 OF Sub-section- IIIC-10 (Type test requirements), Control Valves. Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.		
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 5 OF 5

SUB-SECTION – IIIC-08

CONTROL VALVES AND ACTUATORS

CLAUSE NO.	TECHNICAL REQUIREMENTS			सी एस पी जी सी एल CSPGCL	
CONTROL VALVES, ACTUATORS & ACCESSORIES					
1.00.00	CONTROL VALVES, ACTUATORS & ACCESSORIES				
1.01.00	General Requirements				
1.01.01	The control valves and accessories equipment furnished by the Bidder shall be designed, constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the “Federal Occupational Safety and Health Standards, USA” or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.				
1.01.02	All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves. Ceramic lined control valves shall be provided as per standard and proven practice of QFGDM.				
1.01.03	For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, HP Bypass System refer to the corresponding mechanical sections.				
1.01.04	Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.				
1.02.00	CONTROL VALVE SIZING & CONSTRUCTION				
1.02.01	The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.				
1.02.02	The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer’s approval during detailed engineering.				
1.02.03	Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus, for cavitation service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished. For flashing services, valve with hardened trim shall be provided.				
1.02.04	Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP circulation control valve shall have permissible leakage rate as per leakage Class V. All other				
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023		SUB-SECTION-IIIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS			
सी एस पी जी सी एल CPGCL				
	control valves shall have leakage rate as per leakage Class-IV as per ANSI / FCI /70.2,2006 or equivalent.			
1.02.05	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers except for few cases as per contractor's standard and proven practice subject to employer's approval.			
1.02.06	Control valves for steam and water application shall be provided with rangeability of 30:1 for all services except for applications wherein control valves are envisaged to be operated in lower range like Reheater spray and superheater spray system wherein control valve with rangeability of 50:1 shall be provided			
2.00.00	VALVE CONSTRUCTION			
2.01.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.			
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.			
2.03.00	Cast Iron valves are not acceptable.			
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.			
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.			
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g., double vee type chevron packing or with extra deep gland packing, which shall be equipped with lantern rings to admit pressurized water for gland sealing.)			
2.07.00	Valve characteristic shall match with the process characteristics.			
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.			
2.09.00	Flanged valves shall be in accordance with ANSI B 16.5.			
3.00.00	VALVE MATERIALS			
	Sr. No.	Service	Body material	Trim Material
	1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stellited with stellited faced guideposts and bushings.
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 2 OF 5				

CLAUSE NO.	TECHNICAL REQUIREMENTS			सी एस पी जी सी एल CPGCL
	2.	Severe flashing/cavitation on services	Alloy steel ASTM-A217 Gr. WC9	440 C
	3.	Low flashing/cavitation on service	Alloy steel ASTM-A217 Gr. WC6	17-4 PH SS
	4.	DM water service	316 SS	316 SS
	NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.			
	(b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank.			
	However, Bidder may offer valves with body and trim materials better than specified materials and in such cases, Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.			
4.00.00	END PREPARATION			
	Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.			
5.00.00	VALVE ACTUATORS			
	All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type). The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.			
	Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimetre of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.			
	The travel time of the pneumatic actuators shall not exceed 10 seconds.			
6.00.00	CONTROL VALVE ACCESSORY DEVICES			
6.01.00	All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for			
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 3 OF 5				

CLAUSE NO.	TECHNICAL REQUIREMENTS			सी एस पी जी सी एल CPGCL																
7.00.00	Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements. SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER <table><tr><td>1</td><td>Environment</td><td>a) Protection class.</td><td>IP-65 Minimum</td></tr><tr><td>2</td><td>EMC & CE Compliance</td><td>Required to International Standard like EN/IEC.</td><td>EN50081-2 & EN50082 or equivalent.</td></tr><tr><td>3</td><td>Accessories</td><td>In-built Operator Panel</td><td>Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).</td></tr><tr><td></td><td></td><td>Handheld Calibrator</td><td>(i) Universal HART Calibrator to be provided for conventional positioners. (for quantity, refer Part-A. Contract quantities of the specification). (ii) Fieldbus compatible calibrator to be provided for fieldbus-based positioners. (for quantity, refer Part-A)</td></tr></table>				1	Environment	a) Protection class.	IP-65 Minimum	2	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.	3	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).			Handheld Calibrator	(i) Universal HART Calibrator to be provided for conventional positioners. (for quantity, refer Part-A. Contract quantities of the specification). (ii) Fieldbus compatible calibrator to be provided for fieldbus-based positioners. (for quantity, refer Part-A)
1	Environment	a) Protection class.	IP-65 Minimum																	
2	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.																	
3	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).																	
		Handheld Calibrator	(i) Universal HART Calibrator to be provided for conventional positioners. (for quantity, refer Part-A. Contract quantities of the specification). (ii) Fieldbus compatible calibrator to be provided for fieldbus-based positioners. (for quantity, refer Part-A)																	
7.01.00	POSITIONER WITH INTRINSIC PARTIAL STROKE TEST (PST) FACILITY FGD Bypass Damper is very critical for the safe evacuation of flue gas when FGD is not in operation. Normally it shall be in CLOSED condition most of the times when FGD is in operation. But during emergency need, if it fails to OPEN, it can lead to high furnace pressure and subsequent MFT. Therefore, a PARTIAL STROKE TEST for the Bypass damper to be carried out in AUTO at regular intervals. A timer is set to conduct partial stroke test weekly (programmable). When timer is due, an alarm message is sent to both Main Unit Control Room and FGD Control Room: "FGD PARTIAL STROKE TEST SCHEDULED". A soft Push Button is to be provided in the Main Control Room only. Once the Operator presses the PB, the timer is reset and "FGD PARTIAL STROKE TEST INITIATED "message should flash in both Main Unit CR and FGD CR. An analog output command shall be sent to the FGD Bypass Damper for programmable opening. Once the Damper OPENS to the predetermined Set Point, a close command is issued to close the damper (approx. 10% opening PFT SP is to be given and for CLOSE Limit switch is to be used). After getting, the close feedback "FGD PARTIAL STROKE TEST SUCCESSFUL" message is flashed. This test should complete successfully within a scheduled time. If it does not, "FGD PARTIAL STROKE TEST FAIL" alarm shall be flashed in both Unit CR and FGD CR. Scheme shall be finalised during detailed engineering. Contractor shall provide <i>positioner</i> with intrinsic <i>Partial Stroke Test (PST)</i> facility to achieve the above functionalities for the FGD Bypass Damper with all suitable pneumatic and electrical connections.																			
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023		SUB-SECTION-IIIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES																
PAGE 4 OF 5																				

CLAUSE NO.	TECHNICAL REQUIREMENTS			सी एस पी जी सी एल CPGCL
8.00.00	All other or better specifications of Positioners shall be applicable to PST positioners as mentioned in Section – VI, Part-B, Control Valves, Actuators & Accessories, Sub-Section- IIIC-08, Clause 7.00.00. TEST AND EXAMINATION All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following: 8.01.00 Non-Destructive Test as per ANSI B-16.34. 8.02.00 Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test. 8.03.00 Valve closure test and seat leakage test in accordance with ANSI-B 16.34/ FCI 70.2 standard and as per the leakage class indicated above 8.04.00 Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position. 8.05.00 CV Test: Please refer CI No. 1.00.00 & 3.00.00 OF Sub-section- IIIC-10 (Type test requirements), Control Valves. Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.			
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 5 OF 5



SUB-SECTION – IIIC-08

CONTROL VALVES AND ACTUATORS

SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE

TECHNICAL SPECIFICATIONS
SECTION – VI, PART-B
BID DOC. NO.:CW-CM-11159-C-O-M-001

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	CONTROL VALVES, ACTUATORS & ACCESSORIES 1.00.00 1.01.00 1.01.01 1.01.02 1.01.03 1.01.04 1.02.00 1.02.01 1.02.02 1.02.03 1.02.04 1.02.05 CONTROL VALVES, ACTUATORS & ACCESSORIES General Requirements The control valves and accessories equipment furnished by the Bidder shall be designed, constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the “Federal Occupational Safety and Health Standards, USA” or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification. All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves. Ceramic lined control valves shall be provided as per standard and proven practice of QFGDM. For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, HP Bypass System refer to the corresponding mechanical sections. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification. CONTROL VALVE SIZING & CONSTRUCTION The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes. The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer’s approval during detailed engineering. Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished. For flashing services, valve with hardened trim shall be provided. Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP circulation control valve shall have permissible leakage rate as per leakage Class V. All other control valves shall have leakage rate as per leakage Class-IV as per ANSI / FCI /70.2,2006 or equivalent. The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.02.06	trim design and not by use of silencers except for few cases as per contractor's standard and proven practice subject to employer's approval.			
2.00.00	Control valves for steam and water application shall be provided with rangability of 30:1 for all services except for applications wherein control valves are envisaged to be operated in lower range like Reheater spray and superheater spray system wherein control valve with rangability of 50:1 shall be provided			
2.01.00	VALVE CONSTRUCTION			
2.02.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.			
2.03.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.			
2.04.00	Cast Iron valves are not acceptable.			
2.05.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.			
2.06.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.			
2.07.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing or with extra deep gland packing, which shall be equipped with lantern rings to admit pressurized water for gland sealing.)			
2.08.00	Valve characteristic shall match with the process characteristics.			
2.09.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.			
3.00.00	Flanged valves shall be in accordance to ANSI B 16.5.			
	VALVE MATERIALS			
	Sr. No.	Service	Body material	Trim Material
	1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stellited with stellited faced guide posts and bushings.
	2.	Severe flashing/cavitati on services	Alloy steel ASTM-A217 Gr. WC9	440 C
	3.	Low flashing/cavitati on service	Alloy steel ASTM-A217 Gr. WC6	17-4 PH SS
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO. CW-CM-11159-C-O-M-001		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 2 OF 5				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	4.	DM water 316 SS service	316 SS	
	NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.			
	(b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank.			
	However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.			
4.00.00	END PREPARATION			
	Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.			
5.00.00	VALVE ACTUATORS			
	All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type).The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.			
	Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.			
	The travel time of the pneumatic actuators shall not exceed 10 seconds.			
6.00.00	CONTROL VALVE ACCESSORY DEVICES			
6.01.00	All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.			
7.00.00	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER			
	1	Environment	a) Protection class.	IP-65 Minimum
	2	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO. CW-CM-11159-C-O-M-001		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 3 OF 5				

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
7.01.00	3	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
			Hand Held Calibrator	(i) Universal HART Calibrator to be provided for conventional positioners. (for quantity, refer Part-A. Contract quantities of the specification). (ii) Fieldbus compatible calibrator to be provided for fieldbus based positioners. (for quantity, refer Part-A)
7.01.00	POSITIONER WITH INTRINSIC PARTIAL STROKE TEST (PST) FACILITY FGD Bypass Damper is very critical for the safe evacuation of flue gas when FGD is not in operation. Normally it shall be in CLOSED condition most of the times when FGD is in operation. But during emergency need, if it fails to OPEN, it can lead to high furnace pressure and subsequent MFT. Therefore, a PARTIAL STROKE TEST for the Bypass damper to be carried out in AUTO at regular intervals. A timer is set to conduct partial stroke test weekly (programmable). When timer is due, an alarm message is sent to both Main Unit Control Room and FGD Control Room: "FGD PARTIAL STROKE TEST SCHEDULED". A soft Push Button is to be provided in the Main Control Room only. Once the Operator presses the PB, the timer is reset and "FGD PARTIAL STROKE TEST INITIATED "message should flash in both Main Unit CR and FGD CR. An analog output command shall be sent to the FGD Bypass Damper for programmable opening. Once the Damper OPENS to the predetermined Set Point, a close command is issued to close the damper (approx. 10% opening PFT SP is to be given and for CLOSE Limit switch is to be used). After getting, the close feedback "FGD PARTIAL STROKE TEST SUCCESSFUL" message is flashed. This test should complete successfully within a scheduled time. If it does not, "FGD PARTIAL STROKE TEST FAIL" alarm shall be flashed in both Unit CR and FGD CR. Scheme shall be finalised during detailed engineering. Contractor shall provide positioner with intrinsic Partial Stroke Test (PST) facility to achieve the above functionalities for the FGD Bypass Damper with all suitable pneumatic and electrical connections. All other or better specifications of Positioners shall be applicable to PST positioners as mentioned in Section – VI, Part-B, Control Valves, Actuators & Accessories, Sub-Section- IIIC-08, Clause 7.00.00.			
8.00.00	TEST AND EXAMINATION All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:			
8.01.00	Non Destructive Test as per ANSI B-16.34.			
8.02.00	Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.			
8.03.00	Valve closure test and seat leakage test in accordance with ANSI-B 16.34/ FCI 70.2 standard and as per the leakage class indicated above			
8.04.00	Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO. CW-CM-11159-C-O-M-001		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 4 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS			
8.05.00	CV Test: Please refer CI No. 1.00.00 & 3.00.00 OF Sub-section- IIIC-10 (Type test requirements), Control Valves. Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 5 OF 5

SUB-SECTION – IIIC-08

CONTROL VALVES AND ACTUATORS

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.00.00	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.01.00	General Requirements			
1.01.01	The control valves and accessories equipment furnished by the Bidder shall be designed constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the “Federal Occupational Safety and Health Standards, USA” or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.			
1.01.02	All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves. Ceramic lined control valves shall be provided as per standard and proven practice of QFGDM.			
1.01.03	For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, HP Bypass System refer to the corresponding mechanical sections.			
1.01.04	Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.			
1.02.00	CONTROL VALVE SIZING & CONSTRUCTION			
1.02.01	The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.			
1.02.02	The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer's approval during detailed engineering.			
1.02.03	Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished. For flashing services, valve with hardened trim shall be provided.			
1.02.04	Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP circulation control valve shall have permissible leakage rate as per leakage Class V. All other			
SIPAT SUPER THERMAL POWER STATION STAGE-III (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:	SUB-SECTION-IIIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS	एन टी पी सी NTPC									
1.02.05	control valves shall have leakage rate as per leakage Class-IV as per ANSI / FCI /70.2,2006 or equivalent.										
1.02.06	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers except for few cases as per contractor’s standard and proven practice subject to employer’s approval.										
1.02.06	Control valves for steam and water application shall be provided with rangeability of 30:1 for all services except for applications wherein control valves are envisaged to be operated in lower range like Reheater spray and superheater spray system wherein control valve with rangeability of 50:1 shall be provided										
2.00.00	VALVE CONSTRUCTION										
2.01.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.										
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.										
2.03.00	Cast Iron valves are not acceptable.										
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.										
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.										
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing or with extra deep gland packing, which shall be equipped with lantern rings to admit pressurized water for gland sealing.)										
2.07.00	Valve characteristic shall match with the process characteristics.										
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.										
2.09.00	Flanged valves shall be in accordance to ANSI B 16.5.										
3.00.00	VALVE MATERIALS										
	<table><tr><th>Sr. No.</th><th>Service</th><th>Body material</th><th>Trim Material</th></tr><tr><td>1</td><td>Non-corrosive, non-flashing and non-cavitation service except DM water</td><td>Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C</td><td>316SS stellited with stellited faced guide posts and bushings.</td></tr></table>	Sr. No.	Service	Body material	Trim Material	1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stellited with stellited faced guide posts and bushings.		
Sr. No.	Service	Body material	Trim Material								
1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stellited with stellited faced guide posts and bushings.								
SIPAT SUPER THERMAL POWER STATION STAGE-III (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES								
			PAGE 2 OF 5								

CLAUSE NO.	TECHNICAL REQUIREMENTS			
4.00.00	2.	Severe flashing/cavitation on services	Alloy steel ASTM-A217 Gr. WC9	440 C
	3.	Low flashing/cavitation on service	Alloy steel ASTM-A217 Gr. WC6	17-4 PH SS
	4.	DM water service	316 SS	316 SS
	NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.			
	(b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank.			
However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.				
5.00.00	END PREPARATION			
6.00.00	Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.			
	VALVE ACTUATORS			
	All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type).The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.			
6.01.00	Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimetre of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.			
	The travel time of the pneumatic actuators shall not exceed 10 seconds.			
6.00.00	CONTROL VALVE ACCESSORY DEVICES			
6.01.00	All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for			
SIPAT SUPER THERMAL POWER STATION STAGE-III (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 3 OF 5				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
7.00.00	Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.			
	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER			
	1	Environment	a) Protection class.	IP-65 Minimum
	2	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
	3	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
7.01.00			Hand Held Calibrator	(i) Universal HART Calibrator to be provided for conventional positioners. (for quantity, refer Part-A. Contract quantities of the specification). (ii) Fieldbus compatible calibrator to be provided for fieldbus based positioners. (for quantity, refer Part-A)
	POSITIONER WITH INTRINSIC PARTIAL STROKE TEST (PST) FACILITY			
FGD Bypass Damper is very critical for the safe evacuation of flue gas when FGD is not in operation. Normally it shall be in CLOSED condition most of the times when FGD is in operation. But during emergency need, if it fails to OPEN, it can lead to high furnace pressure and subsequent MFT. Therefore, a PARTIAL STROKE TEST for the Bypass damper to be carried out in AUTO at regular intervals. A timer is set to conduct partial stroke test weekly (programmable). When timer is due, an alarm message is sent to both Main Unit Control Room and FGD Control Room: "FGD PARTIAL STROKE TEST SCHEDULED". A soft Push Button is to be provided in the Main Control Room only. Once the Operator presses the PB, the timer is reset and "FGD PARTIAL STROKE TEST INITIATED" message should flash in both Main Unit CR and FGD CR. An analog output command shall be sent to the FGD Bypass Damper for programmable opening. Once the Damper OPENS to the predetermined Set Point, a close command is issued to close the damper (approx. 10% opening PFT SP is to be given and for CLOSE Limit switch is to be used). After getting, the close feedback "FGD PARTIAL STROKE TEST SUCCESSFUL" message is flashed. This test should complete successfully within a scheduled time. If it does not, "FGD PARTIAL STROKE TEST FAIL" alarm shall be flashed in both Unit CR and FGD CR. Scheme shall be finalised during detailed engineering. Contractor shall provide positioner with intrinsic Partial Stroke Test (PST) facility to achieve the above functionalities for the FGD Bypass Damper with all suitable pneumatic and electrical connections.				
SIPAT SUPER THERMAL POWER STATION STAGE-III (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 4 OF 5				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
8.00.00	All other or better specifications of Positioners shall be applicable to PST positioners as mentioned in Section – VI, Part-B, Control Valves, Actuators & Accessories, Sub-Section- IIIC-08, Clause 7.00.00.			
	TEST AND EXAMINATION			
	All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:			
	8.01.00	Non Destructive Test as per ANSI B-16.34.		
	8.02.00	Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.		
	8.03.00	Valve closure test and seat leakage test in accordance with ANSI-B 16.34/ FCI 70.2 standard and as per the leakage class indicated above		
8.04.00	Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.			
8.05.00	CV Test: Please refer CI No. 1.00.00 & 3.00.00 OF Sub-section- IIIC-10 (Type test requirements), Control Valves.			
	Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.			
SIPAT SUPER THERMAL POWER STATION STAGE-III (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.:		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 5 OF 5				

CHAPTER – 11**CONTROL VALVES WITH ACTUATORS****11.01.00 CONTROL VALVES, ACTUATORS & ACCESSORIES****11.01.00 General Requirements**

11.01.01 The control valves and accessories equipment furnished by the Bidder shall be designed, constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the "Federal Occupational Safety and Health Standards, USA" or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.

11.01.02 All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves.

11.01.03 For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, also refer to the corresponding mechanical sections.

Control valve station shall be provided at the interconnection line between service air header and instrument air header before air dryer unit. When instrument air header pressure falls below set value, the control valve will start opening and maintain the instrument header pressure at specified level in line with plant requirement. Again when instrument air header pressure goes above specified level in line with plant requirement the control valve will fully close automatically. Complete system shall be in bidder scope.

11.02.00 CONTROL VALVE SIZING & CONSTRUCTION

11.02.01 The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.

11.02.02 The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves trim exit outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Owner's approval during detailed engineering.

- 11.02.03 Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and downstream piping. Thus for cavitation/flashing service, only valve with anti cavitations trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished.
- 11.02.04 Control valves for application such as Feed water control valve, HP & LP by pass spray control valves, APRDS control valves, Soot blower control valve, separator drain control valve, SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make- up and valve gland sealing supplying pressure control, CEPs minimum flow control, BFP minimum circulation control valve shall have permissible leakage rate as per leakage Class V. All other control valves shall have leakage rate as per leakage Class-IV.
All SH/RH block valves, shut off valve of LDO & HFO and HP/LP bypass control valve shall have leakage class MSS-SP-61.
- 11.02.05 The control valve induced noise shall be limited to 85 dba at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.
- 11.02.06 The Liquid pressure recovery factor (FL) shall be 0.995 or better for severe flashing/cavitation services. Feed Water Control Valve, Super heater & Reheater Spray Water Control valves, LP/HP heater emergency & normal level control valve, HP /LP BP control valves, HP /LP BP spray control valves, Deaerator Overflow control valve and Separator Drain level control valve shall be considered for Severe Flashing/ cavitations service by bidder.
- 11.02.07 The Liquid pressure recovery factor (FL) shall be 0.985 or better for low flashing/cavitation services.
- 11.02.08 The valve travel time shall be less than 10 second for non critical services valves.
- 11.02.09 Rangeability should be 50 to 1 (min.) for non critical services valves.
- 11.02.10 Modulating Type Control Valve's Linearity, Hysteresis, Accuracy shall be $\leq \pm 1\%$ and Sensitivity shall be $\leq \pm 0.5\%$.
- 11.03.00 **VALVE CONSTRUCTION**
- 11.03.01 All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.
- 11.03.02 Valves with high lift cage guided plugs & quick-change trims shall be supplied.
- 11.03.03 Cast Iron valves are not acceptable.

- 11.03.04 Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Owner. Bonnet joints of the internal threaded or union type will not be acceptable.
- 11.03.05 Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.
- 11.03.06 All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing)
- 11.03.07 Valve characteristic shall match with the process characteristics.
- 11.03.08 Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.
- 11.03.09 Flanged valves shall be rated at no less than ANSI press class of 300 lbs.
- 11.03.10 Each valve shall have an arrow permanently fixed on the valve body to indicate the correct direction of flow.
- 11.03.11 Each valve shall have a stainless steel name plate permanently fastened to the yoke which shall be visible when the valve is in service. The name plate shall include
- a. Tag No. and Valve Serial No.
 - b. Body material, size and pressure rating
 - c. Trim material, size characteristics
 - d. Action on air failure
 - e. Spring range
 - f. Stem travel
 - g. Valve action, etc.

11.04.00 **VALVE MATERIALS**

S. No.	Service	Body material	Trim Material
1	Non-corrosive, non-flashing, and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr WCB for fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC9 for fluid temperature above 275 Deg. C and up to 550 deg. C. and for Aux. steam flow to Deaerator, CRH flow to Deaerator.	316SS stellited with stellited faced guide posts and bushings.
2	Severe flashing/cavitation services	Alloy steel ASTM-A217 Gr. WC9	440 C
3	Low flashing/cavitation	Alloy steel ASTM-A217 Gr. WC6	17-4 PH SS

S. No.	Service	Body material	Trim Material
	services		
4	DM water services	SS 316	316 SS/17-4 PH SS
5.	Main steam to Aux steam header, HP Bypass control valve.	SA182F92	Refer below cl. No. 11.04.01.
6.	LP Bypass Control Valve & Soot blower pressure control valve.	SA182F91	Refer below cl. No. 11.04.01.

- 11.04.01 **i.** Material of the HC PRV valve & Soot blower pressure control valve internals should be as under or better:-
- Guide : Inconel 718
Plug/stem : Inconel 718
Seat ring : SS 316 stellited
- ii.** Material of LP Bypass steam conditioning valve internals should be as under or better:
- Guide : AISI616 or X20CrMoV111, whichever is better
Plug/stem : AISI616 or X20CrMoV111, whichever is better.
Seat ring : A-182 F91/C21 coating or X20CrMoV111, whichever is better.
- iii.** Material of HP Bypass steam conditioning valve internals should be as under or better:
- Guide : X20CrMoV121.
Plug/stem : X20CrMoV121.
Seat ring : X20CrMoV121.
- NOTE :** Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.

Cage material may be different from Trim/Plug material subject to superiority of cage material than trim/plug material.

However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Owner's consideration and approval.

11.05.00 **END PREPARATION**

Valve body ends shall be either butt welded/socket welded, flanged

(Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Owner's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.

11.06.00 **VALVE ACTUATORS**

All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (Electro-hydraulic / pneumatically operated) and separator drain control valve (Electro-hydraulic type). The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.

Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.

The travel time of the pneumatic actuators shall not exceed 10 seconds.

11.07.00 **CONTROL VALVE ACCESSORY DEVICES**

11.07.01 All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.

11.07.02 Separate moisture separator unit for ensuring dryness of air entering I/P as well as the power cylinder is to be supplied with each control valve and control damper.

11.08.00 **SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER**

1	Electrical	a) Input Demand Signal	4-20 mA
		b) Power Supply	Loop Powered from the output card of Control System.

		c) HART Protocol	Compatibility for Remote Calibration & Diagnostics (Super-imposed HART signal on input Signal (4-20 mA)
		d. Valve position sensing	Position sensing, 4-20 mA output signal to be provided for control system
2	Environment	a) Operating temp.	(-)30 To 80 Deg. C
		b) Humidity	0-95 %
		c) Protection class	IP-65 Minimum with Die cast Aluminum/SS316 enclosure.
3	Software for Configuration and Diagnostics	Software	Windows based software. Software shall meet the requirements for Configuration, Diagnostics, Calibration and Testing of the actuator.
		Diagnostic/Test features	Advanced diagnostic features like Stroke counter or Travel counter, Leakage in actuators, Valve Signature analysis, Step Response test, Valve friction /Jamming detection etc. to be provided
4	Test reports/ Certificates	Factory Valve Signature Tests Reports (Pressure versus Valve travel and Travel versus I/P signal) are to be provided.	
		Test certificates as per Manufacture Standard/Relevant Standard are to be submitted.	
5	Configuration/ Calibration	Remote & Local Calibration, Auto & Manual Calibration shall be possible.	
6	Operating Range	Full range/ Split range.	
7	Modes	Valve Action	Direct / Reverse Valve Action
		Flow Characterization	Possible to fit Valve Characteristic Curves- Linear , Equal percentage etc.

8	Fail Safe/Fail Freeze	Fail Safe/Fail Freeze feature is to be provided. (In case the fail freeze feature is not intrinsic to the positioner, Bidder shall achieve the same externally through solenoid valve connected in the pneumatic circuit).	
9	Pneumatic	Air capacity	Sufficient to handle the valves & actuators selected/ Boosters to be supplied, if required.
		Air pressure	To suit the air supply pressure/quality available.
		Process connection	¼" NPT
10	Performance	Characteristic	<=0.5 % of span.
		Ambient temp effect	<=0.01 %/ deg C or better.
11	EMC & CE compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN 50082 or equivalent.
12	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
		Hand Held Hart Calibrator	Universal Hart Calibrator to be provided (for quantity, refer Part-A Vol-V C&I : Contract quantities of the specification).
		Pressure Gauge Block & Position Indicators.	For supply & output pressures, Air Filter Regulator, integral type position transmitter, in built mechanical position indicator and other accessories shall be provided on as required basis for making system complete.
		Electrical Cable Entry	1/2" NPT, side or bottom entry to avoid water ingress.

		Valves Mounting Assembly	For Sliding Stem/Rotary/Single acting/Double acting actuators on as required basis.
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*** Note:**

- i. The HART signals shall be picked up from marshalling terminals of DDCMIS (SG/TG DDCMIS as well as BOP DDCMIS), as applicable. The details of the above mentioned HART management system specification are mentioned in HART system Vol-V, Part B, Chapter 3, DDCMIS, cl. no. 3.45.00. The positioners shall be monitored from this HART management system. To achieve this, Bidder shall provide the necessary software to achieve the functionalities described above under "Remote Configuration and Diagnostics", and this software shall be loaded in the HART management system.
- ii. Actuators shall have provision to be on fail safe condition in case of Air/power/hydraulic system failure.

11.09.00 FOR FOLLOWING CRITICAL APPLICATION SPECIAL CONTROL VALVES ARE REQUIRED:

1. HP & LP Bypass Valves and Control System
2. BFP – Minimum Re-circulation Valve
3. Feed Water Control Valve
4. SH & RH spray Control Valves
5. APRDS System
6. Soot Blower control valve
7. Separator level and Drain Control Valve.
8. Boiler startup recirculation control valve.

11.09.01 General Requirements for Critical Application Control Valves -

- i) The valve accessories shall include hand wheels, limit switches, smart valve positioner (4-20mA DC type), electro pneumatic converter, Air lock relay, Solenoid valve and all other items required for the completeness and the accessories shall be explosion proof type as per hazardous area classification wherever applicable.
- ii) Control valves shall be furnished with IBR certification, wherever required.
 1. **Noise:** The maximum allowable noise level shall be 85 dba or less at 1 m. distance from the downstream bare pipe surface. The specified noise level shall be attained without the use of orifices, mufflers, diffusers. No credit for thermal or acoustical insulations shall be taken.
 2. **Valve Trim:** Valve shall have quick change type trim utilizing top entry. No components shall be screwed or welded into the

body. The valve shall have equal pressure distribution around the plug to avoid chattering / vibration.

Trim of severe/critical service valve shall be of multi stage & multi path design with sufficient no. of discrete pressure drop stage to eliminate the chance of erosion, cavitations, noise, vibration through out the control range of valve.

3. **Leakage Class:** The valve shall have minimum class-V leakage for all steam applications including RH/SH, APRDS, Soot Blower control valve, HP/LP Bypass spray control valves, BFP minimum recirculation valve, Boiler startup recirculation control valve & Low Load feed water control valve.

In case of HP/LP Bypass control valve application, the leakage class should be MSS-SP 61 (block valve leakage).

4. **Actuator:** Actuator type should be pneumatic double acting piston/electro-Hydraulic. All the control valves, isolation, block valves and bypass valves with HP bypass and LP bypass system shall also be provided with electro-hydraulic actuators only.
5. Separate hydraulic power units shall be provided and sized to operate and control the HP Bypass steam conditioning valves, isolation valves & related spray water control valves and LP Bypass steam conditioning valves, isolation valves & related spray water control valves respectively. Each hydraulic unit shall be complete with 2x100% capacity motor driven pumps, valves, piping instrumentation, tubing, reservoir and accumulator(s), control cabinet with accessories all mounted on a common base. The motors shall be connected two (2) different power supplies. The hydraulic system shall have online filtration arrangement to keep hydraulic oil clean. The system shall have automatic temperature control device mounted on the tank to maintain hydraulic oil temperature below 60 deg. C.

11.10.00 TEST AND EXAMINATION

All valves shall be tested in accordance with the quality assurance program agreed between the Owner and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:

- 11.10.01 Non Destructive Test as per ANSI B-16.34.
- 11.10.02 Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.
- 11.10.03 Valve closure test and seat leakage test in accordance with ANSI-B 16.34 and as per the leakage class indicated above.

- 11.10.04 Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.
- 11.10.05 CV Test: Please refer CI No. 13.00.00, Vol. V Part-B, Chapter : 13 (Type test requirements), Control Valves.

Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this chapter has to be read in conjunction with other relevant chapter of this specification.

SUB-SECTION–A-12

SURFACE PREPARATION & PAINTING

**KODERMA THERMAL POWER STATION PHASE-II
(2X800MW)
EPC PACKAGE
BID DOC NO.: DVC/C&M/ENGINEERING/KTPS(2X800
MW)/EPC/IPHB**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B**

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	Specification of surface preparation & painting			
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.			
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.			
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.			
1.04.00	All pipelines shall be Colour coded for identification as per the DVC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.			
1.05.00	SURFACE PREPARATION			
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.			
1.05.02	The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer. SP1 Solvent cleaning SP2 Application of rust converter (Ruskil or equivalent grade) SP3 Power tool cleaning SP4 Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer) SP4* Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns SP5 Shot blasting/ abrasive blasting. SP6 Emery sheet cleaning/Manual wire brush cleaning.			
1.06.00	APPLICATION OF PRIMER/PAINT			
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.			
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.			
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.			
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.			
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 1 of 8

CLAUSE NO.	TECHNICAL REQUIREMENTS		
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminum paint to IS 2339. PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - Weldable primer-Deoxaluminate or equivalent. PS16 - High Build Epoxy CDC mastic `15'. PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.) PS-20 - Epoxy based finish paint		
1.06.06	All weld edge preparation for site welding shall be applied with one coat of wieldable primer.		
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.		
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.		
1.06.09	a) All un-insulated equipments, pipes, valves etc covered in sub-section A-07 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 micron. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO2 pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 micron. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard		
1.06.10 A)	Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows: Primer : One coat of unmodified epoxy resin along with polyimide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct		
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 2 of 8

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	hardener. Total thickness of primer and paint should not be less than 400 microns. B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows: i) For Indoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be done either manually or by any other approved method. (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.		
KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 3 of 8

1.06.11 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														
1.	All insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	As per DVC Colour shade/ coding scheme
2.	All un-insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60°C	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3 \$	35 \$	155 \$	
		Design temperature above 60°C- 200°C	SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
		Design temperature > 200°C	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	
4	Piping hangers / supports (other than (3) above. (un-insulated)		SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100	

	Valves												
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside building and in SG envelope TG	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat	2	35	250
										b) Final coat of paint PS17	1	30	
		Within building TG	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat	2	25	150
										b) Final coat of paint PS17	1	30	
7.	Weld Edges		SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25

1. \$ - The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site. 2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint. 3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable. 4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content> 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme. 5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944. 6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.												
B) Steam Generator & Auxiliaries:												
1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2 \$	20 \$	100 \$
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40
Note: 1) SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection. 2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.												

C) LOW PRESSURE PIPING													
1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per DVC Color shade/ coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											
D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System													
For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System													
For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System.													
For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System.													
For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.													
E) ESP													
1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/PS3*	1	25	-	-	-	PS 4	1	30	55	
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60	

General Notes (Applicable for all above points A to E)

- i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.
- ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

- (i) Surface preparation shall be blast cleaned conforming to Sa 2-1/2 Swiss Standard.
- (ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.
- (iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.
- (iv) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns.
Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION -A-12 SURFACE PREPARATION & PAINTING	Page 8 of 8
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SUB-SECTION–A-12

SURFACE PREPARATION & PAINTING

CLAUSE NO.	TECHNICAL REQUIREMENTS			सी एस पी जी सी एल CSPGCL
1.00.00	Specification of surface preparation & painting			
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.			
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.			
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.			
1.04.00	All pipelines shall be Colour coded for identification as per the CSPGCL Colour-coding scheme, which will be furnished to the contractor during detailed engineering.			
1.05.00	SURFACE PREPARATION			
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.			
1.05.02	The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer.			
	SP1	Solvent cleaning		
	SP2	Application of rust converter (Ruskil or equivalent grade)		
	SP3	Power tool cleaning		
	SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)		
	SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns		
	SP5	Shot blasting/ abrasive blasting.		
	SP6	Emery sheet cleaning/Manual wire brush cleaning.		
1.06.00	APPLICATION OF PRIMER/PAINT			
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.			
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.			
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.			
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.			
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 1 of 11

CLAUSE NO.	TECHNICAL REQUIREMENTS			सी एस पी जी सी एल CSPGCL
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminum paint to IS 2339. PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - Weldable primer-Deoxaluminate or equivalent. PS16 - High Build Epoxy CDC mastic `15'. PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.) PS-20 - Epoxy based finish paint			
1.06.06	All weld edge preparation for site welding shall be applied with one coat of weldable primer.			
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.			
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.			
1.06.09	a) All un-insulated equipments, pipes, valves etc. covered in sub-section A-07 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 microns. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO2 pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 microns. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard			
1.06.10	A)	Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows: Primer : One coat of unmodified epoxy resin along with polymide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct		
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 2 of 11

CLAUSE NO.	TECHNICAL REQUIREMENTS			सी एस पी जी सी एल CSPGCL
	hardener. Total thickness of primer and paint should not be less than 400 microns. B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows: i) For Indoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be done either manually or by any other approved method. (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.			
EPC PACKAGE FOR 2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, HTPS, KORBA WEST		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: 03-05 / 2X660 MW / T-13 / 2023	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 3 of 11

1.06.11 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														
1.	All insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	As per CSPGCL Colour shade/ coding scheme
2.	All un-insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60°C	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3 \$	35 \$	155 \$	
		Design temperature above 60°C- 200°C	SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
		Design temperature > 200°C	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	

4	Piping hangers / supports (other than (3) above. (un-insulated)		SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100
	Valves												
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat	2	35	250
										b) Final coat of paint PS17	1	30	
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat	2	25	150
										b) Final coat of paint PS17	1	30	

7.	Weld Edges	SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25	
1. \$ - The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site. 2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint. 3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable. 4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content> 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme. 5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944. 6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40 Microns is also acceptable.													
B) Steam Generator & Auxiliaries:													
1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2 \$	20 \$	100 \$	
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	

Note: 1) SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.

C) LOW PRESSURE PIPING

1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per CSPGCL Color shade/coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											

D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System

For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System

For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System.

For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System.

For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.

E) ESP

1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/ PS3*	1	25	-	-	-	PS 4	1	30	55
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60

General Notes (Applicable for all above points A to E)

- i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.
- ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

- (i) Surface preparation shall be blast cleaned conforming to Sa 2-1/2 Swiss Standard.
- (ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.
- (iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.
- (iv) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns.
Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

(G.) Surface preparation and painting for CHP, LHP, GHP, AHP

(1) Coal handling, Limestone Handling and Gypsum handling Plant.

- (A) All equipment's of CHP, LHP and GHP inclusive of belt conveyor system and technological structures shall be kept clean. Surfaces to be painted shall be thoroughly cleaned of loose mill scale, rust etc. by wire brushing. All ferrous surfaces shall be applied with one shop coat of 35 micron and one 35 micron site coat of red oxide zinc chromate and two coats, each of 25 micron, synthetic enamel finishing paints unless specified otherwise. A minimum of 120 microns Dry Film Thickness (DFT) after finishedcoat of paint shall be ensured.
- (B) However, idler roller shall be applied with two coats of red oxide Zincchromate only of total thickness of 70 micron at shop.
- (C) For steel buried pipeline, three (3) coats of heavy duty bitumastic paint shall be applied on the cleaned surface. Finally, it should be wrapped with minimum 3 mm thick bitumen impregnated tar felt. The lap joint of the felt shall be generally touched with heavy duty bitumastic paint.

(2) Ash handling System

All surfaces to be painted shall be thoroughly cleaned of oil grease and other foreignmatter. Surface shall be free of moisture and contamination from chemicals and solvents.

(A) Painting Schedule

- (I) All equipments, like pumps, blowers, compressors, vacuum pumps, valves, airlocks/pump tanks, all types of tanks/buffer hopper/collector tank/storage silos (excluding the supporting steel structure), equipment base plate etc.
 - a) Surface Preparation : Commercial Blast Clean
 - b) Primer : Conforming to BS: 5493, Table-4FPart-2, Reference FP-3A.
Binder : Alkyd or modified alkyd
 - c) Main Pigment : Zinc PhosphateNominal coating thickness : 70 microns
Under Coats : Conforming to BS : 5493, Table-4F,Part-3, Reference FU-2A.
Binder : Alkyd of modified alkyd
Main Pigments : Coloured pigments (full colours) suitably extended.
Nominal coating thickness : 70 to 80 microns
 - d) Finish Coats : Conforming to BS : 5493, Table-4F,Part-4 Reference FF-38.
Binder : Alkyd or modified Alkyd

- Main Pigment : Fade-resistant coloured pigments.
- Nominal Coating thickness : 50 to 80 microns
- e) Dry film thickness of system : 190 to 240 microns

(II) For all water/air piping, ash slurry piping, pipe clamps/hangers etc. the following shall be applicable.

- a) Surface Preparation : Power Tool Clean
- b) Primer : Conforming to BS: 5493, Table-4F Part-2, Reference FP-2A.
- Binder : Drying oil modified with phenolic or phenolic modified resin.
- c) Main Pigment : Zinc Phosphate
- Nominal thickness coating : 70 microns
- Under Coats : Conforming to BS : 5493, Table-4F, Part-3, Reference FUIA.
- Binder : Drying oil modified with phenolic or phenolic modified resin.
- Main Pigments : Coloured pigments (full colours) suitably extended.
- Nominal Coating thickness : 25 to 40 microns
- d) Finish Coats : Conforming to BS : 5493, Table-4F, Part-4 Reference FFIA.
- Binder : Drying oil modified with phenolic or phenolic modified resin.
- Main Pigment : Fade-resistant coloured pigments.
- e) Dry film thickness of system : 120 to 150 microns

(B) Surfaces not to be painted (unless otherwise) specified.

Surface of insulation, Stainless steel, nickel, copper brass, monel, aluminium, hastelloy, lead galvanized steel, Valve stem, pump shafts, gauges, Bearing and control surfaces, lined or clad surfaces.

(C) For fly ash extraction and transportation piping, bituminous paint of IS:158 grade of minimum 250 micron thickness shall be provided.

(D) For steel buried pipeline, three (3) coats of heavy duty bitumastic paint shall be applied on the cleaned surface. Finally, it should be wrapped with minimum 3 mm thick bitumen impregnated tar felt. The lap joint of the felt shall be generally touched with heavy duty bitumastic paint.

Inside and outside of strainer basket body shall be protected with one coat of high build zinc phosphate primer and three coats of Chlorinated rubber paint to a total thickness of 200 microns.



ANNEXURE-E

SUB-SECTION-A-12

SURFACE PREPARATION & PAINTING

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC NO.:CW-CM-11159-C-O-M-001**

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	Specification of surface preparation & painting			
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.			
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.			
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.			
1.04.00	All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.			
1.05.00	SURFACE PREPARATION			
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.			
1.05.02	The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer.			
	SP1	Solvent cleaning		
	SP2	Application of rust converter (Ruskil or equivalent grade)		
	SP3	Power tool cleaning		
	SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)		
	SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns		
	SP5	Shot blasting/ abrasive blasting.		
	SP6	Emery sheet cleaning/Manual wire brush cleaning.		
1.06.00	APPLICATION OF PRIMER/PAINT			
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.			
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.			
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION- VI, PART-B BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING
PAGE 1 OF 8				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.			
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminum paint to IS 2339. PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - Weldable primer-Deoxaluminate or equivalent. PS16 - High Build Epoxy CDC mastic `15'. PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.) PS-20 - Epoxy based finish paint			
1.06.06	All weld edge preparation for site welding shall be applied with one coat of wieldable primer.			
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.			
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.			
1.06.09	a) All un-insulated equipments, pipes, valves etc. covered in sub-section A-07 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 microns. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO₂ pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 microns. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard.			
1.06.10	A)	Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows:		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION– VI, PART-B BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	PAGE 2 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Primer : One coat of unmodified epoxy resin along with polyimide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct hardener. Total thickness of primer and paint should not be less than 400 microns. B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows: i) For Indoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be done either manually or by any other approved method. (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION- VI, PART-B BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	PAGE 3 OF 8	

1.06.11 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														As per NTPC Colour shade/ coding scheme
1.	All insulated Pippings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
2.	All un-insulated Pippings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60°C	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3 \$	35 \$	155 \$	
		Design temperature above 60°C- 200°C	SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
		Design temperature > 200°C	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	

4	Piping hangers / supports (other than (3) above. (un-insulated)		SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100	
	Valves													
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120	
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40	
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat	2	35	250	
										b) Final coat of paint PS17	1	30		
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat	2	25	150	
										b) Final coat of paint PS17	1	30		

7.	Weld Edges	SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25	
1. \$ - The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site. 2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint. 3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable. 4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content> 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme. 5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944. 6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.													
B) Steam Generator & Auxiliaries:													
1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2 \$	20 \$	100 \$	
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	

Note: 1) SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.

C) LOW PRESSURE PIPING

1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Color shade/coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											

D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System

For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System

For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System.

For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System.

For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.

E) ESP												
1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/ PS3*	1	25	-	-	-	PS 4	1	30	55
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60

General Notes (Applicable for all above points A to E)

- i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.
- ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

- (i) Surface preparation shall be blast cleaned conforming to Sa 2-1/2 Swiss Standard.
- (ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.
- (iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.
- (iv) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns.
Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

SUB-SECTION–A-12

SURFACE PREPARATION & PAINTING

CLAUSE NO.	TECHNICAL REQUIREMENTS																	
1.00.00	Specification of surface preparation & painting																	
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.																	
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.																	
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.																	
1.04.00	All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.																	
1.05.00	SURFACE PREPARATION																	
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.																	
1.05.02	The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer. <table><tr><td>SP1</td><td>Solvent cleaning</td></tr><tr><td>SP2</td><td>Application of rust converter (Ruskil or equivalent grade)</td></tr><tr><td>SP3</td><td>Power tool cleaning</td></tr><tr><td>SP4</td><td>Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)</td></tr><tr><td>SP4*</td><td>Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns</td></tr><tr><td>SP5</td><td>Shot blasting/ abrasive blasting.</td></tr><tr><td>SP6</td><td>Emery sheet cleaning/Manual wire brush cleaning.</td></tr></table>				SP1	Solvent cleaning	SP2	Application of rust converter (Ruskil or equivalent grade)	SP3	Power tool cleaning	SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)	SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns	SP5	Shot blasting/ abrasive blasting.	SP6	Emery sheet cleaning/Manual wire brush cleaning.
SP1	Solvent cleaning																	
SP2	Application of rust converter (Ruskil or equivalent grade)																	
SP3	Power tool cleaning																	
SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)																	
SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns																	
SP5	Shot blasting/ abrasive blasting.																	
SP6	Emery sheet cleaning/Manual wire brush cleaning.																	
1.06.00	APPLICATION OF PRIMER/PAINT																	
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.																	
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.																	
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.																	
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.																	
SIPAT SUPER THERMAL POWER PROJECT STAGE-III (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 1 of 8														

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminum paint to IS 2339. PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - Weldable primer-Deoxaluminate or equivalent. PS16 - High Build Epoxy CDC mastic `15'. PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.) PS-20 - Epoxy based finish paint			
1.06.06	All weld edge preparation for site welding shall be applied with one coat of wieldable primer.			
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.			
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.			
1.06.09	a) All un-insulated equipments, pipes, valves etc. covered in sub-section A-07 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 microns. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO2 pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 microns. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard.			
1.06.10	A)	Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows: Primer : One coat of unmodified epoxy resin along with polymide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct		
SIPAT SUPER THERMAL POWER PROJECT STAGE-III (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 2 of 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	hardener. Total thickness of primer and paint should not be less than 400 microns. B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows: i) For Indoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be done either manually or by any other approved method. (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.			
SIPAT SUPER THERMAL POWER PROJECT STAGE-III (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION VI, PART-B	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 3 of 8	

1.06.11 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														
1.	All insulated Pippings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	As per NTPC Colour shade/ coding scheme
2.	All un-insulated Pippings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60°C	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3	35	155	
		Design temperature above 60°C- 200°C	SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
		Design temperature > 200°C	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	
4	Piping hangers / supports (other than (3) above. (un-insulated)		SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100	

	Valves												
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside building and in SG envelope TG	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat	2	35	250
										b) Final coat of paint PS17	1	30	
		Within building TG	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat	2	25	150
										b) Final coat of paint PS17	1	30	
7.	Weld Edges		SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25

1. \$ - The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site.
2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint.
3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable.
4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content > 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme.
5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944.
6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.

B) Steam Generator & Auxiliaries:

1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2 \$	20 \$	100 \$
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40

Note: 1) SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.

C) LOW PRESSURE PIPING

1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Color shade/ coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											

D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System

For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System

For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System.

For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System.

For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.

E) ESP

1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/PS3*	1	25	-	-	-	PS 4	1	30	55
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60

General Notes (Applicable for all above points A to E)

- i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.
- ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

- (i) Surface preparation shall be blast cleaned conforming to Sa 2-1/2 Swiss Standard.
- (ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.
- (iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.
- (iv) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns.
Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

CHAPTER – 7**PAINTING****1.0 SCOPE**

1.1 This section covers the painting requirements for the power plant equipment, structures, piping etc. and any other surface required to be painted. The painting system should ensure optimal protection of the installation with minimum need for maintenance, environmental friendly & easy to apply.

2.0 CODES AND STANDARDS

2.1 Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS contract for the material and workmanship.

2.2 The following Indian Standards may be referred to for carrying out the painting job:

IS: 5	:	Colours for ready mixed paints and enamels
IS: 101	:	All Parts and Sections for paint testing
IS: 1303	:	Glossary of terms relating to paints
IS: 2379	:	Colour code for identification of pipelines
IS: 1477	:	Code of practice for painting of ferrous metals in buildings (Parts I & II)
IS: 2524	:	Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
IS: 6278	:	Code of practice for white washing and colour Washing
IS: 13183	:	Aluminium Paint, heat Resistant specification
IS: 158	:	Ready mixed paint, brushing, bituminous, black, Lead free, acid, alkali, water and heat resisting
IS: 2074	:	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
IS: 104	:	Ready mixed paint, brushing, Zinc Chrome, priming
IS: 2932	:	Enamel, synthetic, exterior (a) undercoating (b) finishing.
IS: 2629	:	Recommended Practice for Hot Dip Galvanising
BS EN ISO 14713	:	Code of practice for protection of iron & steel structure against corrosion
ISO 8501-1	:	Preparation of steel substrates before application of paint & related Products. Part-1: Rust grades & preparation grades of uncoated steel substrates & steel substrates after overall removal of previous coatings
ISO 8502-3	:	Assessment of dust on steel surface prepared for painting (Pressure sensitive tape method)
ISO 12944 (Part 1 to 7)	:	Corrosion protection of steel structures by Protective paint systems
SSPC	:	US Specifications of Steel Structures Painting Council, SSPC Volumes I and II
SSPC-SP-08	:	Surface preparation by Pickling
NORSOK M-501	:	Surface preparation & Protective coating

ISO 20340	:	Pre-Qualification test
ASTM	:	American Standard Test Method for paints and coatings
AWWA	:	American Water Works Association
SIS: 55900	:	Swedish standard for blasting

In the event of conflict between the Codes and Standards referred to in the specification and the requirement of this specification, the latter shall govern. Statutory and Local regulations shall be strictly followed in selection and application of paint.

3.0 **GENERAL**

- 3.1 This specification covers the surface preparation, method of application and material to be used for all coating of equipment, steel structures and piping. Steel material subjected to surface preparation on shop/site shall have minimum requirements in accordance with Rust Grade B (SSPC/SSPM Volume-2).
- 3.2 Coating materials according to SSPC, EN ISO, ASTM, BIS or DIN standards, shall be used. The paint shall comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertains to the work. The materials shall be matched with each other so that they are compatible. Coatings deviating this specification shall be subject to approval. Standards of surface preparation and painting shall give a time to first maintenance of 10 years.
- 3.3 The paint to be applied shall be approved by Owner / Engineer.
- 3.4 All paints & paint material used shall be procured from approved manufacturers. Paint shall be supplied in manufacturers original containers with the description of content, specification No., colour, ref no, date of manufacture, shelf life expiry date & pot life.
- 3.5 The paint manufacturers shall provide coating system data sheet for each coating system to be used containing the following information:
1. Surface preparations
 2. Film thickness (min and max)
 3. Min and max recoating intervals at relevant temperatures
 4. Mixing ratio, thinner details and coating repair systems
- 3.6 The sample for testing the paint being used may be taken by the Owner at any time.
- 3.7 In general Shop fabricated equipment will be delivered to the site coated with a shop applied system or the manufacturer's standard finish in accordance with the requirements of this specification.
- 3.8 For equipment that has received shop prime coat, touch-up prime coat and additional coats shall be applied in accordance with the coating schedule. It is responsibility of the vendor to ensure compatibility between shop and field applied paint systems.
- 3.9 Necessary precautions shall be provided to all equipment, structures to protect other surfaces from abrasive blasting, coating over spray and

spatter. Damage to other surfaces or equipment shall be repaired by the vendor.

3.10 The Contractor shall submit the following for review and approval by the Owner:

1. Manufacturer's recommended paint scheme for the project
2. Latest published product & instructions for application data,
3. Procedures for surface preparation and application.
4. Pre qualification for equipments and blasting materials, product, procedure and personnel qualifications for the paint and painting systems.
5. Painting repair procedures

Painting records shall contain:

- Equipment/components/location painted
- Date of painting
- Paint details such as specification No, colour, date of manufacture, shelf life, expiry date
- Application equipments
- Ambient conditions at the time of painting
- Surface temperature
- Drying time between coating, DFT and number of coatings
- Appropriate work plan for painting.

3.11 The supply of all necessary equipments, weather protection, and scaffolding for painting to ensure work is carried out in accordance with the specification and agreed programme.

3.12 Maintenance of the paint work until completion of the contract, this shall include repair of any damaged areas caused by third party.

3.13 Disposal of painting waste resulting from painting, shall comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertains to the work and coating materials.

3.14 It is a mandatory requirement that all operatives working to this procedure take full cognizance and implement necessary safety precautions.

4.0 PREPARATION OF SURFACES

4.1 All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust, weld spatters, sharp edges and any other foreign matter. Removal of grease and oil contamination shall be in accordance with SSPC-SP1 prior to cleaning process described below.

4.2 Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out, hand scrapping may be permitted with steel wire brushes and/or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the Engineer.

4.3 The blast cleaned surface shall be checked for signs of salt contamination as per ISO 8502-6 & 9. The maximum allowable level of contamination shall be 20 mg/m². Surfaces that do not meet these criteria shall be reprocessed.

4.4 **Mechanical Cleaning:**

4.4.1 Manual/power tool cleaning shall be done as per grade St-2 or St-3, of ISO 8504-3. This method to be used for repair painting or on already painted surface and in case of usage on new construction painting prior approval may be obtained from Owner/engineer.

	Condition of surface	ISO 8504-3	SIS 055900	SSPC
Hand tool cleaning	Rusted	C St2	C St2	SP2
	Rusted and pitted	D St2	D St2	SP2
Power tool cleaning	Rusted	C St3	C St3	SP3
	Rusted and pitted	D St3	D St3	SP3

- i) Grade St-2: Thorough scraping and wire brushing, machine brushing, grinding etc. This grade of preparation shall remove loose mill scale, rust and foreign matter. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or with clean brush. After preparation, the surface should have a faint metallic sheen. The appearance shall correspond to the prints designated St-2.
- ii) Grade St-3: very thorough scraping and wire brushing, machine brushing, grinding etc. After preparing the surface, it should have a pronounced metallic sheen and correspond to the prints designated St-3.

4.5 **Blast cleaning:**

4.5.1 **Compressors:** Compressed air supply for blast cleaning shall be free of water and oil. Air compressors shall not be allowed to deliver air at 110° C. The blasting activity shall be performed at ambient temperatures above 5°C and relative humidity less than 85%. Steel temperature shall be 3°C above dew point. Necessary safety precautions for equipment and operator shall be adhered to.

4.5.2 **Abrasives:** Abrasives used for blast cleaning carbon steel and alloy steel shall be as per ISO 8504-2 and SSPC painting manual. Suggested abrasives may be chilled iron grit or shot steel and malleable iron grit and shots non metallic abrasive (aluminium oxide, copper slag, garnet etc.).

4.5.3 Removal of mill scale and rust using abrasives such as grit or shot under high pressure. The grade of blasting performed in line with the approved painting scheme.

4.5.4 Surfaces to be coated shall be free of all grease, oil, loose rust, and loose mill scale. Rust, mill scale, weld spatter, flux, shall be removed by the methods indicated in the Coating Schedule. Oil and grease shall be removed by solvent cleaning method as outlined in SSPC – SP-1 prior to blasting.

4.5.5 The quality and grain size of abrasives and the parameter of their use are to be chosen to obtain the surface profile depth and cleanliness. Abrasives

shall comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertaining to the work.

4.5.6 Profile measurements for abrasive blast cleaned surface shall be made with a Profile comparator and permanent record shall be maintained with Testex Press-O-Film.

4.5.7 Surfaces prepared for coating shall be coated the same day and before any visible rusting occurs (the time elapsed between blast cleaning and commencement of painting shall under no circumstances exceed 4 hours, but in any case must commence before signs of degradation occur).

4.5.8 After blasting cleaning, depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer of minimum dry film thickness 25 mm may be used.

4.5.9 The grades of surface finish:

	ISO 8501-1	SIS 055900	SSPC	NACE
White metal	Sa3	Sa3	SP5	1
Near White metal	Sa 2½	Sa 2½	SP10	2
Commercial blast	Sa2	Sa2	SP6	3
Brush off blast	Sa1	Sa1	SP7	4

4.6 **Paint Application**

4.6.1 **General:**

Paints and other coating materials shall be applied in accordance with the paint manufacturer's instructions. The surface preparation and painting system shall be as described in ANNEXURE with the following exceptions:

- Nameplates, code stampings and push buttons
- Concrete brickwork, tile, and glass unless specified by the Owner / Engineer
- Non-ferrous materials
- Austenitic stainless steel
- Plastic and / or plastic coated materials
- Insulated surface of equipment and pipes except colour coating wherever required
- Any surface specified by the Owner / Engineer not to be painted.

4.6.2 **Paint Application Requirements**

4.6.2.1 The paint shall be applied in accordance with the paint manufacturer's product data sheet, which shall include the mix ratio, the method of application, and the use of thinners and over coating times.

4.6.2.2 Paint application shall be by brush, roller or spray gun. Local regulations regarding spray and roller coating shall be observed. A smooth uniform film shall be applied to the surfaces to be coated.

4.6.2.3 Painting shall be performed when the temperature of the surface is greater than 3°C above the dew point of the surrounding air and relative humidity of the air is less than 85% unless local conditions dictate otherwise and the Owner is in agreement. Guidance on the estimation of the probability of

condensation can be found in ISO 8502-4. The measurement of these conditions is the responsibility of the Vendor.

4.6.2.4 In addition, paints shall not be applied under the following conditions:

- When the surface temperature is greater than 60 °C unless a higher temperature is agreed by the paint manufacturer
- When the air temperature is less than approximately 5°C, depending on local conditions
- When there is the likelihood of an unfavourable change in weather conditions within two hours after painting
- When there is a deposition of moisture in the form of rain, condensation, frost, etc., on the surface.
- When the available light is less than 500 lux.

4.6.2.5 Paints shall not be applied within 50 mm of edges which will later have to be welded. Such weld areas shall be taped/one coat of weldable primer for distance of 50 mm either side of the weld line.

4.6.2.6 When zinc rich primers are used, care shall be taken to mask to avoid any possibility of over spraying onto duplex, austenitic stainless steels; nickel alloys or 9% nickel steel components.

4.6.2.7 Two pack coatings like Air drying epoxy, Polyurethane coatings etc shall be mixed in the ratio recommended by manufacturer to ensure proper and complete curing of the coatings. The base and hardener are to be separately mixed first to obtain a homogenous mixture. The hardener is to be added to the base slowly, with continuous mixing / agitation and not the reverse. Power agitation is preferred over hand mixing.

4.6.2.8 Any addition of thinner to achieve the application viscosity should be made only after the components are thoroughly mixed. Excess thinner is not recommended, as increase in volume, leads to lower DFT, sagging, longer curing time, etc.

4.6.2.9 Coating containing heavy or metallic pigments that have a tendency to settle shall be kept in suspension by continuous use of a mechanical agitator whilst being applied, to ensure uniformity over the surface area (e.g., zinc MIO's pigmented materials).

4.6.2.10 Transport and erection of painted structures shall be carried out only after the drying time specified by the paint manufacturer has elapsed. Handling & packing of painted material shall be appropriate to avoid damage to painting, such as the use of non-metallic slings, etc for handling and by minimising handling after painting. All steel equipment shall be provided with priming or coating system to protect the steel surface during transport, storage, installation and construction.

4.6.3 **Spray Application**

4.6.3.1 Airless or pneumatic spray applications are preferred methods of application. Spraying shall be carried out keeping the spray gun at the

minimum suitable distance from the work piece and consistently at 90° to the surface being painted.

4.6.3.2 Approval of Owner / Engineer shall be obtained during spray painting which may cause interference to other works. If spray painting is to be carried out, the following shall be taken into account:

4.6.3.3 The correct spray tips, air pressures, etc, as recommended by the equipment supplier, shall be used.

4.6.3.4 Conventional air spray equipment is used, the correct combination of air volume, air pressure and fluid flow to give good atomisation to be ensured to get a defect free painted surface. The major disadvantage of conventional air spray is that high build coatings can generally not be applied by this method as most paints have to be thinned to a suitable viscosity for satisfactory atomisation, and so lose their high build properties. Vendor shall follow manufacture's instruction.

4.6.3.5 Air spray (pressure pot) is recommended in cases where large quantities of paint are to be applied as paint in the tank can be prevented from settling, reduces application time and also enables the gun to be turned to any angle to coat objects effectively without spilling paint.

4.6.3.6 Airless spray is recommended as high build coatings can be applied without thinning, very rapid application is possible, giving an economic advantage, compared to conventional spray, overspray and bounce-back are reduced, leading to reduced losses of material and less dust and fume hazards.

4.6.3.7 Each coat shall be applied uniformly and completely over the entire surface. All runs and sags shall be brushed out immediately or the paint shall be removed and the surface re-sprayed.

4.6.3.8 Very complex structures should be painted by brush instead of spray gun to avoid overspray, dry spray and unacceptable paint losses.

4.6.4 **Brush application**

4.6.4.1 Brush application may be used under the following circumstances:

- When areas cannot be properly coated by spraying for reasons such as material or environmental considerations
- For the initial coat of paint to corners, edges, crevices, holes, welds or irregular surface prior to spray application
- For 'touch up' or repairs to localize damaged paint or areas of incorrectly applied paint
- Where the paint manufacturer considers the coating material suitable for brush application.

4.6.4.2 Brushes shall be of a style and quality that will permit the proper application of paint.

4.6.4.3 Brush applications should be done in two passes that are perpendicular to each other 'wet on wet' so that a smooth coat, as near uniform in thickness as possible, is obtained thereby avoiding running and droplets. There should be no deep or detrimental brush marks. Paint shall be worked into all crevices and corners. Runs and sags shall be brushed out.

- 4.6.4.4 During the application of each coat, all areas such as corners, edges, welds, small brackets, bolts, nuts and interstices shall receive additional paint to ensure that these areas have at least the minimum specified dry film thickness and to ensure continuity of coating.
- 4.6.5 **Roller application**
- Roller application shall only be used on relatively large surface areas and only if spraying is not an option. Roller application shall only be used if the first or priming coat of paint has been applied by brush. Roller application shall be in accordance with the paint Manufacturer's instructions.
- 4.6.6 **Coating materials**
- 4.6.6.1 The selected coating materials shall be suitable for the intended use and shall be selected after an evaluation of all relevant aspects such as
- Corrosion protective properties
 - Requirements to health, safety and environment
 - Properties related to application conditions, equipment and personnel
 - Experience with the coating materials and coating system.
- 4.6.6.2 All coating materials and solvents shall be protected from ignition sources and shall remain within storage temperatures and storage conditions recommended by the coating manufacturer. All coating materials and solvents shall be stored in the original container bearing the manufacturer's label and instructions. Performance standard as listed below shall be established by paint manufacturer the records shall be submitted for review.
- Adhesion test (pull off test)
 - Flexibility test
 - Salt spray test (min 1000 Hrs)
 - Water absorption test
 - UV resistance test (external coating)
 - Cathodic dis bonding test (internal coating)
 - Abrasion test (internal coating)
 - Impact resistance test
- 4.6.6.3 Each product shall have a batch number showing year and month of manufacture and giving full traceability of production. Shelf life shall be included in the technical data sheet. All coating materials and solvents shall be stored in the original container bearing the manufacturer's label and instructions.
- 4.6.6.4 The composition of the paint shall be at the discretion of the manufacturer, provided that the finished product meets the requirements of, State or Local regulatory bodies for the products. All vehicle components for use in the manufacture of paints and enamels shall meet the ASTM/ ISO Specification except as otherwise stated coating systems shall be selected as per corrosivity category listed in the table below. Coating systems are tabulated in ANNEXURE and shall be pre-qualified in accordance with specification. Coating systems/ alternative coating systems may be re-subjected to pre-qualification, at the discretion of OWNER/ ENGINEER. The specified coating systems, the number of coats and the coating film thicknesses given in

Annexure are minimum requirements Top coat colors should be in accordance with Annexure.

4.6.7

Gratings and step threads

- i) Surface preparation: Gratings and step threads shall be cleaned by acid pickling as per SSPC-SP-08.
- ii) Hot dip galvanising: The hot dip galvanising shall be done as per IS 2629 .The average mass of coating shall be 610 gm/m².
- iii) Post galvanising treatment: Immediately after galvanising, post treatment such as chromating shall be applied to retard white rust attack.
- iv) Touch up mechanical damages: The repair of damages coatings shall be done as per the recommended practice ASTM A 780.

CORROSIVITY OF ENVIRONMENTS

Corrosivity category		Mass loss per unit surface (per year of exposure)	
		Mass loss g/m ²	Thickness loss µm
C2	Low	>10 to 200	>1.30 to 25
C3	Medium	200-400 g/m ²	(25-50µm)
C4	High	400-650 g/m ²	(50-80µm)
C5	Very High Industrial & marine	650-1500g/m ²	(80-200µm)

Tests required for evaluation of acceptance of coating materials:

TABLE -1**PERFORMANCE TEST OF PAINT**

SL. No.	Test	ASTM TEST METHOD
1.0	Abrasion Resistance: (topcoat only)	ASTM D4060
2.0	Adhesion:	ASTM D4541
3.0	Dry Heat Resistance:	ASTM D2485
4.0	Flexibility: (topcoat only)	ASTM D522, 180° bend
5.0	Pencil Hardness: (topcoat only)	ASTM D3363
6.0	Salt Fog Resistance:	ASTM B117, 1000 hours
7.0	Weather Resistance:	ASTMG23 Type D
8.0	Test	ASTM Test Method
9.0	Density	D 1475
10.0	Dipping properties	D 823
11.0	Drying time	D 1640
12.0	Flexibility	D 1737/D 522
13.0	Hardness	D 3363
14.0	Adhesion (pull off test)	D 4541
15.0	Abrasion resistance	D 968/D 4060
16.0	DFT/Coat	As per SSPC Guidelines
17.0	Storage Stability	D 1849
18.0	Resistance to	

	i) Humidity for 2000 hrs.	D 2247
	ii) Salt Spray for 2000 hrs.	B 117
	iii) Accelerated Weathering	D 822

5.0 **INSPECTION:**

5.1 Inspection will be performed by an inspector authorised by Owner / Engineer. Paint materials including primers and thinners brought to site by contractor for application shall be procured directly from manufactures as per specification and shall be accompanied by manufacturer's test certificates.

5.2 The painting work shall be subjected to inspection by Owner / engineer at all times. The vendor shall offer following stage of inspection:

- Surface preparation
- Primer application
- Subsequent coats
- Paint qualification test

5.3 Vendor shall provide the expert technical services of the paint manufactures as and when required by Owner / engineer to ensure both the surface preparation and applications are carried out as per their recommendations. This service shall be provided without any obligation to Owner.

5.4 The following coating inspection & test shall be carried out:

1. Ambient and steel temperature, relative humidity and dew point min twice in a shift.
2. Surface finish & profile check each component or once per 10 m² after surface preparation.
3. Salt contamination test - Free from salt contamination.
4. Dry Film Thickness as per ISO 2808 No.6.
5. Holiday Test as per ASTM D 5162/ NACE RP 0188.
6. Adhesion Test as per ISO 2409 for cross-cut test, or a pull-off test as per ISO 4624/ ASTM D 4541.

6.0 **SUGGESTED COLOUR CODES FOR PAINTING:**

S No.	Item/Service	Colour	IS-5	Colour (Band)	IS-5
1.0	Structures, platforms, ladders and handrails	Dark Admiralty Grey	632		
2.0	Boiler casing, ESP and ducting	Nut Brown	413		
3.0	Fans, pumps, motors,	Light Grey	631		
4.0	Tanks (without insulation and cladding)				
4.1	Outdoor	Aluminium			
4.2	Indoor	Light grey	631		



S No.	Item/Service	Colour	IS-5	Colour (Band)	IS-5
5.0	Vessels & all other proprietary equipment (without insulation & cladding)	Light grey	631		
6.0	Switchgear	Light grey	631		
7.0	Control & relay panels	Light grey	631 78 of IS1650		
8.0	Turbine	Golden Yellow	356		
9.0	Generator & exciter	Light grey	631		
10.0	Transformers	Aluminium			
11.0	Machinery guards	Signal red	537		
12.0	Crane				
12.1	Crane structure	Golden Yellow	356		
12.2	Trolley and hook	Crimson	540		
13.0	Piping (without insulation and cladding)				
13.1	Water System				
13.1.1	Boiler feed	Sea green	217		
13.1.2	Condensate	Sea green	217	Light brown	410
13.1.3	Bearing cooling water	Sea green	217	French blue	166

Notes:

1. This colour code basically refers to IS: 2379 for piping with necessary modifications.
2. Where band colour is specified, same shall be provided at 30 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.

PAINTING SCHEME FOR C2 AND C3 ENVIRONMENT

S. No	Description	Surface Preparation	Primer			Intermediate paint			Finish coat			Total DFT
			Paint	No. of coats	DFT	Paint	No. of coats	DFT	Paint	No. of coats	DFT	Min.
1.	Boiler structure, un-insulated ducts, suspensions, hangers temperature <120°C	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2		260µ
2.	Indoor structure	Sa 2 ½	HB Zn Phosphate	2	80 µ	HB MIO epoxy	1	120 µ	--	--	--	260µ
3.	Insulated parts exposed to temp >120°C	Sa 2 ½	In organic Zn silicate	2	60 µ							60µ
4.	Water Treatment Plant (external)	Sa 2 ½	Zn rich epoxy	2	80 µ	HB MIO epoxy	2	200 µ	Aliphatic poly urethane	2	80 µ	360µ
5.	Coal Handling Plant	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120 µ	poly urethane	2	60 µ	260µ
6.	Fuel pipings	Sa 2	Ehthy Zn silicate	1	40 µ				HR aluminium paint	2	40 µ	80µ
7.	Un insulated silencer, steel stacks >120°C	Sa 2 ½	Ehthy Zn Silicate	1	40 µ				HR silicone aluminium paint	2	40 µ	80µ
8.	Above ground piping	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2	60 µ	260µ
9.	Burried piping (External)	Sa 2 ½	Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel impregnated fibre									4.0m m
10.	Burried piping (Internal)	Sa 2 ½	Solid rigid poly urethane 500 µ									500µ
11.	Storage tanks (external)	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2	60 µ	260µ
12.	Storage tanks (internal)	Sa 2 ½	3 coats of amine adducts									400µ
13.	DM water tank (internal)	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	150 µ	HB coal tar epoxy	1	150 µ	380µ
14.	Fuel oil tanks (internal)	Sa 2 ½	In organic Zn	2	80	HB MIO	1	150	HB coal tar epoxy	1	150	380µ



"1X800 MW SUPER CRITICAL EXPANSION UNIT
DEEN BANDHU CHHOTU RAM THERMAL POWER PLANT
YAMUNA NAGAR"



			silicate		μ	epoxy		μ			μ	
15.	Insulated parts continuously exposed to condensing water	Sa 2 ½	In organic Zn silicate	2	75 μ							75μ
16.	For insulated piping <125°C	Sa 2 ½	Polyamide cured epoxy coating	2	250 μ							250μ
17.	Electrical parts, control panels, valves, pumps & motors (indoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	80 μ	160μ
18.	Electrical parts, control panels, valves, pumps & motors (outdoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	100 μ	180μ
19.	Switch yard, floor grills walk ways	Sa 2 ½	Hot dip galvanising 80μ									80μ

* Note: Manufacturer to specify details of painting system capable of withstanding environmental conditions for a period of 10 years before first maintenance

PAINTING SCHEME FOR C4 AND C5 ENVIRONMENT

S. No	Description	Surface Preparation	Primer			Intermediate paint			Finish coat			Total DFT
			Paint	No. of coats	DFT	Paint	No. of coats	DFT	Paint	No. of coats	DFT	Min.
1.	Boiler structure, un-insulated ducts, suspensions, hangers temperature <120°C	Sa 2 ½	HB Zn Phospate	2	80 µ	HB MIO epoxy	2	200 µ	Epoxy PU HB	2	80 µ	360µ
2.	Indoor structure	Sa 2 ½	HB Zn Phospate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2	60 µ	260µ
3.	Insulated parts exposed to temp >120°C	Sa 2 ½	In organic Zn silicate	2	60 µ							60µ
4.	Water Treatment Plant (external)	Sa 2 ½	Zn rich epoxy	2	80 µ	HB MIO epoxy	2	200 µ	Epoxy PU HB	2	80 µ	360µ
5.	Coal Handling Plant	Sa 2 ½	HB Zn Phospate	2	80 µ	HB MIO epoxy	2	200 µ	Poly urethane	2	60 µ	340µ
6.	Coal Fuel piping	Sa 2	Ehthy Zn silicate	1	40 µ				HR aluminium paint	2	40 µ	80µ
7.	Un insulated silencer, steel stacks >120°C	Sa 2 ½	Ehthy Zn Silicate	1	40 µ				HR silicone aluminium paint	2	40 µ	80µ
8.	Above ground piping	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2	60 µ	260µ
9.	Buried piping (external)	Sa 2 ½	Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel									4.0 mm
10.	Buried piping (internal)	Sa 2 ½	Solid rigid poly urethane 500 µ									500µ
11.	Storage tanks (external)	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	2	200 µ	Poly urethane	2	60 µ	340µ
12.	Storage tanks (internal)	Sa 2 ½	3 coats of amine adducts									400µ
13.	DM water tank (internal)	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	150 µ	HB coal tar epoxy	1	150 µ	380µ

14.	Fuel oil tanks (internal)	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	150 μ	HB coal tar epoxy	1	150 μ	380μ
15.	Insulated parts continuously exposed to condensing water	Sa 2 ½	In organic Zn silicate	2	75 μ							75μ
16.	For insulated piping <125°C	Sa 2 ½	Polyamide cured epoxy coating	2	250 μ							250μ
17.	Electrical parts, control panels, valves, pumps & motors (indoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	80 μ	160μ
18.	Electrical parts, control panels, valves, pumps & motors (outdoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	100 μ	180μ
19.	Switch yard, floor grills walk ways	Sa 2 ½	Hot dip galvanising coating Wt. 610 gms/M ² (coating thickness of 80μ)									80μ

*** Note:** Manufacturer to specify details of painting system capable of withstanding environmental conditions for a period of 10 years before first maintenance.

ANNEXURE-C**Seal steam supply valve- Check List for Documents/Information to be furnished along with the offer**

SL. No.	Document/Information details	Vendor's confirmation/ Remark
1	Data sheet of valve and actuator	
2	Sizing calculation of valve and actuator	
3	General arrangement drawing of valve along with actuator indicating: i. overall dimensions, ii. required maintenance space, iii. details of weld ends, iv. overall assembly weight v. direction of flow	
4	Hook up diagram along with its functional write up	
5	Detailed catalogue mentioning type of position transmitter position controller, volume booster, air lock relay, air filter and regulator	
6	Priced list of optional spare parts as per applicable BHEL drg. No. 31323900001 for future ordering	



BHARAT HEAVY ELECTRICALS LIMITED

HEEP-HARIDWAR, UTTARAKHAND (249403)

General Instructions and Standard Terms & Conditions for bidding against Tender Enquiry (GISTC)

For Indian Bidders (Version Jun-2025, Rev: 08)

Annexure-3

Declaration for treatment of cases regarding conflict of interest

The bidder notes that a conflict of interest would said to have occurred in the tender process and execution of the resultant contract, in case of any of the following situations:

- a) If its personnel have a close personal, financial, or business relationship with any personnel of BHEL who are directly or indirectly related to the procurement or execution process of the contract, which can affect the decision of BHEL directly or indirectly;
- b) The bidder (or his allied firm) provided services for the need assessment/ procurement planning of the Tender process in which it is participating;
- c) Procurement of goods directly from the manufacturers/suppliers shall be preferred. However, if the OEM/Principal insists on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/ supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer/ supplier could bid directly but not both. In case bids are received from both the manufacturer/ supplier and the agent, bid received from the agent shall be ignored. However, this shall not debar more than one Authorized distributor (with/ or without the OEM) from quoting equipment manufactured by an Original Equipment Manufacturer (OEM) in procurements under a Proprietary Article Certificate.
- d) A bidder participates in more than one bid in this tender process. Participation in any capacity by a Bidder (including the participation of a Bidder as a partner/ JV member or sub-contractor in another bid or vice-versa) in more than one bid shall result in the disqualification of all bids in which he is a party. However, this does not limit the participation of an entity as a sub-contractor in more than one bid if he is not bidding independently in his own name or as a member of a JV.

The Bidder declares that they have read and understood the above aspects, and the bidder confirms that such conflict of interest does not exist and undertakes that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s), in this regard. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

In case, the Bidder is found having indulged in above activities, the same will be considered as a violation of the tender conditions, and suitable action shall be taken by BHEL as per extant policies/ guidelines.

(Signature of the authorized signatory of the bidder)

DECLARATION REGARDING MINIMUM LOCAL CONTENT IN LINE WITH
REVISED PUBLIC PROCUREMENT (PREFERENCE TO MAKE IN INDIA), ORDER 2017- REVISION
DATED 19TH JULY, 2024 AND SUBSEQUENT ORDER(S)

(To be typed and submitted in the Letter Head of the Entity/Firm providing certificate as applicable)

To,
(Write Name & Address of Officer of BHEL inviting the Tender)
Dear Sir,

Sub: Declaration reg. minimum local content in line with Public Procurement (Preference to Make in India), Order 2017-Revision, dated 19th July, 2024 and subsequent order(s).

Ref: 1) Tender Enquiry No:

2) All other pertinent issues till date

We hereby certify that the items offered by (specify the name of the organization here) has a local content of _____ % and this meets the local content requirement for '**Class-I local supplier**' / '**Class II local supplier**' ** as defined in Public Procurement (Preference to Make in India), Order 2017Revision dated 19.07.2024 issued by DPIIT and subsequent order(s).

The details of the location(s) at which the local value addition is made are as follows:

1. _____ 2. _____

3. _____ 4. _____

...

Thanking you,
Yours faithfully,

(Signature, Date & Seal of Authorized Signatory of the Bidder)

** - Strike out whichever is not applicable.

Note:

1. Bidders to note that above format, duly filled & signed by authorized signatory, shall be submitted along with the techno-commercial offer.
2. In case the bidder's quoted value is in excess of Rs. 10 crores, the authorized signatory for this declaration shall necessarily be the statutory auditor or cost auditor of the company (in the case of companies) or a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies).
3. In the event of false declaration, actions as per the above order and as per BHEL Guidelines shall be initiated against the bidder.