

Ref. Enquiry No.: PE/PG/RTC/E-6451/2020

Dated: 03/06/2020

TENDER ENQUIRY THROUGH E-PROCUREMENT

DUE DATE
24/06/2020
BY 10:00 AM

SUBJECT: TENDER ENQUIRY FOR RATE CONTRACT OF SELF CLEANING STRAINERS AS PER TECHNICAL SPECIFICATION NO. PE-TS- RC4-165-N004 Rev 00

OUR REF: TENDER ENQUIRY NO: PE/PG/RTC/E-6451/2020, DTD-03/06/2020

Dear Sir/ Ma'am,

We are pleased to invite your offer for subject package in two parts strictly as per **"Instructions to Bidders"** mentioned at **page no. 1 to 15 of GCC Rev. 07**. Please upload your best quotation/ offer on <https://bhel.abcpocure.com> for the requirement strictly as per schedule of price format before above mentioned due date & time. The details of the tender enquiry are as mentioned below:

Sl. No	Description for which Rate Contract is desired	Tentative Quantity	Delivery required
1	<u>SELF CLEANING STRAINERS -</u> Refer Technical Specification no. PE-TS- RC4-165-N004 Rev 00 for detailed description.	As per BOQ cum price schedule in Annexure-I, IA & A cumulative for the Prospective Projects as per Annexure-III	Delivery Terms for Supply Portion: "Within Five (05) months from date of CAT-1 approval of Primary drawing/documents, subjected to drawing/document submission/re-submission schedule as stipulated, in case of any delay in submission/re-submission of Primary drawing/documents, then same shall be reduced from the given delivery period. Delay in BHEL's comments/approval beyond 18 days shall also be considered for delay analysis" Delivery Terms for Scope of Services: Vendor to depute its service engineer for respective site activity within 15 days from BHEL's intimation (for deputing service engineer) for such site activity. For delay in deputing service engineer, LD on site activities portion shall be applicable @ ½% of the total site activities portion contract value (excluding element of taxes) per week or part thereof, with applicable GST. However, total LD (supply + site activities) shall be limited to 10% of cumulative total contract value excluding taxes and freight (supply + site activities). Note: a. The end period specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule. b. The delivery conditions specified are for contractual LD purposes, however BHEL may ask for early deliveries without any compensation thereof. c. Non-applicable drawings shall be decided during execution of the package. d. Wherever schedule of drawings/documents submission / re-submission is stipulated in the Technical Specifications, same shall be superseded by delivery specified in NIT.

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(OFF) 0120-4213591, 9911170053

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Drawing Schedule:

BHEL Drawing No	Drawing Title	Primary/Secondary	Drg Sch for Vendors
PE-V4-XXX-165-N001	P&ID - OF SCS SYSTEM	Primary	R-0 within 21 days (for all except Installation plan, for Installation Plan 30 Days) from PO & subsequent revisions incorporating all the BHEL comments within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
PE-V4-XXX-165-N002	TECHNICAL DATA SHEET-SCS	Primary	
PE-V4-XXX-165-N003	INSTALLATION PLAN-SCS	Primary	
PE-V4-XXX-165-N004	GENERAL ARRANGEMENT OF SCS	Primary	
PE-V4-XXX-165-N006	C&I Part-I, PANEL-TDS, I/O LIST, CABLE SCH AND CONTROL PHILOSOPHY FOR SCS	Primary	
PE-V4-XXX-165-N008	QP-SCS	Primary	R-0 within 15 days from approval of TDS & subsequent revisions incorporating all the BHEL comments within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
PE-V4-XXX-165-N005	GA OF FLUSHING PUMP & FOUNDATION DETAILS OF FLUSHING PUMP AND SADDLE SUPPORT (If Applicable)	Primary	
PE-V4-XXX-165-N007	GA & WIRING DIAGRAM OF PANEL-SCS	Primary	R-0 within 15 days from approval of C&I Part-I document & subsequent revisions incorporating all the BHEL comments within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
PE-V4-XXX-165-N009	O&M MANUAL-SCS	Secondary	within 30 days of issuance of MDCC.

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Your best quotation/offer for the above requirement, in line with our terms and conditions, should be submitted online via e-procurement system. It shall be the responsibility of the bidder to ensure that the Tender is submitted on or before the due date by 10 a.m. Part-I bids shall be opened at 11 a.m. on the due date in the presence of authorized representatives of the bidders, who may like to be present.

Note: -

1. Please note that Part Supplies offered for tender BOQ shall disqualify the bidder's offer.
2. Documents and Credential as per Technical PQR, Techno Commercial Bids should be uploaded on the e-procurement portal.

Please refer GCC Rev-07, which is available on <https://www.bhelpem.com/Documents/GCC/GCCRev07.pdf>. You are requested to kindly download the same.

1. Rate contract, on firm price basis, is proposed for 2 years from placement of Rate Contract PO with a provision for further extension after review on mutual consent.
Rate contract is proposed to be done with 2 vendors in ratio of 70:30 value wise at L1 FOR site price for this package on same rates and terms & conditions. Splitting of RC among 2 vendors may be changed during project ordering process if any vendor in RC is not approved by customer (i.e. BHEL may place order on any of the vendor in RC up to total applicable RC value in case of non-availability of customer approval for other vendor in RC). However, order for a project shall not be split.
2. Price break-up of L1 vendor shall be counter offered for acceptance to all bidders who participated in Price Bid Opening/RA for 30% value and in case acceptance of counter offer received from more than one vendor then **acceptance shall be considered as per FINAL Price Bid Opening / Reverse Auction Ranking (as applicable)**. If none accepts L1 price break-up, RC shall be done with L1 vendor for 100% value
3. Being a Rate Contract, Quantity is divisible & hence in line with cl. no. 3 (b) of make in India Circular ref: No. P-45021/2/2017-PP (BE-II) dtd 28/05/18 issued by Ministry of Commerce and Industry, Govt. of India, If L 1 bid is not from a local supplier, 50% of the order quantity shall be awarded to L 1. Thereafter, the lowest bidder among the local suppliers, will be invited to match the L 1 price for the remaining 50% quantity subject to the local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such local supplier subject to matching the L 1 price. In case such lowest eligible local supplier fails to match the L 1 price or accepts less than the offered quantity, the next higher local supplier within the margin of purchase preference shall be invited to match the L 1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on local suppliers, then such balance quantity may also be ordered on the L 1 bidder.
In such case further counter-offering for 70:30 as mentioned at point no. 2 shall not be applicable. However, if L1 bid is from local supplier or local supplier is not in the range of margin of purchase preference then further counter-offering for 70:30 shall be applicable as mentioned at point no. 2.
4. As per make in India Circular ref: No. P-45021/2/2017-PP (BE-II) dtd 28/05/18, the Margin of Purchase Preference shall be 20%.
5. For Self Cleaning Strainers package, the Local content shall be 34%. Standard Performa for self-certification of local content by bidders enclosed with NIT & same shall be submitted along with your offer.

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6. Rate Contract is proposed to be finalized on total lump sum basis. However, there is % allocation weightage against BOQ quantity of each item which shall be used for arriving at price break up and same will also ensure that item rates of L1 bidder will be lowest for each items compared with other bidders' rate.
7. Bidders to note the following: -
- Evaluation is proposed on Ex Works + Freight basis.
 - Bidder to give single % of freight charges considering anywhere in India in the freight column. Bidders have to give same % of freight for each line item, also same % freight shall be applicable for Mandatory spares.
 - Bidders to mention applicable GST rate on (total Ex. works + freight) in the specified cells of price schedule. However, may please note that GST shall not be considered in evaluation.
 - Though evaluation is proposed on Ex Works + Freight, but there is % allocation weightage against BOQ quantity of each item which shall be used for arriving at price break up. Bidders need to give only their total ex works price for given BOQ at the specific cells that has been kept opened in the price schedule available in the e-procurement portal (Grand Total ex works price). Price mentioned anywhere else in BOQ or price uploaded anywhere else in the e-procurement portal shall not be taken in cognizance.
 - Rest of the prices shall be derived by BHEL in line with allocation fixed for each item. There is formula applied in price schedule form available in e-procurement portal. As soon as bidder fills the cells for Total Ex works, freight percentage and GST percentage, rest values for e.g. unit ex works – item wise, total ex works – item wise, FOR site price – item wise will filled automatically. Bidders can also validate and cross check the same by using Check Formula button.
 - For better clarity to the bidders where value is to be filled is kept open in price form at e-procurement portal and for other columns it will be locked which denotes shall be derived by BHEL as per allocation fixed against each item.
 - HSN Code furnished by Engineering has been mentioned in Price Schedule.
 - Incomplete offer shall be summarily rejected.
 - Pre-Qualifying Requirements (PQR): All the bidders (registered/ non-registered) will be asked to submit documents fulfilling PQR (technical & financial) requirements along with the bid & their further evaluation shall be done accordingly.
 - Bidders to note that their bid shall be conditional subject to qualify PQR (technical) by registered vendors & non-registered vendors have to qualify PQR (technical) & get registered with PEM for the package.
 - CIF is not applicable for the package.
 - Quantity variation for the package is +30%.

TERMS AND CONDITIONS:

- Procurement of the subject package shall be done through e-procurement.
- Enquiry No., due date etc. must be legibly super scribed on the offers as per "Instructions to Bidders" mentioned at page no. 1 to 15 of GCC Rev. 07.
- Offers should be uploaded in two parts online at <https://bhel.abcprocure.com> as follows:
 - Part-I Bid: - Documents and Credential as per Technical PQR and Techno-Commercial offer (along with un-priced copy of un-priced bid and un-priced schedule of Technical-Commercial Deviation).
 - Part II Bid: - Bidders need to give only their total ex works price for given BOQ at the specific cells that has been kept opened in the price schedule available in the e-procurement portal (Grand Total ex works price). Price mentioned anywhere else in BOQ or price uploaded anywhere else in the e-procurement portal shall not be taken in cognizance.

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4. Bidder to note that this is a conditional Tender enquiry and the price bid (Part-II) opening/RA participation shall be subject to following condition:
- a) Techno-commercial qualification/recommendation of bidder by the BHEL-PEM
5. Terms and conditions: -
- a) Part I bid will be opened on date & time mentioned in the NIT or subsequent corrigenda/amendments, if any.
- b) **Techno-commercial offer of only those bidders shall be evaluated who will meet the Technical pre-qualifying requirement of the tender.**
6. **Bidders shall submit their offers meeting the requirements of the following tender documents and other Terms and Conditions included in this Enquiry Letter:**
- **ANNEXURE-I of GCC Rev. 07:** Letter to be furnished by the Bidders.
 - **ANNEXURE-II: DEVIATION SHEET (COST OF WITHDRAWAL)** - To be furnished by the Bidders
- All the above Tender Documents shall automatically become a part of the Order/Contract after its finalisation.
7. Vendors shall quote in accordance with the requirements mentioned in the tender documents. In case of deviations (Technical/ Commercial), the same shall be highlighted separately giving Clause references along with the Cost of withdrawal of Deviations as per **Annexure-II to GCC Rev 07 of "DEVIATION SHEET (COST OF WITHDRAWAL)"** along with reasons for taking such deviations
- Bidder to note all the points mentioned in "Notes" of Annexure-II to GCC Rev 07.**
8. **Please note the following:**
- a. **Price format is enclosed for compliance.**
- b. **SCC enclosed for compliance.**
- c. **GCC Rev-07 enclosed for compliance.**
- d. **GCC Rev-07 is available on <https://www.bhelpem.com/Documents/GCC/GCCRev07.pdf>. You are requested to kindly download the same.**
9. Tenders shall be submitted strictly in accordance with the requirements of the above tender documents.
10. Standard pre-printed terms & conditions of the tenderers shall not be considered valid.
11. Validity of offer shall be as per **Clause No. 7.0, "Instructions to Bidders" of GCC Rev 07.**
12. Unsolicited fresh/revised Price Bids shall not be entertained.
13. Purchaser shall be under no obligation to accept the lowest or any other tender and shall be entitled to accept or reject any/all tender(s) in part or full without assigning any reason whatsoever.
14. Late tenders will be rejected.
15. Tenders and all correspondence thereof, shall be addressed to the undersigned by name & designation and sent at the following address:

Mr. I P SINGH, DGM/CMM
M/s Bharat Heavy Electricals Ltd.,
Project Engineering Management,
Power Project Engineering Institute,
HRD & ESI Complex,
Plot No 25, Sector-16 A, Noida-201301
Kind Attn: I P SINGH/ CMM

Mr. N C SHARMA, DY MGR/CMM
M/s Bharat Heavy Electricals Ltd.,
Project Engineering Management,
Power Project Engineering Institute,
HRD & ESI Complex,
Plot No 25, Sector-16 A, Noida-201301
Kind Attn: N C SHARMA/ CMM

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E-MAIL: indra.pal.singh@bhel.in
Ph. No. 0120-4368749 ,9818989654

E-MAIL: ncsharma@bhel.in
Ph. No. 0120-4213591 ,9911170053

16. **PRE-QUALIFICATION REQUIREMENT:** - Bidders to note that their bid shall be conditional subject to qualify PQR by registered vendors & non-registered vendors have to qualify PQR & get registered with PEM for the package. **For registration in PEM** "Bidders needs to apply & get registered for subject package with PEM before P-2 (price bid opening) & hence you need to apply online for registration on PEM web portal & have to enclose acknowledgement with the bid documents else their bid may not be considered for evaluation" Procurement 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.
17. Bidder has to submit "NO DEVIATION CERTIFICATE FOR COMMERCIAL TERMS AND CONDITIONS AS PER GCC (07), SCC AND NIT". In case of deviations, bidder to clearly mention the same with their techno-commercial offer.
18. All the above Tender Documents shall automatically become a part of the Order/Contract after its finalization.
19. All corrigenda, addenda, amendments, time extensions, clarifications etc. to the tender will be hosted on BHEL websites only (www.bhelpem.com, www.bhel.com & <https://bhel.abcprocure.com> under subject tender reference. Bidders are requested to visit our websites from time to time to keep themselves updated. **Bidders may go through the Sellers' manual & Help documents provided on E-Procurement Portal website & obtain required Digital Signature Certificate (Class-III) for participating in the subject Tender.**
20. Inspection shall be done by BHEL/ END CUSTOMER/Third party Agency (finalized by BHEL).
21. Delivery terms for dispatches shall be FOR Dispatch Station.
22. This enquiry is subject to Conditions/ limits if any imposed in PMD / Vendor registration.
23. Non- registered bidder to submit the credentials required for Registration in BHEL PEM: -
"Online Registration Portal is operational in BHEL. Non-registered Vendors, who wish to apply for registration with BHEL-PEM, have to apply through Online Registration Portal available at <https://supplier.bhel.in/>. All credentials and/or documents duly signed and stamped related to registration has to be uploaded on the website and submit the application for registration. One set of hard copy of the filled-up SRF downloaded from Online Registration Portal duly signed and stamped has to be submitted."
24. Purchaser reserves the right to split up the scope of the tender enquiry and place the orders for different scope/ items with different bidders and also increase or decrease the quantity.
25. BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial

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evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

Link for Detailed guidelines of reverse auction 2016 to be followed as:

http://www.bhel.com/vender_registration/pdf/Guidelines%20for%20Reverse%20Auction-2016.pdf

IMPORTANT INSTRUCTION TO BIDDERS IN CASE OF REVERSE AUCTION

“The Bidders have to quote the Single Price (i.e. Total Ex-works + Freight) (excl. GST) in Reverse Auction. Price are to be inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope, Freight as applicable, including loading (if any). De-loading (if any) shall be done in line with NIT terms”.

26. If any bidder has mentioned the term Not Applicable / Not required / Not Quoted in BHEL price format. The bidder needs to substantiate the same. If the same item will be required in future for the system same will be supplied free of cost.
27. L1 bidder will have to submit Bank Guarantee for each POs (irrespective of value) which will be placed under the Rate Contract finalised through this tender considering RC as original contract as per format mentioned in Annexure-III of GCC Rev 07
28. All other terms and conditions shall be as per GCC Rev 07 and Special Conditions of Rate Contract as per attached Annexure-II.

Thanking you,
Yours faithfully,
For and on behalf of BHEL

Digitally signed by NARESH
CHANDRA SHARMA
Date: 2020.06.03 12:48:00
+05'30'

N C Sharma/Dy. Manager
(Name & Signature of official)

Enclosure:

1. Enquiry Terms & Conditions
2. Price Format– Annexure I, IA & A
3. RC-SCC – ANNEXURE II
4. Prospective Project List – Annexure III
5. Technical PQR-Annexure-IV
6. Technical Specifications

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RATE CONTRACT - NIT REF NO-PE/PG/RTC/E-6451/2020, DTD-03/06/2020

PRICE SCHEDULE FOR SELF CLEANING STRAINERS (RC-04)

NAME OF VENDOR-

SL NO	ITEM DESCRIPTION	UOM	ORDERED QUANTITY	HSN CODE	UNIT EX-WORKS PRICE (DULY PACKED) IN PERCENTAGE OF TOTAL EX WORKS PRICE OF SELF CLEANING STRAINERS GIVEN AT SL NO-A.7 OF COUNM 8	UNIT EX-WORKS PRICE (DULY PACKED) (INR)	TOTAL EX-WORKS PRICE (DULY PACKED) IN PERCENTAGE OF TOTAL EX WORKS PRICE OF SELF CLEANING STRAINERS GIVEN AT SL NO-A.7 OF COUNM 8	TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	FREIGHT CHARGES WITHOUT GST @ % OF TOTAL EX WORKS (INR)	APPLICABLE GST RATE % ON (TOTAL EX WORKS + FREIGHT) (INR)	TOTAL F.O.R SITE PRICE (INR)
1	2	3		4	5	6	7	8	9	10	11
A	SELF CLEANING STRAINERS- MAIN SUPPLY										
A.1	TYPE I	NOS.	4	8421	5.78684	Derived	23.14738	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A.2	TYPE II	NOS.	2	8421	5.70358	Derived	11.40716	Derived			Derived
A.3	TYPE III	NOS.	2	8421	5.16236	Derived	10.32473	Derived			Derived
A.4	TYPE IV	NOS.	2	8421	6.11990	Derived	12.23980	Derived			Derived
A.5	TYPE V	NOS.	6	8421	5.28726	Derived	31.72356	Derived			Derived
A.6	TYPE VI	NOS.	2	8421	5.57868	Derived	11.15737	Derived			Derived
A.7	TOTAL (A.1 TO A.6)						100.00	TO BE QUOTED = Rs X	Derived	Derived	Derived
B	MANDATORY SPARES			Refer Annexure-IA & A for BOQ & % weightage type wise (Total ex-works value of mandatory spares component is 26.27 % of "X" at sl. No. A.7 col. 8)							
C	CHARGES OF SITE ACTIVITIES (INSTALLATION CHECK, COMMISSIONING AND PG TESTING) As per technical specification/NIT): Site visit charges (no. of visits)			Refer Annexure-IA for BOQ & % weightage Type wise (Total ex-works value of services at site component is 2.10% of "X" at sl. No. A.7 col. 8)							

D	CHARGES OF SITE ACTIVITIES (INSTALLATION CHECK, COMMISSIONING AND PG TESTING) As per technical specification/NIT):- Manday Charges, (no. of mandays)	Refer Annexure-IA for BOQ & % weightage type wise (ex-works value of services at site (optional) component is 2.40% of "X" at sl. No. A.7 col. 8)							
E	GRAND TOTAL (A.7+B+C+D)								Derived = Rs Y
Note:-									
1. Bidder to note that evaluation shall be on Total Ex works price + Freight charges, however, Bidder to quote total Ex works value of the SELF CLEANING STRAINERS mentioned at A.1 to A.6 (Rs X) only as per the BOQ above. The item wise break up of Ex works prices (unit as well as total) for all the items in the BOQ shall be derived as per the % weightage indicated above by BHEL. Indigenous bidder also need to indicate taxes percentage in the respective column and freight percentage of Ex works value considering delivery anywhere in India in the freight column.									
2. % Freight as quoted for Main Supply items, same shall also be considered for mandatory spares items.									
3. Value is to be filled only where “to be quoted” is mentioned and for other columns where “derived” is mentioned same shall be derived by BHEL as per % allocation fixed against each item									
4. Prices shall remain firm during contract execution.									

SUGGESTIVE PRICE SCHEDULE:- RATE CONTRACT OF SELF CLEANING STRAINERS (SCS): RATE CONTRACT - NIT REF NO-PE/PG/RTC/E-6451/2020, DTD-03/06/2020																			
BREAK UP FOR SUPPLY, SERVICES AND MANDATORY SPARES																ANNEXURE-1A			
SL No.	ITEM DESCRIPTION			UOM -DESCRIPTION	UOM	TYPE-1		TYPE-2		TYPE-3		TYPE-4		TYPE-5		TYPE-6			
						QTY.	PRICE	QTY.	PRICE	QTY.	PRICE	QTY.	PRICE	QTY.	PRICE	QTY.	PRICE		
1		2			3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1.0	MAIN SUPPLY	1.1	Unit Ex-Works Price (for 1 Set of SCS)			Rs.		Derived		Derived		Derived		Derived		Derived		Derived	
		1.2	Quantity (Total Sets of SCS)			Numbers=Nos.	Nos.	4		2		2		2		6		2	
		1.3	Total Ex-Work Price (as per SI. No 1.1 x 1.2)			Rs.		Derived		Derived		Derived		Derived		Derived		Derived	
		Percentage wise (%) Breakup w.r.t. to Total Ex- works Cost of SCS			PERCENT=%	%		23.15		11.41		10.32		12.24		31.72		11.16	
		Total Ex- works Cost of SCS				RS.	To be Quoted												
					PERCENT=%	%	100												
2.0	SERVICES AT SITE	CHARGES OF SITE ACTIVITIES (INSTALLATION CHECK, COMMISSIONING AND PG TESTING) As per technical specification/NIT)																	
		a)	Site visit charges			Nos of visits	Nos.	4	Derived	2	Derived	2	Derived	2	Derived	6	Derived	2	Derived
		2.1	Percentage wise (%) Breakup wrt to Unit Ex- works Cost of SCS			PERCENT	%		8.06		4.09		4.52		3.81		13.23		4.18
		b)	Manday Charges			No. of Man Days	Nos.	16	Derived	8	Derived	8	Derived	8	Derived	24	Derived	8	Derived
		2.2	Percentage wise (%) Breakup wrt to Unit Ex- works Cost of SCS			PERCENT	%		9.21		4.67		5.16		4.35		15.12		4.78
3.0	MANDATORY SPARES	Percentage wise (%) Breakup wrt Unit Ex- Works Cost of that perticular type of SCS			PERCENT=% (wrt S.No. 1.1)	%	99.28		51.82		57.26		46.94		167.72		51.49		
						Rs.	Derived		Derived		Derived		Derived		Derived		Derived		
NOTES :																			
1	SITE VISIT CHARGES NOTED AT 2.A STNADS FOR TRAVEL TO AND FRO CHARGES, INSURANCE CHARGES ETC. MANDAYS CHARGES NOTED AT 2.B INCLUDES PROFESSIONAL/WORKING CHARGES INCLUDING STAYAT SITE.																		
2	COST OF SITE VISITS AND MANDAYS AS PER 2.0 ABOVE SHALL BE DERIVED BASED ON THE % WEIGHTAGE GIVEN. FURTHER,ADDITIONAL SERVICES AT SITE (IF REQUIRED) ,CHARGES SHALL BE ALSO BE OBTAINED ON PRORATA BASIS AS 2.0 ABOVE.																		
3	SITE CERTIFICATION SHALL BE REQUIRED IN CALCULATION OF "COST OF SERVICE AT SITE" MENTIONED WHETHER EXTRA STAY/ LESS STAY.																		
4	IN CASE OF NON-COMPLETION OF INSTALLATION CHECK, COMMISSIONING AND PG TESTING IN SITE VISITS STIPULATED AT NOTE NO. 1 ABOVE, FOR ANY REASONS NOT ATTRIBUTABLE TO VENDOR (TO BE CERTIFIED BY BHEL SITE), VENDOR SHALL COMPLETE ABOVE ACTIVITIES IN SUBSEQUENT SITE VISITS FOR WHICH COST SHALL BE BORNE BY BHEL ON PRO-RATA BASIS ON PRICE OF SITE VISIT DERIVED AS ABOVE.																		
5	PRICES OF ALL ACCESSORIES , COMMISSIONING & ERECTION SPARES , SPECIAL TOOLS & TACKLES AND OTHER ACCESSORIES NOT LISTED ABOVE SHALL BE INCLUDED IN THE PRICE OF SCS & SHALL BE SUPPLIED WITH THE SCS.																		
6	VALUE IS TO BE FILLED ONLY WHERE "TO BE QUOTED" IS MENTIONED AND FOR OTHER COLUMNS WHERE "DERIVED" IS MENTIONED SAME SHALL BE DERIVED BY BHEL AS PER % ALLOCATION FIXED. SPARES & SERVICES PRICES SHALL ALSO BE DERIVED BY BHEL AS PER % ALLOCATION SPECIFIED.																		
7	PLEASE REFER TECHNICAL SPECIFICATION PE-TS-RC4165-N004 FOR DETAILS.																		
8	BOQ MENTIONED IN THE SPARE LIST (ANNEXURE- A) IS TENTATVE AND MAY VARY DURING THE PROJECT EXECUTION..																		

MANDATORY SPARES - SCS, RC-4 : % Break up of Each Item cost w.r.t. Unit Ex-Works cost of that particular type: NIT REF NO-PE/PG/RTC/E-6451/2020, DTD-03/06/2020														ANNEX-A	
	1	2	3	4		5		6		7		8		9	
SL.NO.	DESCRIPTION OF EQUIPMENT / ITEM Spares to be supplied under this specification.	DESCRIPTION OF UNIT OF MEASUREMENT	UOM	TYPE-1	% Cost w.r.t unit Ex-works cost	TYPE-2	% Cost w.r.t unit Ex-works cost	TYPE-3	% Cost w.r.t unit Ex-works cost	TYPE-4	% Cost w.r.t unit Ex-works cost	TYPE-5	% Cost w.r.t unit Ex-works cost	TYPE-6	% Cost w.r.t unit Ex-works cost
A.	FOR TYPE-2, TYPE-3, TYPE-5:														
1	MEASURING INSTRUMENTS:														
	Transmitters of all types and model no. (for measurement of pressure, differential pressure, flow, level, temp, etc.). This shall include magnetic/electromagnetic flow meter, mass flow meter also.	10% or 1 no. of each type and model, whichever is more.	1 LOT			1	18.25%	1	20.16%			3	59.06%		
	Local Gauges for Pressure, Differential pressure, flow, level, temp	5% or 1 no. of each type, model and range, whichever is more.	1 LOT			1	1.46%	1	1.61%			3	4.72%		
2	OTHER RELATED CONTROL AND INSTRUMENTATION SYSTEMS / EQUIPMENTS:														
	Electronic card assembly/ PCBs, Moisture/ condensate monitor, power supply modules	10% of each type, model and rating	1 LOT			1	2.92%	1	3.23%			3	9.45%		
3	PROCESS CONNECTION PIPING (For Impulse Piping /Tubing and Air Supply Piping as Applicable):														
	1. Valves of all types and models	10% or 1 no. of each type, class, size and model whichever is more.	1 LOT			1	1.46%	1	1.61%			3	4.72%		
	2. 2 way, 3way, 5way valve manifolds	10% or 1 no. of each type, class, size and model whichever is more.	1 LOT			1	1.46%	1	1.61%			3	4.72%		
	3. Fittings	10% or 1 packet of each type, class, size and model whichever is more.	1 LOT			1	0.73%	1	0.81%			3	2.36%		
	4. Purge meters	5% of each model or 1 no. whichever is more.	1 LOT			1	0.73%	1	0.81%			3	2.36%		
	5. Filter regulators	20% of each model or 2 nos. whichever is more.	1 LOT			1	0.73%	1	0.81%			3	2.36%		
4	ELECTRICAL ACTUATORS:														
	Actuators	1 no of each type and rating	1 LOT			1	20.44%	1	22.58%			3	66.14%		
	Electronic PCB of all types	10% of each type & model	1 LOT			1	0.73%	1	0.81%			3	2.36%		
	Absolute Encoder (replaceable part)	5% of each type & model	1 LOT			1	1.46%	1	1.61%			3	4.72%		
	Electronic Torque sensor	5% of each type & model	1 LOT			1	1.46%	1	1.61%			3	4.72%		
B	FOR TYPE-1, TYPE-4, TYPE-6:														
1	MEASURING INSTRUMENTS:														
	All types of local indicators	1 no. of each make, model and type	1 LOT	2	2.88%					1	1.36%			1	1.49%
	All type of Electronic Transmitters and Ultrasonic Transmitters including sensors.	10% or 1 no. of each type and model whichever is more.	1 LOT	2	35.97%					1	17.01%			1	18.66%
2	PROCESS CONNECTION PIPING (For Impulse Piping / Tubing and Air Supply Piping as Applicable):														
	Valves	1 no. of each type, class, size and model.	1 LOT	2	2.88%					1	1.36%			1	1.49%
	2 way, 3 way, 5 way valve manifolds	1 no. of each type, class, size and model.	1 LOT	2	2.88%					1	1.36%			1	1.49%

	Fittings	5% or 1 no. of each type, class, size and model whichever is more.	1 LOT	2	1.44%					1	0.68%			1	0.75%
3	ELECTRIC ACTUATORS:														
	Actuators	1 no of each type and rating	1 LOT	2	40.29%					1	19.05%			1	20.90%
	Electronic PCB of all types	10% of each type & model	1 LOT	2	1.44%					1	0.68%			1	0.75%
	Absolute Encoder (replaceable part)	5% of each type & model	1 LOT	2	2.88%					1	1.36%			1	1.49%
	Electronic Torque sensor	5% of each type & model	1 LOT	2	2.88%					1	1.36%			1	1.49%
4	OTHER RELATED CONTROL AND INSTRUMENTATION SYSTEMS / EQUIPMENTS:														
	Electronic cards & Power Supply cards	10% or 2 nos. whichever is more.	1 LOT	2	5.76%					1	2.72%			1	2.99%

NOTES:

- Wherever set is mentioned, one set of the spares of that item shall be for complete replacement of that particular item for one equipment.
- Any fraction of a item shall mean the next higher.
- Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%) of the total population of the plant. In case, the quantity so calculated happens to be fraction, the same shall be rounded off to next higher whole number.
- Wherever the quantities have been indicated for each type, size, thickness, material, radius, range, etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid.
- In case, spares indicated in the list are not applicable to the particular design offered by the bidder, the bidders should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.



BHEL / PEM / CMM
SPECIAL CONDITIONS OF RATE CONTRACT

ANNEXURE- II TO NIT REF NO-PE/PG/RTC/E-6451/2020, DTD-03/06/2020: SPECIAL CONDITION OF RATE CONTRACT FOR SELF CLEANING STRAINERS

1. BHEL/PEM intends to enter into Rate Contract for supply of the tendered items for a period of two years. The Rate Contract shall come into force from the date of issue of Purchase order for Rate Contract. Validity for ordering shall be two years from the purchase order for Rate Contract.
2. Details of consignee and project site information for dispatch of material shall be intimated at the time of placement of PO for specific project after finalization of RC.
3. Transit Insurance is in BHEL scope.
4. The items will be required against respective projects. Exact quantities and Project information shall be intimated while placing order for a specific project based on the Rate Contract.
5. The prices shall remain firm (except for those items in which PVC is applicable as per NIT) during the period of two years with a provision for further extension after review on mutual consent.
6. Inspection of materials shall be carried out by BHEL/CQA and or by Customer or by an authorized agency at manufacture's works before dispatch, if required. Dispatch of material to be done, only after receipt of BHEL/Customer MDCC. It is responsibility of vendor to for obtain Material Dispatch Clearance Certificate (MDCC) from BHEL or Customer as required before dispatch of material.

Vendor shall give inspection call on BHEL-CQS web site to applicable inspection agency with a copy of inspection call to BHEL-PEM for arranging Customer participation (if applicable) in inspection / Joint inspection on the proposed date with an advance notice of 15 working days. Inspection charges shall be paid by BHEL-PEM.

Items have to be manufactured as per specification and supplied strictly in accordance with the approved BHEL / Customer's Drawings & Quality Plan. The items/ test certificate of items, which for any reason are not acceptable to BHEL / Customer, shall be required to be retested. No extra charge shall be payable on those account by BHEL.

7. Mode of dispatch shall be by road through Schedule Bank/BHEL (PEM) approved transporters.
8. Other terms and conditions shall be as per Standard Technical specification no, GCC Rev 07 & Enquiry letter.
9. This enquiry is subject to Conditions/ limits if any imposed in PMD/ Vendor registration.
10. Tentative quantity is given in enquiry.
11. Bidders to submit offer for RC of said items ONLINE via e-Procurement System only. Bidder to upload tender documents complete in all respects duly signed & stamped on each and every page by the authorized signatory of the bidder as a token of acceptance of all the terms and conditions of tender.
12. The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendor/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL web site <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud as soon as it comes to their notice.

**ANNEX-III TO NIT REF NO-PE/PG/RTC/E-6451/2020,
DTD-03/06/2020:
TENTATIVE PROJECT LIST**

SL NO.	TENTATIVE PROJECT LIST
1	Ramagundam (3X200 MW+3X500 MW)
2	Nabinagar (3X660 MW)
3	Bhilai (2X250 MW)
4	Korba (3X200 Mw+4x500 MW)
5	BRBCL Nabinagar (4X250 MW)
6	North Karanpura (800 MW)
7	Mouda (500 MW)
8	Barh-2 (660 MW)
9	Barh-1 (660 MW)

Note-

Project list is indicative only, BHEL may ask for delivery anywhere in India for any of the project added in the prospective project/ existing projects during RC period.

	PRE-QUALIFYING REQUIREMENTS(TECHNICAL)SELF CLEANING STRIANER (SCS).	TECHNICAL SPECIFICATION NO: PE-TS-RC4-165-N004 TECHNICAL PQR NO: REV NO.-00 DATE: 19.05.2020
		STANDARD PQR NO: PE-PQ-STD-165-N004 REVISION NO: 03 DATE: 12.03.2020
		SHEET: 1 of 3
		FORM NO. PEM 6100-0
PROJECT: Rate Contract of SCS		
PACKAGE: SELF CLEANING STRAINER (SCS)		
1. The bidder should have designed, manufactured, tested, inspected & supplied the SCS with minimum flow of 300 Cum/hr, which have been successfully in use for at least 1 year in thermal power plant or similar industry/ application and bidder is in business of SCS on continuous basis. 2. The Bidders shall furnish following support documents for assessment of Bidder w.r.t. PQR as indicated at Sl. No. 1 above: A. Bidder's Experience list of SCS for last 5 years (as on the enquiry/NIT date) for assessment of bidder for supplying the SCS on regular basis for establishing business continuity in enclosed format- Annexure-1. Bidder shall furnish the PO copy of at least one executed Contract as indicated in the experience list. B. Bidder shall furnish any one from below in support of successful performance of SCS for one year: i. Satisfactory Performance feedback certificates from End Customer (Owner) (in English) for at least one successfully executed contract which has been in use for atleastone year indicating salient features like year of commissioning of SCS, rating of project, Size of SCS, project name etc., date of issue of certificate and name/ designation of the certificate issuer for power plant/similar application industry. The reference SCS should have been in successful operation for at least one (1) year prior to the date of subject enquiry/NIT. OR ii. The bidder has been awarded One repeat contract for SCS from End Customer (Owner) / Purchaser (in English) for power plant/similar application industry. Repeat contract shall be considered when the second contract is given by the same purchaser/ owner after lapse of minimum 1 year from execution (viz. commissioning) of first contract. Supporting documents for execution of the first contract like commissioning report or PG test report along with the PO Copy to be furnished, if bidder intends to submit the documents for Repeat Contracts. The date of repeat contract order should not be later than the date of subject enquiry/NIT.		



**PRE-QUALIFYING
REQUIREMENTS(TECHNICAL)SELF
CLEANING STRIANER (SCS).**

TECHNICAL SPECIFICATION NO: PE-TS-RC4-165-N004

TECHNICAL PQR NO: REV NO.-00
DATE: 19.05.2020

STANDARD PQR NO: PE-PQ-STD-165-N004

REVISION NO: 03 DATE: 12.03.2020

SHEET: 2 of 3

Notes:-1.Purchase order copy, supporting drgs/technical data sheets etc. are to be submitted along with the bid for which the bidder intends to furnish the performance feedbacks / repeat contracts for reference purpose only.

Any additional document required in support of above documents to establish the co-relation between the above documents and the supplied item shall be provided by the bidder.

2. Offers of the JV companies/ Joint Bidders/ bidders having collaboration/ licensing agreement/ MOU/ Indian subsidiaries shall be evaluated as follows:

- a. If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.
- b. If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.
- c. If bidder happens to bid jointly with their partner, then credentials of both the partners will be considered for meeting PQR as per distribution of the work. In all such cases, lead bidder as specified in bid documents shall be responsible for overall execution of the contract and all guarantee/ warranty.
- d. If bidder happens to be the having valid collaboration agreement/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

Note: If bidder(s) qualifies on the basis of credentials of his principal/ JV partner/ Collaborator/ joint bidder/licensing Company etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder/ licensing Company shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. and warranty/ guarantee shall be submitted along with the offer.

3. Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/ licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of the project.

4. Purchase order for spare items shall not be considered as repeat order qualifying criteria.

5. Consideration of offer shall be subject to customer's approval of bidders, if applicable.

6. Bidder to submit all supporting documents in English, If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.

7. Vendor may also qualify based on the credential of principal meeting package specific qualifying requirements having technical valid collaboration/licensing agreement/MOU/Indian subsidiaries.

8. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.



**PRE-QUALIFYING
REQUIREMENTS(TECHNICAL)SELF
CLEANING STRIANER (SCS).**

TECHNICAL SPECIFICATION NO: PE-TS-RC4-
165-N004

TECHNICAL PQR NO: REV NO.-00
DATE: 19.05.2020

STANDARD PQR NO: PE-PQ-STD-165-N004
REVISION NO: 03 DATE: 12.03.2020

SHEET: 3 of 3

9. After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

Annexure – 1									
<u>EXPERIENCE LIST</u>									
EQUIPMENT/PACAKAGES : SELF CLEANING STRAINER									
Vendor :									
SL. NO.	PROJECT	CUSTOMER/ CONSULTANTS	YEAR OF SUPPLY	SIZE (MM)	CAPACITY (Cub. M/ Hr)	QTY	MATERIAL OF CONSTRUCTION (HOUSING/STRAINER ELEMENT)	QUALITY OF WATER HANDLED	Performance feedback certificate from end user (enclosed/not enclosed)



On Letter head of Company

Ref.....

Date.....

To,

Bharat Heavy Electricals Limited

PEM, PPEI Building, Plot No 25,

Sector -16A, Noida (U.P)-201301

Subject: - Certification regarding local content

Reference: Tender Enquiry No-.....

Name of Package:

Dear Sir,

We hereby certify that items offered by us of(package name).....for.....(Project Name/Rate contract)..... has local content of -----% and meets the requirement of minimum local content in line with Cl. No.....of NIT No.....dated.....and the Public Procurement (Preference to Make in India), Order 2017 dated-15.06.2017, 28.05.2018 & 29.05.2019.

We further confirms that details of location at which the local value addition is made will be our registered works at(address of the works)

Yours very truly

..... (authorized signatory of company)

..... (firm name)

authorized signatory
of company

**TECHNICAL SPECIFICATION
FOR
RATE CONTRACT OF
SELF CLEANING STRAINERS (SCS)**

Specification No.: PE-TS- RC4-165-N004 Rev 00



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BLDG., SEC-16A, PLOT NO. 25
NOIDA – 201301 (UP)**



TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**

SECTION:

SUB-SECTION:

REV. NO. 0 DATE 25/02/2020

SHEET 1 OF 1

INDEX

THIS TECHNICAL SPECIFICATION CONSISTS OF FOLLOWING SECTIONS:

CONTENTS

SECTION	TITLE
I	Specific Technical Requirements
IA	Specific Technical Requirements (Mechanical)
IB	Specific Technical Requirements (Elec.)
IC	Specific Technical Requirements (C&I)
ID	Data Sheet – A
II	Standard Technical Specifications
IIA	Standard Technical Specifications (Mechanical)
IIB	Standard Technical Specifications (Elec.)
IIC	Standard Technical Specifications (C&I.)
III	Documents to be submitted by Bidder
IIIA	Guarantee Schedule (To be submitted along with the Bid by all Bidders)
IIIB	Compliance Certificate (To be submitted along with the Bid by all Bidders)
IIIC	Data Sheet – B (To be submitted by successful Bidder after award of Contract)

Notes:

1. In case there is conflict in different clauses of specification, most stringent clause (as decided by BHEL / end customer) shall be followed, if no specific deviation is taken by bidder and accepted by BHEL during tender stage in that regard.
2. For detailed list of documents to be submitted by bidder in their technical offer, please refer cl. no. 13 of Section-IA.
3. For detailed list of documents to be submitted by vendor after award of contract, please refer Datasheet-C of Section-IIA.



TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**

SECTION: I

SUB-SECTION:

REV. NO. 0 DATE 25/02/2020

SHEET 1 OF 1

SECTION - I

SPECIFIC TECHNICAL REQUIREMENTS

- SUB-SECTION IA** - Specific Technical Requirements (Mech.)
- SUB-SECTION IB** - Specific Technical Requirements (Electrical)
- SUB-SECTION IC** - Specific Technical Requirements (C & I)
- SUB-SECTION ID** – Datasheet-A



TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**

SECTION: **I**

SUB-SECTION: **IA**

REV. NO. **0** DATE **25/02/2020**

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SUB-SECTION – IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)



TITLE:
TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CLEANING STRAINER

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: PE-TS-RC4-165-N004
SECTION: I
SUB-SECTION: IA
REV. NO. 0 **DATE 25/02/2020**
SHEET 1 OF 7

1.0 GENERAL

1.1 This specification is intended for finalization of rate contract between BHEL PEM and Bidder. Standard technical detail as indicated in the specification shall be agreed upon between BHEL PEM and Bidder. Project specific technical detail shall be made available to the bidder along with project enquiry.

1.2 This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing for delivery installation checks, commissioning, Trail run and PG test for Self-Cleaning Strainer with mandatory spares complete with all accessories as per the requirements specified in this specification.

The Self Cleaning Strainer (SCS) complete with all accessories shall conform to the standard technical specifications (Section-II) and Data Sheet-A enclosed herewith. In addition, the requirements of this section I including customer specification attached (as applicable) shall also be complied with. However, wherever the details given in Section-II and Data Sheet-A are different, the requirements of Data Sheet-A shall prevail. Similarly, in the event of contradictions between Section-I/ customer specification (Annexure-IV) / Section-II/ Data Sheet-A, the same shall prevail in the order as: customer specification, Section-I, Datasheet-A, Section-II.

Section I consists of 4 Sub-Sections viz. Sub-Sec. IA, IB and IC for Mechanical, Electrical and C&I respectively and Sub-Section ID for Datasheet-A, the requirements of all 4 subsections shall be complied with.

NOTE: -

1. The specification is made with the intent of entering Rate Contract for the Supply, Commissioning, Trail run and PG test of Self Cleaning Strainer for various projects time to time.

2. Type of SCS have been detailed in Data Sheet-A, Section-1D. The bidder shall include complete supplies in his scope. Part supplies offered shall disqualify the bidder's offer. Evaluation shall be combined and further details shall be indicated in NIT.

List of Self Cleaning Strainer (SCS) for various water Application:

a) For CW Blow down water Application:

- | | | |
|-------------|--------------------------------|--|
| i) TYPE-1 | Flow= 600 CUM/HR, SIZE= 300 NB | vi) TYPE-6: Flow=450 Cum/hr, Size=250 NB |
| ii) TYPE-2 | Flow= 475 CUM/HR, SIZE= 300 NB | |
| iii) TYPE-3 | Flow= 150 CUM/HR, SIZE= 150 NB | |
| iv) TYPE-4 | Flow= 650 CUM/HR, SIZE= 350 NB | |
| v) TYPE-5 | Flow= 280 CUM/HR, SIZE= 200 NB | |

Bidder to note that flow of SCS for various sizes may vary during detail engineering up to (+) 5%. Same shall be informed during project specific order. However maximum possible design parameters are indicated in the respective datasheet of each type in Section- ID of this specification. No commercial implication shall be applicable for the same.

1.3 The omission/ addition of specific reference to any component / accessory necessary for the proper performance of the equipment's shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

1.4 The bids shall be evaluated as per NIT. Ordering shall be done separately for each project.



TITLE:
TECHNICAL SPECIFICATION FOR RATE
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SELF CLEANING STRAINER
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SHEET 2 OF 7

1.5 Bidder to quote for items as per price schedule attached in NIT. The quantity as mentioned in the BOQ is only for evaluation purpose. However actual ordered quantity may vary from project to project throughout the year.

2.0 DESCRIPTION OF EQUIPMENTS:

SELF CLEANING STRAINER (SCS).

The Self Cleaning Strainer (SCS) is intended to prevent accumulation of debris in ACW Pipeline. The water through the self cleaning strainers outlet shall be supplied to the Secondary side of Plate Heat Exchangers. The water analysis is indicated with Datasheet-A.

3.0 SCOPE OF SUPPLY UNDER THE SPECIFICATION IN THE BIDDER'S SCOPE FOR SELF CLEANING STRAINER (SCS).

3.1 The details of SCS with quantities, design parameters, size and MOC's as per Data Sheet-A.

3.2 SCOPE OF SUPPLY IN THE BIDDER'S SCOPE FOR SELF CLEANING STRAINER:

3.2.1 Each set of SCS shall comprise as following:

- a) Flushing pump with drive Motor (if required) - 1 No.
- b) **For CW Blow down water:** - Supply of complete interconnecting pipe (as applicable) and debris disposal pipe work including flanges/counter flanges, bends, fittings, supports, gaskets, fasteners etc. shall be in scope of Bidder. However, bidder is to consider debris disposal pipe length and no. of bends as per the list of BOQ mentioned in Data-Sheet A to this Section. In case actual piping comes out to be less than the BOQ of Data Sheet-A, still bidder has to supply the same as minimum requirement. Bidder shall finalize the pipework to suit the layout at contract stage in such a way that minimum site welding is required for pipework by purchaser at site.
- c) Filter body/ housing Vent and drain connections along with their isolating valves.
- d) Length of Self Cleaning Strainer, complete with bolts, nuts and gaskets shall be as per Data Sheet-A. Thickness of body flange shall be as per BS 4504/ equivalent standard.
- e) Differential pressure measuring system for Self-Cleaning Strainer. DP measuring system shall comprise of 2 Nos. DPT + 1 No. DPG for each SCS and shall be with Remote seal arrangement. Stubs for DPT and DPG shall be independent.
- f) The Electrical & C&I items/ accessories as specified in succeeding clause/respective sections herein.
- g) Starter Panel (Switch Gear Panel) shall be as follows:

2 Sets of Self Cleaning Strainer shall have one Common Starter Panel (Switch Gear Panel) for DCS based control system. Switch Gear Panel should have suitable arrangement like Bus Coupler for providing redundancy to incoming supply feeder (1Working + 1 Standby feeder).



TITLE:
TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CLEANING STRAINER
SPECIFIC TECHNICAL REQUIREMENTS

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- h) Power and Control cables between Starter Panel and various drives in bidder's scope of supply. Refer note at electrical scope between BHEL and Vendor in section IB.
- i) All the field instruments stipulated in this specification shall be in Bidder's scope.
- j) Set of commissioning spares, on "As required basis".
- k) Set of mandatory spares as indicated in Data Sheet A.
- l) Supporting arrangement complete with saddle support, foundation plates, anchor bolts, nuts, sleeves, inserts, all installation materials, fixing bolts, clamps and other accessories etc. for complete equipment supplied under this package.
- m) Finish paints for touch up painting of equipment after erection at site, in sealed containers.
- n) Set of special tools and tackles if required for maintenance and erection of the equipment supplied.
- o) Various drawings, data test reports/ certificates instruction manuals for erection operation and maintenance etc. as specified in Data Sheet-C and cables schedule indicating BOQ for power & control cables.
- p) Panels & Instruments: Scope and Type as specified in C&I section wherever required.

Any item not specified but required to make SCS complete package shall also be in bidder's scope.

4.0 SCOPE OF SERVICES INCLUDED IN THE BIDDER'S SCOPE:

The bidder's scope also includes following services at site, for scope under this specification for Self-Cleaning Strainer:

- a) Installation checks (Erection in BHEL's scope).
- b) Commissioning of equipment.
- c) Performance Guarantee Testing.

PG Test of equipment shall be generally conducted immediately after commissioning. These activities for different units shall be timed separately.

- **For drawings/documents approval**

In the event of order all drawings / documents in soft as well as hard copy shall be submitted as per Cl. No. 10.0.

Further on receipt of Customer comments, if required bidder's engineer shall visit BHEL/ Customer along with soft copy to resolve all issues and incorporate comments in the soft copy for across the table finalization and Category-I approval.



TITLE:
TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CLEANING STRAINER

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: PE-TS-RC4-165-N004
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- **Site Visits for installation check / commissioning/PG Test:**

Bidder to include cost of site visits for installation check, commissioning and PG testing in their base price.

5.0 EXCLUSIONS:

The following are excluded from the bidder's scope.

5.1 Civil foundation works required for installation

5.2 Erection of Equipment at site.

6.0 DESIGN CONSTRUCTION:

In addition to the requirements of Section-IIA the following shall also be complied.

6.1 Layout Piping Arrangement Drg. is enclosed in the specifications at Annexure-III of Datasheet-A.

6.2 Thickness of body flange and counter flange of SCS shall be as per BS 4504/ equivalent standard.

6.3 The materials of construction specified in Data Sheet-A are minimum requirements and materials of construction for other components not specified shall be similarly selected by the bidder for the intended duty which shall be subject to purchaser's approval during detailed engineering in the event of order.

6.4 Housing/ body of SCS shall be designed and manufactured as per the applicable codes for pressure vessels and to take care of force and moments as enclosed in the specification. However, in no case thickness of housing/ body shall be less than connecting pipe thickness as specified in Data Sheet-A of Self Cleaning Strainer.

6.5 Adequate provision for future installation of Cathodic Protection for Self-Cleaning Strainer (Sacrificial type) shall be kept by the bidder in the equipment.

6.6 Velocity in the pipe work shall be less than 1.5 m/ sec for pump suction and less than 2.0 m/ sec. in other pipe work. All valves upto 150 NB shall be ball valves. For higher sizes, gate/ globe/ B.F. valves shall be provided. All instrument valves shall be needle valves.

7.0 Performance Guarantee for SCS.

Performance Guarantee Parameters shall be as under:

- Max. Pressure drop in Self-Cleaning Strainer in clean condition (Test to be conducted along with commissioning) – not exceeding 1.0 MWC. The Bids shall be technically rejected for pressure drop quoted higher than 1.0 MWC.



TITLE:
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SPECIFIC TECHNICAL REQUIREMENTS

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Any deviation to above pressure drop will not be accepted.

In case the successful bidder fails to demonstrate above parameter, he shall carry out modifications at his own cost, to purchaser's approval.

In case bidder fails to demonstrate above parameter to purchaser's satisfaction even after modification carried by him at site, the purchaser has the right to reject the equipment out rightly and bidder is liable to resupply the equipment meeting the contractual performance parameters within time period mutually agreed upon without any cost implication to BHEL/Customer.

8.0 SPARES:

8.1 Mandatory Spares

Mandatory Spares shall be as per Data Sheet-A or annexure enclosed with data sheet A.

9.0 Quality Plan

Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer approval and customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. Charges for 3rd party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself.

If BHEL or BHEL customer decides to witness the tests along with third party, the cost of travel of BHEL or BHEL customer shall be borne by BHEL or BHEL customer themselves.

10.0 DELIVERY & DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE:

Delivery of Equipment and drawing submission shall be as per NIT.

11.0 The make of various bought out items shall be subjected to approval of Customer/ BHEL in the event of order.

12.0 It is mandatory for the bidders to submit along with the bid the deviations if any whether major or minor in the schedule of deviations only. ***In the absence of deviations listed in the schedule of deviations the offer shall be deemed to be in full conformity with the specification "non-withstanding" anything else stated elsewhere in bidder's offer, data sheets etc. The implied/ indirect deviations in data sheets etc. Shall not be binding on the purchaser.***

13.0 The following documents shall be furnished by the bidder with his offer:

- Compliance certificate duly signed and stamped (Enclosed at Section III).
- Guarantee schedule duly signed and stamped (Enclosed at Section III).
- GA drawings of following with empty/ filled-ups.
 - SCS body/ housing (as applicable).
 - Flushing Skid (if any).
 - Other equipment considered necessary for Layout/ Civil.



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- Electrical Load Data (Enclosed at Section III).
- Schedule of Deviation (Enclosed in NIT).

The bidder to note that load requirement furnished and finalized during tender stage shall only be provided by BHEL and any changes or additional requirement of Electrical load by bidder during contract stage shall be provided by BHEL with cost repercussions to the bidder.

NOTE: Apart from above, no other drawing/ document/ data sheet etc. shall be submitted along with the offer. If any drawing/ document etc. is submitted with the offer, same shall be considered as for 'Reference' purpose only and shall not be reviewed/ commented upon and any deviation, exclusion to scope, etc. taken in documents but not highlighted in the deviation schedule shall not be taken cognizance of.

14.0 Self-Cleaning Strainer packing procedure before dispatch

The purpose of this procedure is to outline the requirements and procedures for protecting the equipment's during shipment and preserving during the storage.

14.1 Preparation for Packing:

- After hydro testing, operation, all fluids e.g. water etc., shall be completely drained from all SCS's parts, and the equipment blown dry.
- All material shall be cleaned internally and externally to remove, scale, rust fillings and any other foreign material.
- The SCS shall be placed on a strong wooden base & bolted to the wooden base using the foundation holes for further transportation up to site.

14.2 Protection of parts:

- SCS Shell shall be packed in properly in high grade bubble plastic wrap for transportation, and long storage at site.
- Actuators shall be packed in separate wooden box of proper sizes.
- SCS items (EXCEPT SCS Shell) shall be packed in proper sizes of wooden cases. High grade woods like Rubber woods, jungle wood, hard wood, mango wood, pine wood, etc. is used for packing.
- Loose material, & Electrical & Electronics items shall be packed in corrugated box and plastic bags with proper tagging and marking of handle with care in proper sizes of wooden cases
- All finished (or) machined (External C.S. Surfaces shall be protected against corrosion with corrosion resisting coating, which is easily removable (Compound shall be such that it will remain on the surface at temperature normally encountered during shipping & storage).
- All machined surfaces shall be protected from mechanical damage. All external unfinished carbon steel surfaces shall be sand blasted & shall be coated with rust preventive primer.
- Flanged opening if any shall be covered with blank flanges sealed with blank gasket of



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natural rubber or equivalent. Butt welded opening shall be closed with temporary closing covers. Internal threads shall be protected with metal plug sealed with Teflon tape (if applicable). External thread shall be protected with PVC sleeve.

- Wooden cases shall be covered with HDPE cloth from inside wooden box and the top. All the opening in Self Cleaning Strainer shall be closed properly by suitably covering to prevent foreign material entering in plate heat exchanger.
- All fabricated wooden cases & crates conform to the requirement as per table given below:

Gross Weight [Kgs.]	Board Thickness	Batton / Rafter Thickness
2000 to 9000	Min. 30 mm	Min. 35 mm
9000 to 18000	Min. 50 mm	Min. 35 mm

- All the equipment shall be protected for entire period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and storage. All MS parts which are not painted shall be provided with coating of grease.
- Clay Desiccant or such other moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.

14.3 Preservation

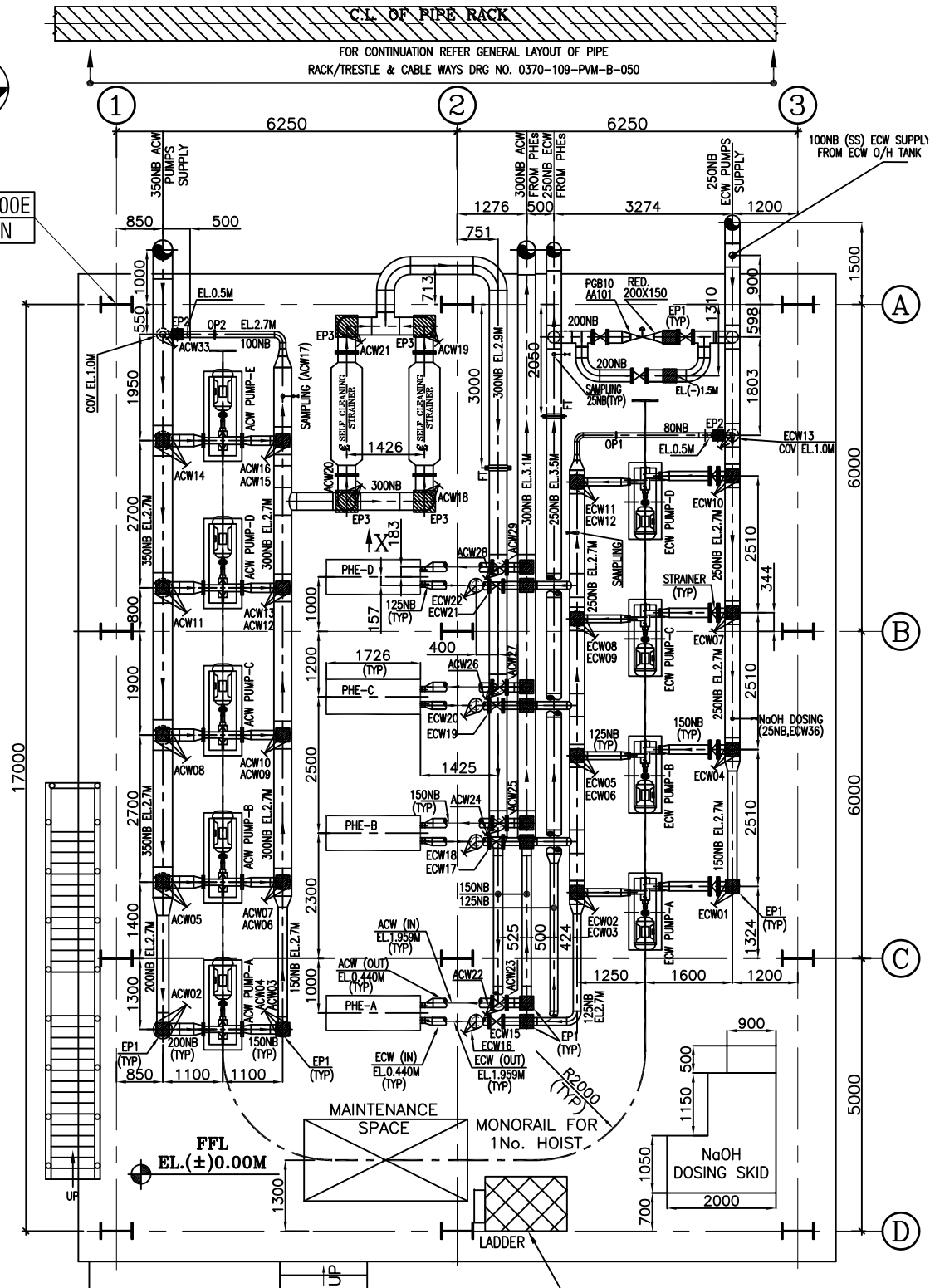
The equipment's shall be stored under closed/open space in packed condition until installation. The packages containing loose plates and gaskets are to be protected from extreme climatic conditions.

14.4 Photographs

Bidder to take photographs of all parts like SCS Shell, Screen, pumps (if any), piping, valves, instruments, actuators, panel (inside & outside) and sent to engineering department along with all inspection reports before final dispatch.



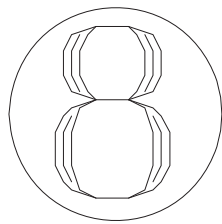
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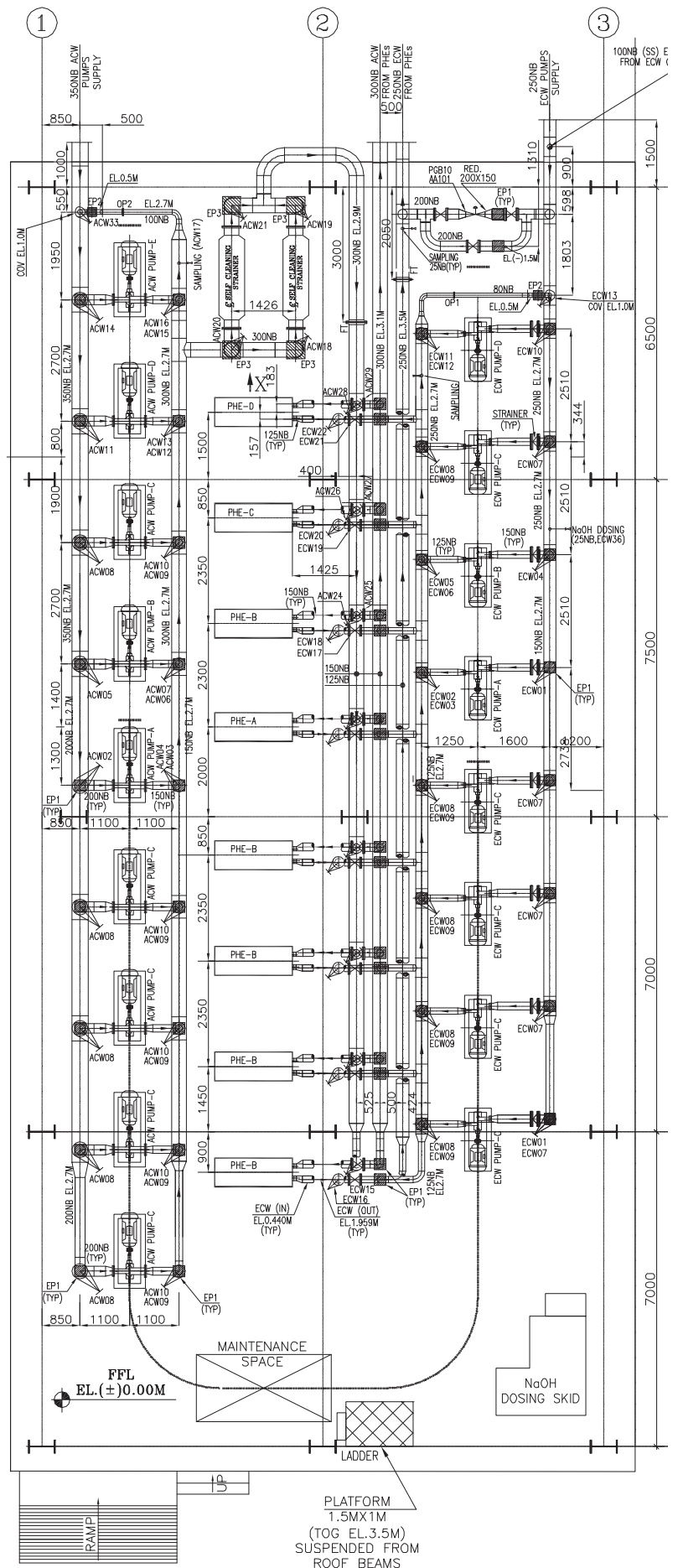
FOR TYPE-2
& TYPE-5

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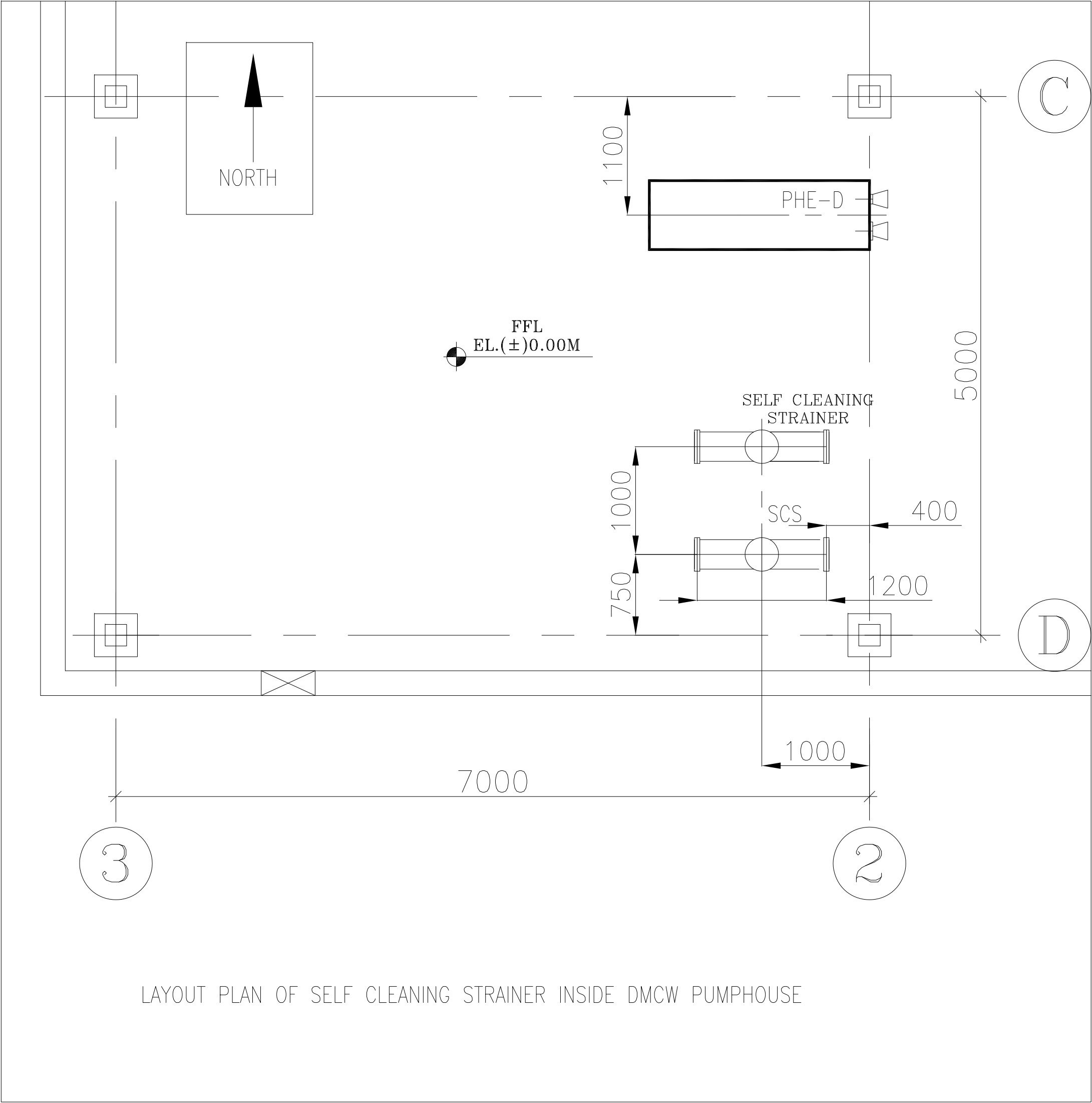
ACW&D INC
PUNP SHEED



FOR TYPE-4

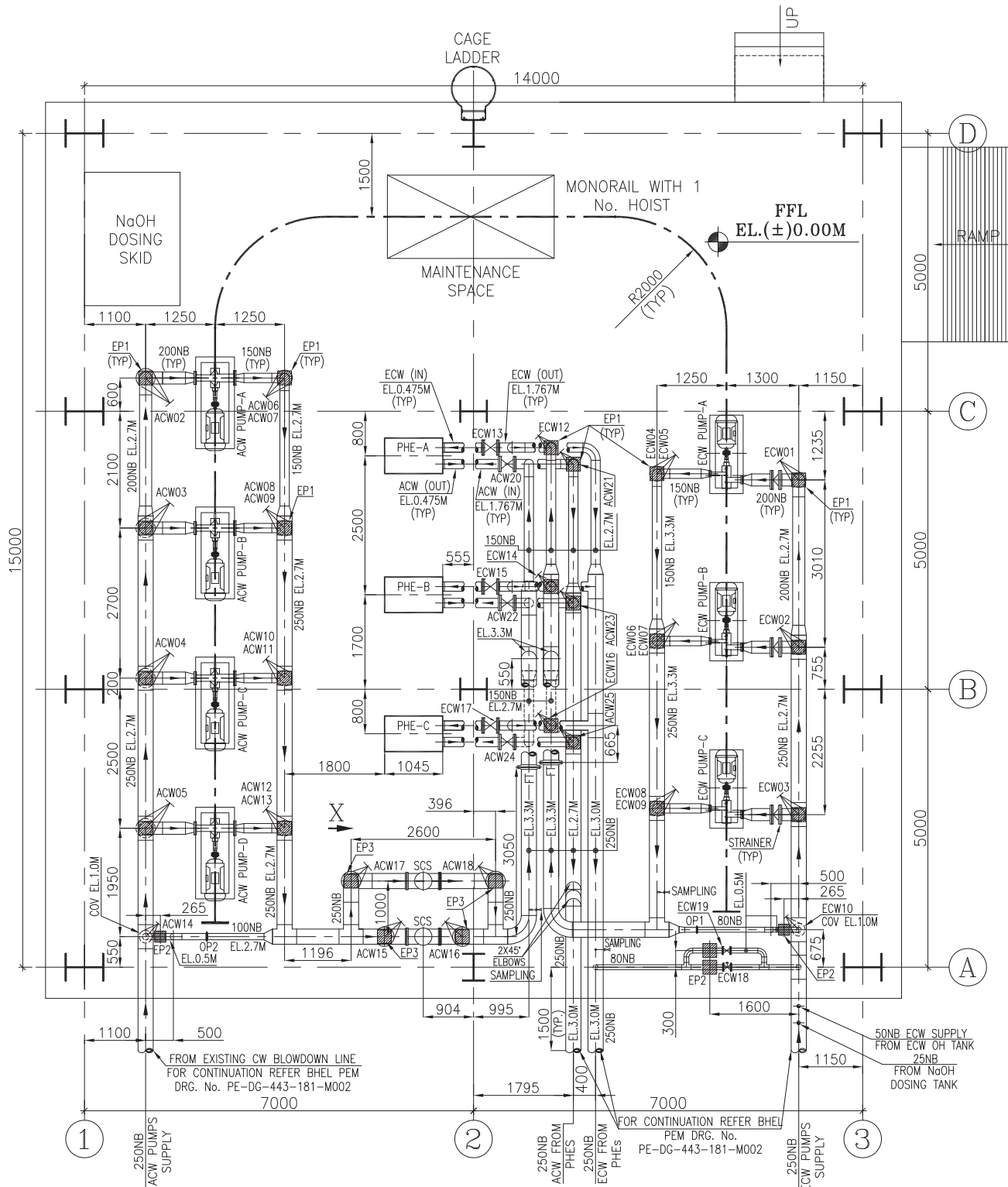


APPLICABLE
FOR TYPE-5

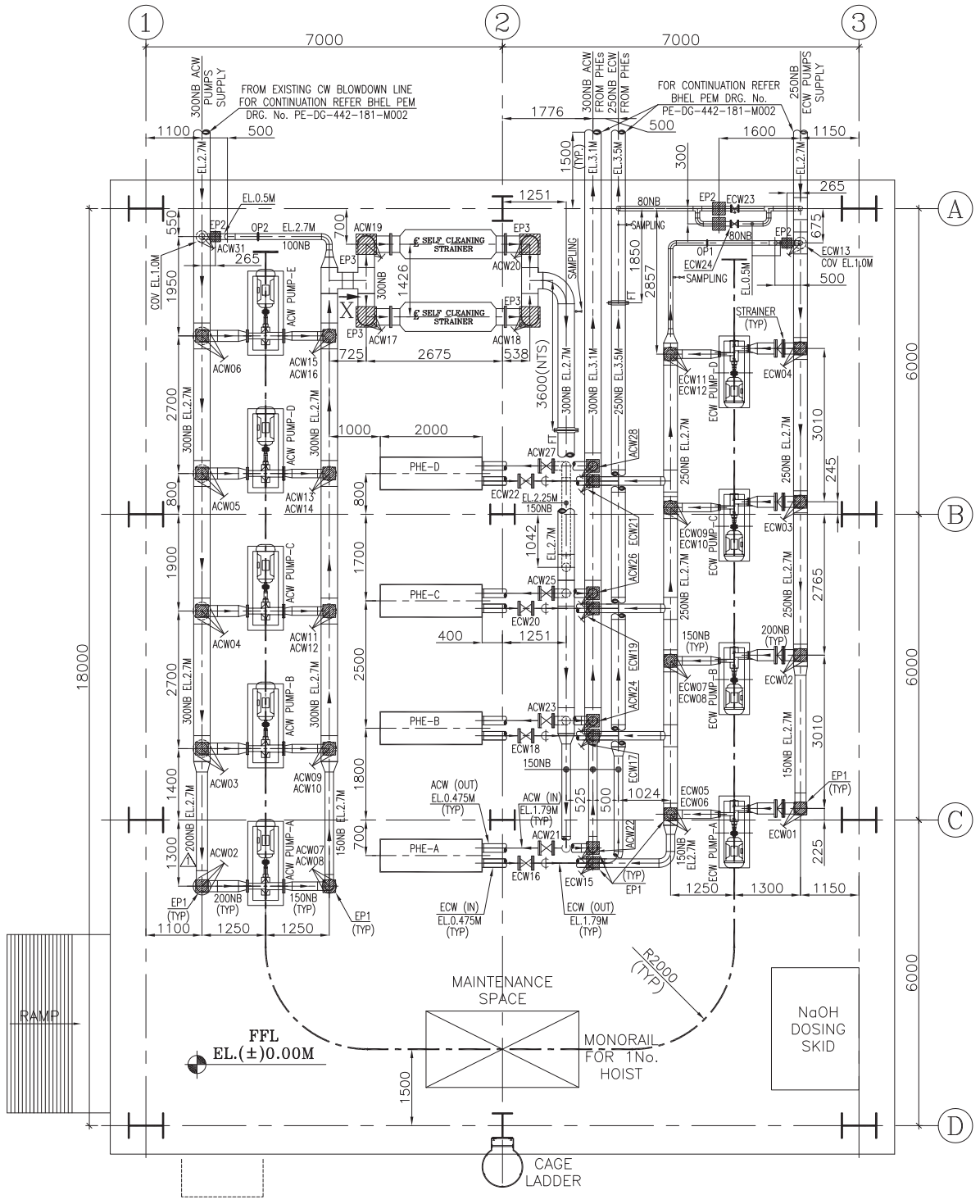


LAYOUT PLAN OF SELF CLEANING STRAINER INSIDE DMCW PUMPHOUSE

APPLICABLE FOR TYPE-6



APPLICABLE FOR TYPE-1





TITLE:
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SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**

SECTION: **I**

SUB-SECTION: **IB**

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SUB-SECTION – IB

SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)



TITLE :
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
SELF CLEANING STRAINER

SPECIFICATION NO.
VOLUME NO. : II-B
SECTION : I
REV NO. : 00 DATE : 27.02.2020
SHEET : 2 OF 3

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

- a) Services and equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Electrical load requirement for SELF CLEANING STRAINER (all AC & DC loads at different voltage levels like 415V AC, 240 V AC, 220 V DC etc).
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
- g) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
- h) Motor shall meet minimum requirement of motor specification.
- i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- j) Cable BOQ worked out based on routing of cable listing provided by the vendor for “ both end equipment in vendor’s scope”shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer “Electrical Scope between BHEL and Vendor”.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 3.1** The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.



TITLE :
**ELECTRICAL EQUIPMENT SPECIFICATION
FOR
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SPECIFICATION NO.
VOLUME NO. : **II-B**
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3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 List of enclosures :

- a) Electrical scope between BHEL & vendor (Annexure –I)
- b) Technical specification for motors.
- c) Datasheets & quality plan for motors.
- d) Electrical Load data format (Annexure –II)
- e) BHEL cable listing format (Annexure –III)

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

ANNEXURE - I

PACKAGES: SELF CLEANING STRAINER (SCS)

SCOPE OF VENDOR: SUPPLY

PROJECT: :

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC Starter cum control panel (if applicable)	BHEL Vendor	BHEL BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL Vendor BHEL	BHEL BHEL BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Cabling/ termination by BHEL.
4	Junction box for control & instrumentation cable	Vendor	BHEL	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	BHEL	Refer scope/ C&I portion of specification for scope of fibre Optical cables if used between PLC/ micro processor & DCS.
6	Cable trays, accessories & cable trays supporting system	BHEL	BHEL	
7	Cable glands and lugs for equipment supplied by Vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty copper lugs for power & control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	BHEL	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL	BHEL	

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES: SELF CLEANING STRAINER (SCS)

SCOPE OF VENDOR: SUPPLY

PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
10	Equipment grounding & lightning protection	BHEL	BHEL	
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to customer/ BHEL approval at contract stage.
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	BHEL	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Equipment layout drawings	Vendor	-	For preparation of cabling layout drawings by BHEL, vendor shall furnish Electrical equipment layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling,
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.

	TITLE LV MOTORS DATA SHEET-A	SPECIFICATION NO. VOLUME II B SECTION D REV. NO. DATE: 27.02.2020 SHEET 1 OF 2
<u>ANNEXURE-III</u> 1.0 Design ambient temperature : 50 °C 2.0 Maximum acceptable kW rating of LV motor : 200KW * 3.0 Installation (Indoors/ Outdoors) : As required 4.0 Details of supply system a) Rated voltage (with variation) : 415V ± 10% b) Rated frequency (with variation) : 50 Hz + 3 % to - 5% c) Combined voltage & freq. variation : 10% (sum of absolute values) d) System fault level at rated voltage : 50 kA for 1 sec e) Short time rating for terminal boxes o 110 kW and above (Breaker : 50 KA for 0.25 sec. Controlled) o Below 110 kW (Contactor : 50 KA protected by HRC fuse Controlled) f) LV System grounding : Solidly 5.0 Winding & Insulation : Class F with temp rise limited to class B 6.0 Minimum voltage for starting : 85% for motor ratings below 110kW (As percentage of rated voltage) 80% for motor ratings from 110kW to 200kW. 7.0 Power cables data : Shall be given during detailed engg. 8.0 Earth Conductor Size & Material : Shall be given during detailed engg. 9.0 Space heater supply (for motors >=30kw) : 240 V, 1φ, 50 Hz 10.0 Rating up to which Single phase motor : Acceptable below 0.2 kW 11.0 Locked rotor current a) Limit as percentage of FLC : As per IS 12615 12.0 Makes : BHEL/ Customer approval (Package owner to take care) 13.0 Paint shade : Blue (RAL 5012) – Corrosion proof 14.0 Degree Of protection for motor/ terminal box : Degree of protection for various enclosures as per IEC60034-05 shall be as follows:- i) Indoor motors - IP 54 ii) Outdoor motors - IP 55 iii) Cable box-indoor area - IP 54 iv) Cable Box-Outdoor area - IP 55 * LT motors of continuous duty shall be energy efficient IE3 class conforming to IS-12615 15.0 TESTING REQUIREMENTS: IN LINE WITH SPECIFICATION		

TECHNICAL SPECIFICATION
FOR MOTORS
SUB-SECTION-II-E2

MOTORS

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	MOTORS			
1.00.00	GENERAL REQUIREMENTS			
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.			
1.02.00	All equipment's shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.			
1.03.00	Contactor shall provide fully compatible electrical system, equipment's, accessories and services.			
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.			
1.05.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.			
1.06.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances for Contactors equipment and systems shall be under the Contactor scope.			
1.07.00	Degree of Protection			
	Degree of protection for various enclosures as per IEC60034-05 shall be as follows :-			
	i)	Indoor motors	-	IP 54
	ii)	Outdoor motors	-	IP 55
	iii)	Cable box-indoor area	-	IP 54
	iv)	Cable box-Outdoor area	-	IP 55
2.00.00	CODES AND STANDARDS			
	1)	Three phase induction motors	:	IS/IEC:60034
	2)	Single phase AC motors	:	IS/ IEC:60034
	3)	Crane duty motors	:	IS:3177, IS/IEC:60034
	4)	DC motors/generators	:	IS:4722, IS/IEC:60034
	5)	Energy Efficient motors	:	IS 12615, IEC:60034-30
LOT-IA PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-0011-109(1)-2		SUB SECTION-II-E2 MOTORS
PAGE 1 OF 9				

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.		
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.		
6.02.00	Torque Requirements		
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.		
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.		
6.03.00	Starting voltage requirement (a) Up to 85% of rated voltage for ratings below 110 KW (b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW (c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW (d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW (e) Up to 75 % of rated voltage for ratings above 4000KW		
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES		
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.		
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below (a) Fuel oil area : Group – IIB (b) Hydrogen generation : Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA /IEC60034)		
LOT-IA PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-0011-109(1)-2	SUB SECTION-II-E2 MOTORS
			PAGE 3 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
7.03.00	Winding and Insulation (a) Type : Non-hygroscopic, oil resistant, flame resistant (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. (c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15. (d) 240VAC, 415V AC & 220V DC motors : Thermal Class (B) or better		
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.		
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.		
7.06.00	Noise level for all the motors shall be limited to 85 dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.		
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.		
7.08.00	Motor body shall have two earthing points on opposite sides.		
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.		
7.10.00	3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Employer shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.		
LOT-IA PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-0011-109(1)-2	SUB SECTION-II-E2 MOTORS
			PAGE 4 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS																	
7.11.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.																	
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.																	
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.																	
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.																	
7.15.00	The size and number of cables (for HT motors) to be intimated to the successful Contactor during detailed engineering and the Contactor shall provide terminal box suitable for the same.																	
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance): <table><tr><td>(a) From 50KW & upto 110KW</td><td>:</td><td>11.0</td></tr><tr><td>(b) From 110 KW & upto 200 KW</td><td>:</td><td>9.0</td></tr><tr><td>(c) Above 200 KW & upto 1000KW</td><td>:</td><td>10.0</td></tr><tr><td>(d) From 1001KW & upto 4000KW</td><td>:</td><td>9.0</td></tr><tr><td>(e) Above 4000KW</td><td>:</td><td>6 to 6.5</td></tr></table>	(a) From 50KW & upto 110KW	:	11.0	(b) From 110 KW & upto 200 KW	:	9.0	(c) Above 200 KW & upto 1000KW	:	10.0	(d) From 1001KW & upto 4000KW	:	9.0	(e) Above 4000KW	:	6 to 6.5		
(a) From 50KW & upto 110KW	:	11.0																
(b) From 110 KW & upto 200 KW	:	9.0																
(c) Above 200 KW & upto 1000KW	:	10.0																
(d) From 1001KW & upto 4000KW	:	9.0																
(e) Above 4000KW	:	6 to 6.5																
10.00.00	TYPE TEST																	
10.01.00	HT MOTORS																	
10.01.01	The Contactor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The Contactor shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the Employer's engineer.																	
10.01.02	The type tests shall be carried out in presence of the Employer's representative, for which minimum 15 days notice shall be given by the Contactor. The Contactor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.																	
10.01.03	In case the Contactor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering																	
LOT-IA PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-0011-109(1)-2	SUB SECTION-II-E2 MOTORS															
			PAGE 5 OF 9															

CLAUSE NO.	TECHNICAL REQUIREMENTS			
10.01.04	the type test reports to the Employer for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the Contactor.			
10.01.05	Further the Contactor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the Contactor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the Contactor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.			
10.01.06	LIST OF TYPE TESTS TO BE CONDUCTED The following type tests shall be conducted on each type and rating of HT motor (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque test (subject to test bed constraint). (d) Full load test(subject to test bed constraint) (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp.,coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose. LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED The following type test reports shall be submitted for each type and rating of HT motor (a) Degree of protection test for the enclosure followed by IR, HV and no load run test.			
LOT-IA PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-0011-109(1)-2	SUB SECTION-II-E2 MOTORS	PAGE 6 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	(b) Terminal box-fault level withstand test for each type of terminal box of HT motors only. (c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15 (d) Surge-withstand test on inter-turn insulation shall be as per clause no. 4.2 of IEC 60034, part-15		
10.02.00	LT Motors		
10.02.01	LT Motors supplied shall be of type tested design. During detailed engineering, the Contactor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last <i>ten</i> years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.		
10.02.02	However if the Contactor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the Contactor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.		
10.02.03	LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only 1. Measurement of resistance of windings of stator and wound rotor. 2. No load test at rated voltage to determine input current power and speed 3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) 4. Full load test to determine efficiency power factor and slip 5. Temperature rise test 6. Momentary excess torque test. 7. High voltage test 8. Test for vibration severity of motor. 9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)		
LOT-IA PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-0011-109(1)-2	SUB SECTION-II-E2 MOTORS
			PAGE 7 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS
10.03.00 10.04.00	10. Test for degree of protection and 11. Overspeed test. 12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price. The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC																												
	TABLE - I DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS <table><tr><td>Motor MCR in KW of</td><td>Minimum distance between centre stud and gland plate in mm As per manufacturer's practice.</td></tr><tr><td>UP to 3 KW</td><td></td></tr><tr><td>Above 3 KW - upto 7 KW</td><td>85</td></tr><tr><td>Above 7 KW - upto 13 KW</td><td>115</td></tr><tr><td>Above 13 KW - upto 24 KW</td><td>167</td></tr><tr><td>Above 24 KW - upto 37 KW</td><td>196</td></tr><tr><td>Above 37 KW - upto 55 KW</td><td>249</td></tr><tr><td>Above 55 KW - upto 90 KW</td><td>277</td></tr><tr><td>Above 90 KW - upto 125 KW</td><td>331</td></tr><tr><td>Above 125 KW-upto 200 KW</td><td>203</td></tr></table> For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm. PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE: NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows: <table><tr><td>Motor MCR in KW</td><td>Clearance</td></tr><tr><td>UP to 110 KW</td><td>10mm</td></tr><tr><td>Above 110 KW and upto 150 KW</td><td>12.5mm</td></tr><tr><td>Above 150 KW</td><td>19mm</td></tr></table>				Motor MCR in KW of	Minimum distance between centre stud and gland plate in mm As per manufacturer's practice.	UP to 3 KW		Above 3 KW - upto 7 KW	85	Above 7 KW - upto 13 KW	115	Above 13 KW - upto 24 KW	167	Above 24 KW - upto 37 KW	196	Above 37 KW - upto 55 KW	249	Above 55 KW - upto 90 KW	277	Above 90 KW - upto 125 KW	331	Above 125 KW-upto 200 KW	203	Motor MCR in KW	Clearance	UP to 110 KW	10mm	Above 110 KW and upto 150 KW	12.5mm	Above 150 KW	19mm
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LOT-IA PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-0011-109(1)-2	SUB SECTION-II-E2 MOTORS	PAGE 9 OF 9																													



TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**

SECTION: **I**

SUB-SECTION: **IC**

REV. NO. **0** DATE **25/02/2020**

SHEET **1** OF **1**

SUB-SECTION – IC

SPECIFIC TECHNICAL REQUIREMENTS (C &I)

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	

**TECHNICAL SPECIFICATION
(CONTROL AND INSTRUMENTATION)
FOR
SCS SYSTEM**

	NTPC FGD PACKAGES LOT - 1A, 2 & 3		DESN	BhC
	JOB NO: 457,463,466,467 & 468		CHKD	KKM/CM/SK
	REV. NO. 00	DATE: 24.02.2020	APPD	RKR/SCS

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	

INDEX

S. No.	DESCRIPTION
1	TITLE SHEET
2	INDEX SHEET
3	SPECIFIC C&I TECHNICAL REQUIREMENT FOR SCS
4	C&I SCOPE MATRIX
5	GENERAL TECHNICAL REQUIREMENTS
6	LIST OF DOCUMENTS/DELIVERABLES
7	SPECIFICATION FOR MEASURING INSTRUMENTS (PRIMARY & SECONDARY) AND LOCAL CONTROL PANEL
8	INSTRUMENTATION CABLE, CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY
9	INSTRUMENT INTERFACING DRAWING
10	INSTRUMENT STUB DETAILS
11	SIGNAL EXCHANGE BETWEEN DRIVES AND DCS
12	QUALITY ASSURANCE FOR INSTRUMENTS & STARTER PANEL/LCP AND TYPE TEST REQUIREMENTS
13	MANDATORY SPARES
14	SUB VENDOR LIST
15	KKS NUMBERING PHILOSOPHY

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
Specific C&I Technical Requirement for SCS		

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR SCS SYSTEM	
Specific Technical Requirements (C&I):		
1.0	SCS system shall be operated from FGD-DCS (DCS-BHEL Scope of supply) through operator work stations.	
2.0	Bidder to provide local control panel(LCP)/starter panel for SCS system. This LCP/starter panel will act as interface between the FGD-DCS and the field devices for commands & feedbacks. In addition, LCP/starter panel shall have the provision of command (start/stop) & feedback interface with plant FGD-DCS	
3.0	Bidder to supply all the instruments (DPT, DPG etc.) required for the package along with necessary fittings, accessories and valve manifold etc. All instruments shall be provided with durable epoxy coating for housing and all exposed surfaces of the instruments.	
4.0	All the Electronic Transmitter for Pressure, Differential Pressure and DP based Flow /Level measurements shall be genuine, verifiable PROFIBUS PA protocol compatible instruments. The transmitters shall be connected to DDCMIS through PROFIBUS PA protocol complying to IEC 61158 directly from transmitter. This is subject to customer approval and BHEL decision shall be final.	
5.0	ON OFF and INCHING type actuators (Non-intrusive type) shall be PROFIBUS-DP compatible with Open/Close command termination logic suitably built inside the actuator.	
6.0	The PROFIBUS protocol design shall be further validated by BHEL and approved by NTPC during detailed engineering and any variation/ changes required based on DDCMIS system requirements and actual field installation, operational philosophy etc. shall be considered by bidder without any implications.	
7.0	All transmitters shall be suitably grouped together and mounted inside (i) Local Instruments Enclosures (LIEs) in case of open areas of the plant and (ii) In Local Instrument Racks (LIRs) in case of covered areas.	
8.0	Complete C&I system for SCS System is in bidder's scope of supply. Items not specifically mentioned however required for the completeness of the system shall be supplied by bidder without any commercial implication.	

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR SCS SYSTEM	
9.0	The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire SCS system. The requirements given are to be read in conjunction with detailed Technical specification enclosed in the specification. Further in case of any discrepancy in the requirement within the same section noted by the bidder in the specification, the same will be brought to the notice of BHEL in the form of pre- bid clarification. In absence of any pre-bid clarification, the more stringent requirement as per interpretation of customer shall prevail without any commercial implication.	
10.0	The quantity of instruments for the system shall be as per tender P & ID wherever provided of the respective system as a minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.	
11.0	415V AC Power supply shall be provided by BHEL at a single point (Please refer the Electrical Specification for more detail), further distribution to various instruments/equipment of the system shall be in bidder scope. Bidder to include necessary power distribution board, changeover circuit in his scope. Any power supply other than the above, UPS power etc., if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Bidder to submit the power requirement along with the bid.	
12.0	Power supply derived for contact interrogation, interposing relay and solenoid shall generally be ungrounded 24 V D.C. only.	
13.0	The make of the items shall be from sub-vendor list. However the make/model of various instruments/items/systems shall be subject to approval of owner/purchaser during detailed engineering stage. No commercial implication in this regard shall be acceptable. In case of any conflict or repetition of clauses in the specification, the more stringent requirements among them are to be complied with.	
14.0	The design, manufacture, inspection, testing, site calibration and installation of all C&I equipment and systems covered under this specification shall conform to the latest editions of applicable codes and standards.	

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR SCS SYSTEM	
15.0	The scope of cable shall be referred in Electrical scope split sheet in Electrical portion of the specification.	
16.0	Bidder shall provide Cable Schedule in BHEL excel format provided in Electrical portion of the specification. All cable interconnection details for complete system shall be in Bidders' scope.	
17.0	Instrument installation and accessories required for the same shall be in Bidder's scope and shall be subject to customer/BHEL's approval during detailed engineering.	
18.0	Bidder to provide erection hardware including junction boxes, canopies, structural steel as required.	
19.0	Every panel-mounted instrument, requiring power supply, shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.	
20.0	Provision for separate Terminal block/wiring diagram for power and control blocks of control panel to be ensured.	
21.0	To ensure availability, adequate redundancy in system design shall be provided at hardware, software and sensor level. For the protection system, independent sensing device shall be provided to ensure adequate safety of plant equipment.	
22.0	Redundancy of sensors shall be provided by bidder (i) Triple redundancy for all analog and binary inputs required for protection of system/drives. (ii) For all other control functions dual redundancy of the sensors shall be provided by the bidders.	
23.0	The design of the control systems and related equipment shall adhere to the principle of 'Fail Safe' Operation wherever safety of personnel / plant equipment is involved and shall not cause a hazardous condition. However, it shall also be ensured that occurrence of false trips are avoided/minimized.	
24.0	All panels, cabinets shall be provided with a continuous bare copper ground bus. The ground bus shall be bolted to the panel structure on bottom on	

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR SCS SYSTEM	
	both sides. The bolts shall face inside of panels. The system ground shall be isolated from the panel ground with suitable isolators. All internal component grounds or common shall be connected to the system ground, which shall be fabricated of copper flat (size 25mm x 6mm min., length as applicable).	
25.0	Bidder to perform tests of C&I items/instruments/systems as per quality plans/type test attached in the specification.	
26.0	The requirements given are to be read in conjunction with detailed Technical specification enclosed.	
27.0	The bidders shall specifically mention any deviation they would like to take on the C&I specification. In absence of only deviation, a "No deviation" certificate is to be furnished.	
28.0	All field instruments shall be weatherproof, drip tight, dust tight and splash proof suitable for use under outdoor ambient conditions prevalent in the subject plant. All field-mounted instruments shall be mounted in suitable locations where maximum accessibility for maintenance is achieved. All the field instruments shall also be provided with SS tag nameplate and double compression type Nickel-plated brass cable gland. Gaskets, Fasteners, Counter and mating flange (SS316 material), nuts & bolts etc. shall also be included, wherever required with the field instruments.	
29.0	For instruments which are not located inside covered building, suitable canopy/ protective arrangement shall be provided which shall be approved during detail engineering.	
30.0	All the wetted parts of the instruments including the accessories like root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments as well as valves shall be of SS-316 material, suitable pressure class and same shall be in bidder's scope.	
31.0	All instruments should be supplied with valid calibration and test certificates provided by OEM.	
32.0	At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc.	
33.0	Double root valve shall be provided for all pressure tapings where the design pressure exceeds 40kg/cm ² .	

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR SCS SYSTEM	
34.0	All the instruments PG/DPG/DPT/PT etc. as applicable shall have chemical/diaphragm seal.	
35.0	Number of pairs to be selected for Screen/ Control cable (a) F-Type: 2P/4P/8P/12P(Size : 0.5 mm2) (b) G-Type: 2P/4P/8P/12P(Size : 0.5 mm2) (c) Core Cable: 3CX2.5sqmm2/ 5CX2.5sqmm2/ 12CX1.5sqmm2	
36.0	Drive control philosophy/signal exchange list attached elsewhere in the specification are Tentative and shall be finalized during detailed engineering.	
37.0	Bidder to provide mandatory spares as per mandatory spares list. Attached elsewhere in the specification	
38.0	Editable & pdf copy of Drawings/Documents and data to be furnished after award of the contract: List of Drawings/Documents and data to be furnished by bidder after award of the contract are mentioned under section” List Of Documents/Deliverables”.	
 Note:- 1. All equipment items shall be of latest design with proven on track record. 2. The above given scope is indicative & minimum. Any item/ equipment not indicated above however required for the completeness of the system is to be supplied by bidder without any technical, commercial and delivery implication to BHEL. 3. Documents of C&I System shall be submitted to end user/owner for approval during detail engineering. Changes, if any, shall be accommodated by the bidder without any price/time implication.		

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
C&I SCOPE MATRIX FOR SCS		

SCOPE MATRIX - SCS SYSTEM		
S.No.	PROJECT	NTPC FGD PACKAGES - LOT 1A, 2, 3
1	SYSTEM APPLICABLE: SELF CLEANING STRAINER (SCS)	Y
2	SYSTEM CONFIGURATION: UNITISED OR COMMON OR AS APPLICABLE	COMMON
3	CONTROL SYSTEM	REFER NOTE-1
4	LOCATION OF CONTROL SYSTEM	
5	CONTROL SYSTEM SCOPE (BIDDER /BHEL/ CUSTOMER)	
6	CONTROL FROM PUSH BUTTONS ON STARTER PANEL	Y; REFER NOTE 3
7	ANNUNCIATION ON STARTER PANEL (Y/N) -- IF Y, MIN NO. OF HARDWIRED ALARMS / INDICATIONS	Y; REFER NOTE-4
8	MIMIC ON STARTER PANEL (Y/N)	NA
9	PROTECTION CLASS FOR STARTER PANEL	AS PER DATASHEET OF 'LOCAL CONTROL CUM STARTER PANEL' (herein also referred as 'Starter Panel' or 'Local Control Panel' or 'Switchgear Panel' interchangeably)
10	ACTUATOR WITH INTEGRAL STARTER(Non-intrusive type)) (Y/N) - SHALL BE FOUNDATION FIELDBUS/PROFIBUS-DP PROTOCOL COMPATIBLE.	Y
11	DPG/ DPT PER COLTCS SYSTEM * TRANSMITTERs SHALL BE FOUNDATION FIELDBUS/PROFIBUS-PA PROTOCOL COMPATIBLE.	DIFFERENTIAL PRESSURE TRANSMITTER = 2 nos. (Across each Filter) DIFFERENTIAL PRESSURE GAUGE = 1 no. (Across each Filter)
12	SEA WATER APPLICATION	NA
	NOTES:	
1	Type of control system shall be DDCMIS (FGD-DCS) based, located in FGD - Control Room in BHEL scope. Field instrumentation and starter panels for the package are in bidder's scope of supply.	
2	Self cleaning strainer shall be supplied with its Local control panel/Starter panel and its annunciation for its operation. Extent of annunciation shall be decided during detailed engg.	

3	Push buttons and indication lamps for Open/Close and Start/Stop of drives/equipments shall be provided on the starter panel. Remote and local indication, indicating lamps / LED cluster for instruments/drives/equipments status and critical alarms shall be provided on the starter panel. Nos. shall be decided during detailed engineering.
4	415 V, 3 phase AC power supply shall be provided by BHEL at a single point for the starter panel. Further any electrical distribution shall be in bidder's scope. Any other voltage requirement to be arranged/derived by bidder by providing suitable control transformer. Starter panel in bidder's scope shall have provision for redundant feeder with fast automatic changeover if redundant feeder is applicable.
5	Bidder to terminate all control elements in the local control cum starter panel/Junction box for further cabling to DDCMIS.
6	Following documents shall be provided by bidder during detailed engineering for approval: a. Input/Output list, Drives list, b. Instrument datasheets and check lists/Quality plan, c. Panel external/internal GA drawing and termination details, d. Panel datasheet and QAP e. Recommended control logics / Control philosophy . f. Complete cable schedule & cable interconnection details
7	All the instruments along with necessary fittings, accessories and valve manifold etc., instrument rack and junction boxes, erection hardware shall be in bidder's scope of supply.
8	LIR/LIE shall be provided for mounting the instruments in the field.
9	Mandatory spare list shall be referred in 'List of mandatory spares' attached elsewhere in the specification and shall be supplied by bidder.
10	Open/close limit switch feedback of valves are to be connected to DCS for remote viewing and for interlock & protection.
11	The Vendor list/ sub-vendor list shall be subject to BHEL / Customer approval during contract stage.
12	The technical requirements for instruments mentioned in the specification are minimum requirements. Items not specifically mentioned and required for the completeness of the system shall be supplied by bidder.

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
GENERAL TECHNICAL REQUIREMENTS (SCS SYSTEM)		

	SPECIFICATION FOR CONTROL & INSTRUMENTATION FOR AUX PACKAGES	SPECIFICATION NO.:	
		VOLUME	
		SUB SECTION	
		REV. NO.	DATE :
		SHEET	OF

GENERAL REQUIREMENT

1.0 Bidder shall provide complete and independent control & instrumentation system with all accessories, auxiliaries and associated equipments for the safe, efficient and reliable operation of auxiliary systems.

2.0 The quantity of instruments for auxiliary system shall be as per tender P & ID wherever provided of the respective system as a minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.

3.0 Measuring instruments/equipment and subsystems offered by the bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further all the instruments shall be of proven reliability, accuracy, and acceptable international standards and shall be subject to employer's approval. All instrumentation equipment and accessories under this specification shall be furnished as per technical specification, ranges, makes/ numbers as approved by the employer' during detail engineering.

4.0 The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifold and all the other accessories required for mounting/ erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments; sensors, switches etc for external connection including spare contacts shall be wired out to suitably located junction boxes.

5.0 The customer specification attached as Specific Technical Requirement will supercede the Data sheets, if there is any mismatch.

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
LIST OF DOCUMENTS/DELIVERABLES		

LIST OF DELIVERABLES OF PEM - C&I DEPARTMENT FOR NTPC FGD PACKAGES - LOT 1A, 2, 3

DOCUMENT NUMBER PE-GL-457/463/466/467/468-145-I100 SHEET 1 of 1

Sl.No.	DRAWING NO.	DRAWING/DOCUMENT TITLE	CATEGORY
1	PE-V0-XXX-145-I901	CONTROL & OPERATIONAL WRITE-UP FOR THE SYSTEM	A
2	PE-V0-XXX-145-I902	CONTROL SCHEME/LOGIC DIAGRAM(TO BE IMPLEMENTED IN DDCMIS)	A
3	PE-V0-XXX-145-I903	HMI PICTURES/PLANT SCHEMATICS	A
4	PE-V0-XXX-145-I904	INSTRUMENT SCHEDULE WITH SET POINTS	A
5	PE-V0-XXX-145-I905	I/O LIST (ANALOG & BINARY)	A
6	PE-V0-XXX-145-I906	DRIVE LIST/SOLENOID/ACTUATOR VALVE LIST WITH LOCATION DATA	A
7	PE-V0-XXX-145-I907	FIELD JB/LIE/LIR, DRIVES TERMINATIONS	A
8	PE-V0-XXX-145-I908	DATASHEETS FOR INSTRUMENTS, JBs, etc.	A
9	PE-V0-XXX-145-I909	QUALITY PLANS (INSTRUMENTS,LCP etc.)	A
10	PE-V0-XXX-145-I910	INSTRUMENT HOOK UP DRAWING	A
11	PE-V0-XXX-145-I911	THERMOWELL SIZING CALCULATION	A
12	PE-V0-XXX-145-I913	CABLE SCHEDULE & INTERCONNECTION	A
13	PE-V0-XXX-145-I914	ANNUNCIATION & SOE LIST	A

NOTES:

1. ANY OTHER DOCUMENT DECIDED DURING DETAILED ENGINEERING SHALL BE PROVIDED BY BIDDER WITHOUT ANY COMMERCIAL/TECHNICAL IMPLICATION.
2. CONTRACTOR TO SUBMIT REUSABLE DATABASE FORMATS IN BHEL/CUSTOMER APPROVED FORMATS LIKE MS EXCEL,MS ACCESS OF DOCUMENTS LIKE INSTRUMENT SCHEDULE, I/O LIST, DRIVE LIST,FIELD JB TERMINATIONS, CABLE SCHEDULE & INTERCONNECTION, etc. SOFT COPY OF FORMATS SHALL BE PROVIDED TO SUCCESSFUL BIDDERS.
3. 'XXX' REFERS TO SPECIFIC PROJECT CODE AS APPLICABLE.

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
· SPECIFICATION FOR MEASURING INSTRUMENTS (PRIMARY & SECONDARY) AND CONTROL PANEL		

CLAUSE NO.	TECHNICAL REQUIREMENTS	Annexure-III C	एनटीपीसी NTPC
1.00.00	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)		
1.01.00	Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Employer's approval.		
1.02.00	Every panel-mounted instrument requiring power supply shall be provided with easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.		
1.03.00	All transmitters, sensors, switches and gauges for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided on as required basis with in quoted lump sum price. The Contractor shall furnish all Instrumentation / Control equipment & accessories under this specification as per technical specification, ranges, makes & model as approved by the Employer during detailed engineering.		
1.04.00	The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.		
1.07.00	The instruments, for which technical specification is not attached, shall be supplied as per the standard and proven practice of the contractor. The same shall be established by the contractor during detailed engineering by providing detailed explanation/concepts, if required by the employer, of such implementation along with standard documentation.		

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC						
16.00.00	FIELD INSTRUMENTS BASED ON FIELDBUS The following instruments shall be connected to DDCMIS through fieldbus i.e. FOUNDATION Fieldbus/PROFIBUS PA protocol complying to IEC 61158 directly from transmitter.							
16.01.00	Electronic Transmitter for Pressure, Differential Pressure and DP based Flow / Level measurements. <table border="1"> <thead> <tr> <th>S No.</th><th>Features</th><th>Essential/Minimum Requirements</th></tr> </thead> <tbody> <tr> <td>1.</td><td>Type of Transmitter</td><td>FOUNDATION Fieldbus/PROFIBUS PA based output</td></tr> </tbody> </table>	S No.	Features	Essential/Minimum Requirements	1.	Type of Transmitter	FOUNDATION Fieldbus/PROFIBUS PA based output	
S No.	Features	Essential/Minimum Requirements						
1.	Type of Transmitter	FOUNDATION Fieldbus/PROFIBUS PA based output						

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	2	Accuracy	± 0.060 % of calibrated range (minimum) for calibrated range greater than 400 mmwc. +0.065% of calibrated range (minimum) for calibrated range greater than 250 kg/cm2. ± 0.10 % of calibrated range (minimum) for calibrated range less than 400 mmwc.
	3.	Stability	0.25 % of calibrated range for 10 years for calibrated range greater than equal to 400 mmwc on standard conditions of manufacturer. 0.2 % of calibrated range for 1 years for calibrated range less than 400 mmwc on standard conditions of manufacturer. 0.15% of calibrated range for 5 years for DPT with static pressure greater than 250 kg/cm2.
	4	Turn down	50:1 for greater than or equal to span of 400mmwcl. 20:1 for span below 400mmwcl. 10:1 for span greater than 250 kg/cm2 (Above mentioned (2,3,4) parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only).
	5	Housing	Weather proof as per IP-67, metallic housing with durable corrosion resistant coating
	6.	Electrical connection	½" NPT(F) FOUNDATION Fieldbus/PROFIBUS PA compatible
	7.	Process connection	½" NPT (F)
	8.	Operating Ambient temperature	85 deg C without display. 70 deg C with display.
		Overpressure	150% of max operating pressure
	9	Accessories	-Diaphragm seal, pulsation dampeners, syphon etc. as required by service and operating condition. -2 valve manifold for absolute & gauge pressure transmitters, -3-valve for DP and 5 valve manifold for level/flow applications. -The valve manifold shall be non-integral type. -For hazardous area, enclosure as described in NEC article 5.

CLAUSE NO.	TECHNICAL REQUIREMENTS 
	10. Mounting 2 inch pipe mounting with Enclosure/Rack/Canopy. 11. Diagnostics & display Self-Indicating feature and digital display on transmitter display Notes - For primary air/ secondary air/flue gas/ furnace pressure applications, DP type transmitters shall be provided for pressure measurement below 2000 mmwc. - LVDT type is not acceptable. - Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

CLAUSE NO.

TECHNICAL REQUIREMENTS



4.00.00

SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE.

SI. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS		
		Pr. Gauge/ DP Gauge/ Draught gauges	Temperature Gauge	Level Gauge
1	Sensing Element	Bourdon for high pressure, Diaphragm/ Bellow for low pr.	Inert gas actuated/ Liquid filled other than mercury	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Material of sensing element	SS 316	SS 316	
3	Material of movement	SS 304	SS 304	
4	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel/304 SS
5	Dial size	150mm	150 mm	Tubular covering entire range
6	End connection	1/2 inch NPT (M)	1/2 inch or 3/4 inch NPT (M).	Process connection as per ASME PTC and drain/vent 15 NB

CLAUSE NO.
TECHNICAL REQUIREMENTS


7	Accuracy	±1% of span	± 1% of span	± 2%
8	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical
9	Range selection	Shall cover 125% of max. operating press	Shall cover 125% of max. operating temp	Shall cover max. Operating level.
10	Over range	125% of FSD	125% of FSD	-
11	Housing	Weather and dust proof as per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak proof
12	Zero/span adjustment	Provided	Provided	—
13	Identification	Engraved with service legend or laminated phenolic name plate		
14	Accessories	Blow out disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	SS Thermowell	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
Notes:-				
*Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.				
Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.				
Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.				

10.00.00

FIELD MOUNTED LOCAL JUNCTION BOXES

- | | | |
|--------|---------------------------------|---|
| (i) | No. of ways | 12/24/36/48/64/72/96/128 with 20% spares terminals. |
| (ii) | Material and Thickness | 4mm thick Fiberglass Reinforced Polyester (FRP). |
| (iii) | Type | Screwed at all four corners for door. Door gasket shall be of synthetic rubber. |
| (iv) | Mounting clamps and accessories | Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply. |
| (v) | Type of terminal blocks | Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided. |
| (vi) | Protection Class | IP: 55 minimum for indoor & IP-65 minimum for outdoor applications. |
| (vii) | Grounding | To be provided. |
| (viii) | Color | RAL 7035 |

CLAUSE NO.	TECHNICAL REQUIREMENTS 
10.00.00 10.01.00 10.01.01	CONTROL CABINETS / PANELS / DESKS The cabinets shall be IP-22 protection class. The Contractor shall ensure that the packaging density of equipment in these cabinets is not excessive and abnormal temperature rise, above the cabinet temperature during normal operation or air-conditioning failure, is prevented by careful design. This shall be demonstrated to the Employer during the factory testing of the system. The Contractor shall ensure that the temperature rise is limited to 10 deg. C above ambient and is well within the safe limits for system components even under the worst condition and specification requirements for remote I/O cabinets. Ventilation blowers shall be furnished as required by the equipment design and shall be sound proof to the maximum feasible extent. If blowers are required for satisfactory system operation, dual blowers with blower failure alarm shall be provided in each cabinet with proper enclosure and details shall be furnished with proposal. Suitable louvers with wire mesh shall be provided on the cabinet. The cabinets shall be designed for front access to system modules and rear access to wiring and shall be designed for bottom entry of the cables.

CLAUSE NO.	TECHNICAL REQUIREMENTS			
10.01.02	The cabinets shall be totally enclosed, free standing type and shall be constructed with minimum 2 mm thick steel plate frame and 1.6 mm thick CRCA steel sheet or as per supplier's standard practice for similar applications, preferred height of the cabinet is 2200 mm. The cabinets shall be equipped with full height front and rear doors. The floor mounting arrangement for other cabinets shall be as required by the Employer and shall be furnished by the Contractor during detailed engineering.			
10.01.03	Cabinet doors shall be hinged and shall have turned back edges and additional braking where required ensuring rigidity. Hinges shall be of concealed type. Door latches shall be of three-point type to assure tight closing. Detachable lifting eyes or angles shall be furnished at the top of each separately shipped section and all necessary provisions shall be made to facilitate handling without damage. Front and rear doors shall be provided with locking arrangements with a master key for all cabinets. If width of a cabinet is more than 800 mm, double doors shall be provided.			
10.01.04	Two spray coats of inhibitive epoxy primer-surface shall be applied to all exterior and interior surfaces. A minimum of 2 spray coats of final finish colour shall be applied to all surfaces. The final finished thickness of paint film on steel shall not be less than 65-75 micron for sheet thickness of 2 mm and 50 microns for sheet thickness of 1.6 mm. The finish colors for exterior and interior surfaces shall conform to following shades: (a.) Exterior:- As per RAL 9002 (End panel sides RAL 5012), to be finalised during detailed engineering. (b.) Interior:- Same as above.			
10.01.05	Paint films which show sags, checks or other imperfections shall not be acceptable.			
10.01.05	As an alternative, single coat of anodic dipcoat primer along with single textured powder coating with epoxy polyester meeting the thickness requirement is also acceptable.			
10.01.06	Refer Subsection Basic Design Criteria, Part-B, Section-VI for grounding requirements.			
10.02.00	The mimic shall be configured on the OWS/CRTs and it shall be possible to control, monitor and operate the plant from the same.			
10.03.00	The technical specification covering panel fabrication details, wiring and termination details etc. shall be as described under Sub-Section INST CABLE of this specification.			
LOT-IB PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1B)-9		SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM
PAGE 23 OF 27				

CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC			
5.00.00	PROCESS ACTUATED SWITCHES			
	FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS		
		Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches
	Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .
	Material	316 SS	Bulb 316 SS/ capillary 304 SS	316 SS
	End connection	½ inch NPT (F)	½ inch NPT (F)	Manufacturer standard
	Over range/ proof pressure	150% of maximum operating pr.	-	150% of maximum operating pr.
	Repeatability	+/- 0.5% of full range		
	No. of contacts	2 No.+2NC. SPDT snap action dry contact		
	Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)		
	Elect. Connection	Plug in socket.		
	Set point adjustment	Provided over full range.		
	Dead band adjustment	Adjustable/ fixed as per requirement of application.		
	Enclosure	Weather and dust proof as per IP-55, metallic housing.		
	Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories
	Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-

CLAUSE NO.	TECHNICAL REQUIREMENTS		
6.00.00 7.00.00	<table border="1"> <tr> <td>Power Supply (wherever required)</td><td>As per Contractor's Standard practice.</td></tr> </table> Notes :- 1) Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application. 2) Pressure/ Diff pressure switches for very low press/ DP measurements can have sensor material other than SS316 in case of any technical limitation and the offered product is standard product of the manufacture for very low pressure applications. 3) Repeatability can be upto +/-1% of full range in case of switches with diaphragm seals or very low pressure/DP range. 4) The specifications of switches for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. SOLENOID VALVES Solenoid valves shall fulfill the following requirements: - a) Type 2/3/4 way SS 316/ forged brass (depending on the application subject to Employer's approval during detailed engg.) b) Power supply 24V DC. c) Plug in connector connection. d) Insulation : Class "H" Limit switches e) Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of Fire alarm Control System subject to a minimum of 60V, 6VA rating. Protection class shall be IP-55.	Power Supply (wherever required)	As per Contractor's Standard practice.
Power Supply (wherever required)	As per Contractor's Standard practice.		



TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**

SECTION: **I**

SUB-SECTION: **ID**

REV. NO. **0** DATE **25/02/2020**

SHEET **1** OF **1**

SUB-SECTION – ID

DATASHEET-A



DATA SHEET - A

SPECIFICATION NO.: PE-TS-RC4-165-N004

SELF CLEANING STRAINER (SCS)

REV. NO.: 00. DATE : 22/02/2020

SECTION : I. SUB-SECTION : ID

SL NO	DESCRIPTION	UNITS	TYPE - 1	TYPE-2	TYPE - 3	TYPE-4	TYPE - 5
1.0	GENERAL						
1.1	No. of Strainers/ Filters required for station	Nos.	Total 4 sets - i.e.(2 working + 2 standby)	Total 2 Sets - i.e.(1 Working + 1 Standby)	Total 2 Sets - i.e.(1 Working + 1 Standby)	Total 2 Sets - i.e.(1 Working + 1 Standby)	Total 6 sets - i.e.(3 working + 3 standby)
1.2	Liquid Handled		CW Blowdown water	CW Blowdown water	CW Blowdown water	CW Blowdown water	CW Blowdown water
1.3	Size of SCS Shell	NB	300	300	150	350	200
1.4	Length of SCS Shell	mm	As per Bidder standard	As per Bidder standard	As per Bidder standard	As per Bidder standard	As per Bidder standard
1.5	Connecting pipe size (OD x Thk)	mm x mm	323.9 X 6.0	323.9 x 6.0	166.5 X 5.4	355.6 X 6.0	219.1 X 6.0
1.6	Scope of Counter Flange of SCS Shell		In bidder's scope	In bidder's scope	In bidder's scope	In bidder's scope	In bidder's scope
1.7	BOQ for Debris Discharge Piping (For CW Blow down water).		1. Dia of pipe: To be decided by bidder. 2. Length of pipe: 50 m pipe length. 3. No. of bends: 5 Nos.	1. Dia of pipe: To be decided by bidder. 2. Length of pipe: 50 m pipe length. 3. No. of bends: 5 Nos.	1. Dia of pipe: To be decided by bidder. 2. Length of pipe: 50 m pipe length. 3. No. of bends: 5 Nos.	1. Dia of pipe: To be decided by bidder. 2. Length of pipe: 50 m pipe length. 3. No. of bends: 5 Nos.	1. Dia of pipe: To be decided by bidder. 2. Length of pipe: 50 m pipe length. 3. No. of bends: 5 Nos.
1.8	Filter type/ duty		On line / continuous	On line / continuous	On line / continuous	On line / continuous	On line / continuous
1.9	Location		ACW Pump Discharge Header (Outdoor)	ACW Pump Discharge Header (Outdoor)	ACW Pump Discharge Header (Outdoor)	ACW Pump Discharge Header (Outdoor)	ACW Pump Discharge Header (Outdoor)
2	DESIGN DATA						
2.1	Operating pressure at SCS Inlet Flange	kg/cm2 (g)	3.5 - 5.5	3.5 - 5.5	3.5 - 5.5	5.5 - 6.5	3.5 - 6.7
2.2	Design pressure for SCS Shell	kg/cm2 (g)	10	7.5	10	10	10
2.3	Design Mechanical temperature	Deg. C	60	60	60	60	60
2.4	Flow rate through filter						
	a) Normal	Cub m/Hr	600	475	150	650	280
	b) Maximum	Cub m/Hr	780	617.5	195	845	365
2.5	Design differential pressure for filter section/ screen	kg/cm2 (g)	1.5 (Min.)	1.5 (Min.)	1.5 (Min.)	1.5 (Min.)	1.5 (Min.)
2.6	Type of suspended matter likely to enter the filter		Typical debris encountered in closed circuit ACW system with Cooling Tower	Typical debris encountered in closed circuit ACW system	Typical debris encountered in closed circuit ACW system	Typical debris encountered in closed circuit ACW system	Typical debris encountered in closed circuit ACW system
2.7	Differential pressure measuring system set pressure						
	For initiating flushing/ backwashing	mbar	110	110	110	110	110
	For alarm/ annunciation	mbar	160	160	160	160	160
2.8	Filter section/ screen perforation size	mm	2 mm (max)	2 mm (max)	2 mm (max)	2 mm (max)	2 mm (max)
2.9	Free flow area in the screen basket		Atleast 120 % of pipe inlet area	Atleast 120 % of pipe inlet area	Atleast 120 % of pipe inlet area	Atleast 120 % of pipe inlet area	Atleast 120 % of pipe inlet area
2.1	Debris discharge flow during flushing period	Cub m/ Hr.	Not to exceed 3% of total flow rate	Not to exceed 3% of total flow rate	Not to exceed 3% of total flow rate	Not to exceed 3% of total flow rate	Not to exceed 3% of total flow rate
3	GUARANTEED PERFORMANCE REQUIREMENT						
3.1	Pressure drop across the filter (i.e. between inlet and outlet connection) at normal flow						
	a) Clean condition	MWC	1 MWC	1 MWC	1 MWC	1 MWC	1 MWC
	b) Partially (50%) choked condition	MWC	1.6 MWC	1.6 MWC	1.6 MWC	1.6 MWC	1.6 MWC
4	MATERIALS OF CONSTRUCTION						
4.1	Filter body/ housing including Body Flange		IS:210 Gr. FG260 or ASTM-A-515 Gr. 75/IS:2062 and internally painted with epoxy (with minimum housing thickness same as connecting pipe thickness)	IS:210 Gr. FG260 or ASTM-A-515 Gr. 75/IS:2062 and internally painted with epoxy (with minimum housing thickness same as connecting pipe thickness)	IS:210 Gr. FG260 or ASTM-A-515 Gr. 75/IS:2062 and internally painted with epoxy (with minimum housing thickness same as connecting pipe thickness)	IS:210 Gr. FG260 or ASTM-A-515 Gr. 75/IS:2062 and internally painted with epoxy (with minimum housing thickness same as connecting pipe thickness)	IS:210 Gr. FG260 or ASTM-A-515 Gr. 75/IS:2062 and internally painted with epoxy (with minimum housing thickness same as connecting pipe thickness)
4.2	Connecting pipe (Inlet/ Outlet)		CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589	CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589	Carbon Steel ERW as per IS1239 (Heavy Grade)	CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589	CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589
4.3	Filter screen/ section		SS 316	SS 316	SS 316	SS 316	SS 316
4.4	Shaft		SS 316	SS 316	SS 316	SS 316	SS 316
4.5	Supporting cage		SS 316	SS 316	SS 316	SS 316	SS 316
4.6	Differential measuring system		SS 316	SS 316	SS 316	SS 316	SS 316
4.7	Flushing/ backwashing unit		SS 316	SS 316	SS 316	SS 316	SS 316
4.8	Backwash rotor shoes		Neoprene	Neoprene	Neoprene	Neoprene	Neoprene
4.9	Any other internal hardware /pipes etc.		SS 316	SS 316	SS 316	SS 316	SS 316
4.1	Flushing Pump (If applicable)						
	a) Casing		CI to IS 210 FG 260	CI to IS 210 FG 260	CI to IS 210 FG 260	CI to IS 210 FG 260	CI to IS 210 FG 260
	b) Impeller		SS-316	SS-316	SS-316	SS-316	SS-316
	c) Shaft		SS-316	SS-316	SS-316	SS-316	SS-316

			DATA SHEET - A				SPECIFICATION NO.: PE-TS-RC4-165-N004
			SELF CLEANING STRAINER (SCS)				REV. NO.: 00. DATE : 22/02/2020
							SECTION : I. SUB-SECTION : ID
SL NO	DESCRIPTION	UNITS	TYPE - 1	TYPE-2	TYPE - 3	TYPE-4	TYPE - 5
4.11	Valves						
4.11.1	Check Valves (65 NB & Above)		For sizes 65 NB and above-Swing check type or dual plate type. End connection shall be flanged type.	For sizes 65 NB and above-Swing check type or dual plate type. End connection shall be flanged type.	For sizes 65 NB and above-Swing check type or dual plate type. End connection shall be flanged type.	For sizes 65 NB and above-Swing check type or dual plate type. End connection shall be flanged type.	For sizes 65 NB and above-Swing check type or dual plate type. End connection shall be flanged type.
	a) Body & Bonnet		Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.
	b) Disc for Check Valve		SS-316	SS-316	Carbon Steel as per ASTM-A216-Gr. WCB.	SS-316	SS-316
	c) Stem		ASTM A-182 Gr. F6a	ASTM A-182 Gr. F6a	ASTM A-182 Gr. F6 or equivalent	ASTM A-182 Gr. F6a	ASTM A-182 Gr. F6a
4.11.2	Check Valves (50 NB & Below)		For size 50 NB and below-Piston type End connection shall be socket welded type.	For size 50 NB and below-Piston type End connection shall be socket welded type.	For size 50 NB and below-Piston type End connection shall be socket welded type.	For size 50 NB and below-Piston type End connection shall be socket welded type.	For size 50 NB and below-Piston type End connection shall be socket welded type.
	a) Body & Bonnet		Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105
	b) Disc for Check Valve		SS-316	SS-316	SS-316	SS-316	SS-316
	c) Stem		13% Cr Steel as per ASTM A-182 Gr. F6a.	13% Cr Steel as per ASTM A-182 Gr. F6a.	13% Cr Steel as per ASTM A-182 Gr. F6a.	13% Cr Steel as per ASTM A-182 Gr. F6a.	13% Cr Steel as per ASTM A-182 Gr. F6a.
4.11.3	Gate/ Globe Valves 50 Nb & Below		End connection shall be socket welded type.	End connection shall be socket welded type.	End connection shall be socket welded type.	End connection shall be socket welded type.	End connection shall be socket welded type.
	Body & Bonnet		Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105	Carbon steel as per ASTM A-105
4.11.4	Gate/Globe Valves (65NB & above)		End connection shall be flanged type.	End connection shall be flanged type.	End connection shall be flanged type.	End connection shall be flanged type.	End connection shall be flanged type.
	a) Body & Bonnet		Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.	Carbon Steel as per ASTM-A216-Gr. WCB.
	b) Disc		SS-316	SS-316	Carbon Steel as per ASTM-A216-Gr. WCB.	SS-316	SS-316
	c) Stem		ASTM A-182 Gr. F6a	ASTM A-182 Gr. F6a	ASTM A-182 Gr. F6 or equivalent	ASTM A-182 Gr. F6a	ASTM A-182 Gr. F6a
4.11.5	BFV Valves (65NB & above)						
	a) Body & Disc		2 % Ni Cl to IS-210 GR FG-260	2 % Ni Cl to IS-210 GR FG-260	2 % Ni Cl to IS-210 GR FG-260	2 % Ni Cl to IS-210 GR FG-260	2 % Ni Cl to IS-210 GR FG-260
	b) Sealing, Retaining segment & internals		SS-304	SS-304	SS-304	SS-304	SS-304
	c) Bearing		Self lubricating type	Self lubricating type	Self lubricating type	Self lubricating type	Self lubricating type
	d) Companion Flange		-		-		-
4.11.6	Ball valves						
	i) Body		SA 351 CF8M	SA 351 CF8M	SA 351 CF8M	SA 351 CF8M	SA 351 CF8M
	ii) Ball		SA 351 CF8M	SA 351 CF8M	SA 351 CF8M	SA 351 CF8M	SA 351 CF8M
	iii) Stem		SS 318	SS 318	SS 318	SS 318	SS 318
4.12	Debris discharge/ Interconnecting Piping material						
			a) Up to 150 NB - Carbon steel ERW, IS:1239 (Heavy Grade). b) 200 NB and above - CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589	a) Up to 150 NB - Carbon steel ERW, IS:1239 (Heavy Grade). b) 200 NB and above - CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589	a) Up to 150 NB - Carbon steel ERW, IS:1239 (Heavy Grade). b) 200 NB and above - CS to IS 2062 Gr. B, rolled & butt welded, conforming to IS 3589	a) Up to 150 NB - Carbon steel ERW, IS:1239 (Heavy Grade). b) 200 NB and above - CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589	a) Up to 150 NB - Carbon steel ERW, IS:1239 (Heavy Grade). b) 200 NB and above - CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589
4.13	Inspection hole		Required	Required	Required	Required	Required
5	COUNTER FLANGES FOR SCS SHELL		In Bidder's Scope	In Bidder's Scope	In Bidder's Scope	In Bidder's Scope	In Bidder's Scope
5.1	MATERIAL						
	a) Flanges		IS 2062, Gr. E-250B, epoxy painted	IS 2062, Gr. E-250B, epoxy painted	IS 2062, Gr. B, epoxy painted	IS 2062, Gr. E-250B, epoxy painted	IS 2062, Gr. E-250B, epoxy painted
	b) Fasteners		A 193 & A 194	A 193 & A 194	A 193 & A 194	A 193 & A 194	A 193 & A 194
	c) Gaskets		Min 4 mm thick rubber	Min 4 mm thick rubber	Min 4 mm thick rubber	Min 4 mm thick rubber	Min 4 mm thick rubber
5.2	Drilling Standard		ANSI B 16.5 / AWWA C 207 / BS EN 1092 or equivalent	ANSI B 16.5 / AWWA C 207 / BS EN 1092 or equivalent	ANSI B 16.5 / AWWA C 207 / BS EN 1092 or equivalent	ANSI B 16.5 / AWWA C 207 / BS EN 1092 or equivalent	ANSI B 16.5 / AWWA C 207 / BS EN 1092 or equivalent
6	OTHER COUNTER FLANGES		In Bidder's Scope	In Bidder's Scope	In Bidder's Scope	In Bidder's Scope	In Bidder's Scope
6.1	MATERIAL						
	a) Flanges		IS 2062, Gr. E-250B, epoxy painted	IS 2062, Gr. E-250B, epoxy painted	IS 2062, Gr. B, epoxy painted	IS 2062, Gr. E-250B, epoxy painted	IS 2062, Gr. E-250B, epoxy painted
	b) Fasteners		A 193 & A 194	A 193 & A 194	A 193 & A 194	A 193 & A 194	A 193 & A 194
	c) Gaskets		Min 4 mm thick rubber	Min 4 mm thick rubber	Min 4 mm thick rubber	Min 4 mm thick rubber	Min 4 mm thick rubber
7	Material of Other components not specified above		Suitable for intended duty & water quality	Suitable for intended duty & water quality	Suitable for intended duty & water quality	Suitable for intended duty & water quality	Suitable for intended duty & water quality

			DATA SHEET - A				SPECIFICATION NO.: PE-TS-RC4-165-N004
			SELF CLEANING STRAINER (SCS)				REV. NO.: 00. DATE : 22/02/2020
							SECTION : I. SUB-SECTION : ID
SL NO	DESCRIPTION	UNITS	TYPE - 1	TYPE-2	TYPE - 3	TYPE-4	TYPE - 5
8	PAINTING						
8.1	External Surface						
	a) Surface preparation						
	b) Primer		All surface other than stainless steels shall be painted. The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by shotblasting (SA 2.5) etc shall be subjected to BHEL/Customer approval. For all the steel surfaces, a coat of chlorinated rubber based zinc phosphate primer of minimum thickness DFT of 50 microns followed up with undercoat of chlorinated rubber paint of minimum DFT of 50 microns shall be applied. Then, intermediate coat consisting of one coat of chlorinated rubber based paint pigmented with Titanium di-oxide with minimum DFT of 50 microns and topcoat consisting of two coats of chlorinated rubber paint of approved shade and color with glossy finish and DFT of 100 microns shall be provided. Total DFT of paint system shall not be less than 200 microns.	All surface other than stainless steels shall be painted. The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by shotblasting (SA 2.5) etc shall be subjected to BHEL/Customer approval. For all the steel surfaces, a coat of chlorinated rubber based zinc phosphate primer of minimum thickness DFT of 50 microns followed up with undercoat of chlorinated rubber paint of minimum DFT of 50 microns shall be applied. Then, intermediate coat consisting of one coat of chlorinated rubber based paint pigmented with Titanium di-oxide with minimum DFT of 50 microns and topcoat consisting of two coats of chlorinated rubber paint of approved shade and color with glossy finish and DFT of 100 microns shall be provided. Total DFT of paint system shall not be less than 200 microns.	The surfaces of stainless steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting. The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by brushing, shot-blasting etc. For all the steel surfaces exposed to (outdoor installation) atmosphere, a coat of chlorinated rubber based zinc phosphate primer of minimum thickness DFT of 50 microns followed up with undercoat of chlorinated rubber paint of minimum DFT of 50 microns shall be applied. Then, intermediate coat consisting of one coat of chlorinated rubber based paint pigmented with Titanium di-oxide with minimum DFT of 50 microns and topcoat consisting of two coats of chlorinated rubber paint of approved shade and color with glossy finish and DFT of 100 microns shall be provided. Total DFT of paint system shall not be less than 200 microns.	All surface other than stainless steels shall be painted. The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by shotblasting (SA 2.5) etc shall be subjected to BHEL/Customer approval. For all the steel surfaces, a coat of chlorinated rubber based zinc phosphate primer of minimum thickness DFT of 50 microns followed up with undercoat of chlorinated rubber paint of minimum DFT of 50 microns shall be applied. Then, intermediate coat consisting of one coat of chlorinated rubber based paint pigmented with Titanium di-oxide with minimum DFT of 50 microns and topcoat consisting of two coats of chlorinated rubber paint of approved shade and color with glossy finish and DFT of 100 microns shall be provided. Total DFT of paint system shall not be less than 200 microns.	All surface other than stainless steels shall be painted. The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by shotblasting (SA 2.5) etc shall be subjected to BHEL/Customer approval. For all the steel surfaces, a coat of chlorinated rubber based zinc phosphate primer of minimum thickness DFT of 50 microns followed up with undercoat of chlorinated rubber paint of minimum DFT of 50 microns shall be applied. Then, intermediate coat consisting of one coat of chlorinated rubber based paint pigmented with Titanium di-oxide with minimum DFT of 50 microns and topcoat consisting of two coats of chlorinated rubber paint of approved shade and color with glossy finish and DFT of 100 microns shall be provided. Total DFT of paint system shall not be less than 200 microns.
	c) Intermediate						
	c) Final paint						
8.2	Internal Surface						
	a) Surface preparation		SA 2.5 of Swedish Specification SIS 05.5900.197	SA 2.5 of Swedish Specification SIS 05.5900.197	SA 2.5 of Swedish Specification SIS 05.5900.197	SA 2.5 of Swedish Specification SIS 05.5900.197	SA 2.5 of Swedish Specification SIS 05.5900.197
	b) Primer		One coat of epoxy resin based primer	One coat of epoxy resin based primer	One coat of epoxy resin based primer	One coat of epoxy resin based primer	One coat of epoxy resin based primer
	c) Final paint		Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns	Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns	Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns	Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns	Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns
9	SHOP TEST						
9.1	Hydrostatic test						
	a) Test Pressure	bar (g)	1.5 times design pressure	1.5 times design pressure	1.5 times design pressure	1.5 times design pressure	1.5 times design pressure
	b) Test duration	min.	30	30	30	30	30
9.2	Leakage test						
	a) Test Pressure	bar (g)	Design Pressure	Design Pressure	Design Pressure	Design Pressure	Design Pressure
	b) Test duration	min.	30	30	30	30	30
10	Adequate provision for future installation of cathodic protection required		YES	YES	YES	YES	YES
11	Whether automatic flushing/ back- washing operation effected by the following :						
	i. Differential pressure		YES	YES	YES	YES	YES
	ii. Adjustable timer		YES	YES	YES	YES	YES
	iii. Push button		YES	YES	YES	YES	YES
12	Whether provision for manual flushing / backwashing operation is made in the event of control system failure.		YES (if required)	YES (if required)	YES (if required)	YES (if required)	YES (if required)
13	Whether built in flushing arrangement complete with flushing pump, valves, and associated piping, is provided.		YES (if required)	YES (if required)	YES (if required)	YES (if required)	YES (if required)
14	MANDATORY SPARES		As per Annexure-III (After data sheet-A)	As per Annexure-III (After data sheet-A)	As per Annexure-III (After data sheet-A)	As per Annexure-III (After data sheet-A)	As per Annexure-III (After data sheet-A)

Notes Regarding Mandatory spares:

- Wherever set is mentioned, one set of the spares of that item shall be for complete replacement of that particular item for one equipment.
- Any fraction of a item shall mean the next higher.
- Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%) of the total population of the plant. In case, the quantity so calculated happens to be fraction, the same shall be rounded off to next higher whole number.
- Wherever the quantities have been indicated for each type, size, thickness, material, radius, range, etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid.
- In case, spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.



DATA SHEET - A

SPECIFICATION NO.: PE-TS-RC4-165-N004

SELF CLEANING STRAINER (SCS)

REV. NO.: 00. DATE : 22/02/2020

SECTION : I. SUB-SECTION : ID

SL NO	DESCRIPTION	UNITS	TYPE - 6
1.00	GENERAL		
1.1	No. of Strainers/ Filters required for station	Nos.	Total 2 Sets - i.e.(1 Working + 1 Standby)
1.2	Liquid Handled		Clarified Water
1.3	Size of SCS Shell	NB	250
1.4	Length of SCS Shell	mm	As per Bidder standard
1.5	Connecting pipe size (OD x Thk)	mm x mm	273.0 X 6.0
1.6	Scope of Counter Flange of SCS Shell		In bidder's scope
1.7	BOQ for Debris Discharge Piping (For Clarified water).		1. Dia of pipe: To be decided by bidder. 2. Length of pipe: 50 m pipe length. 3. No. of bends: 5 Nos.
1.8	Filter type/ duty		On line / continuous
1.9	Location		ACW Pump Discharge Header (Outdoor)
2	DESIGN DATA		
2.1	Operating pressure at SCS Inlet Flange	kg/cm ² (g)	5.5 - 6.5
2.2	Design pressure for SCS Shell	kg/cm ² (g)	10
2.3	Design Mechanical temperature	Deg. C	60
2.4	Flow rate through filter		
	a) Normal	Cub m/Hr	450
	b) Maximum	Cub m/Hr	585
2.5	Design differential pressure for filter section/ screen	kg/cm ² (g)	1.5 (Min.)
2.6	Type of suspended matter likely to enter the filter		Typical debris encountered in closed circuit ACW system
2.7	Differential pressure measuring system set pressure		
	· For initiating flushing/ backwashing	mbar	110
	· For alarm/ annunciation	mbar	160
2.8	Filter section/ screen perforation size	mm	2 mm (max)
2.9	Free flow area in the screen basket		Atleast 120 % of pipe inlet area
2.1	Debris discharge flow during flushing period	Cub m/ Hr.	Not to exceed 3% of total flow rate
3	GUARANTEED PERFORMANCE REQUIREMENT		
3.1	Pressure drop across the filter (i.e. between inlet and outlet connection) at normal flow		
	a) Clean condition	MWC	1 MWC
	b) Partially (50%) choked condition	MWC	1.6 MWC
4	MATERIALS OF CONSTRUCTION		
4.1	Filter body/ housing including Body Flange		IS-210 Gr. FG 260 / ASTM-A515 Gr. 75 / Carbon Steel to IS - 2062 Gr. E-250B. with epoxy painted inside (with minimum housing thickness same as connecting pipe thickness)
4.2	Connecting pipe (Inlet/ Outlet)		CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589
4.3	Filter screen/ section		SS 316
4.4	Shaft		SS 316
4.5	Supporting cage		SS 316
4.6	Differential measuring system		SS 316



DATA SHEET - A

SPECIFICATION NO.: PE-TS-RC4-165-N004

SELF CLEANING STRAINER (SCS)

REV. NO.: 00. DATE : 22/02/2020

SECTION : I. SUB-SECTION : ID

SL NO	DESCRIPTION	UNITS	TYPE - 6
4.7	Flushing/ backwashing unit		SS 316
4.8	Backwash rotor shoes		Neoprene
4.9	Any other internal hardware /pipes etc.		SS 316
4.1	Flushing Pump (If applicable)		
	a) Casing		CI to IS 210 FG 260
	b) Impeller		SS-316
	c) Shaft		SS-316
4.11	Valves		
4.11.1	Check Valves (65 NB & Above)		For sizes 65 NB and above-Swing check type or dual plate type. End connection shall be flanged type.
	a) Body & Bonnet		Carbon Steel as per ASTM-A216-Gr. WCB.
	b) Disc for Check Valve		SS-316
	c) Stem		ASTM A-182 Gr. F6a
4.11.2	Check Valves (50 NB & Below)		For size 50 NB and below-Piston type End connection shall be socket welded type.
	a) Body & Bonnet		Carbon steel as per ASTM A-105
	b) Disc for Check Valve		SS-316
	c) Stem		13% Cr Steel as per ASTM A-182 Gr. F6a.
4.11.3	Gate/ Globe Valves 50 Nb & Below		End connection shall be socket welded type.
	Body & Bonnet		Carbon steel as per ASTM A-105
4.11.4	Gate/Globe Valves (65NB & above)		End connection shall be flanged type.
	Ø Body & Bonnet		Carbon Steel as per ASTM-A216-Gr. WCB.
	Ø Disc		SS-316
	Ø Stem		ASTM A-182 Gr. F6a
4.11.5	BFV Valves (65NB & above)		
	Ø Body & Disc		2 % Ni CI to IS-210 GR FG-260
	Ø Sealing, Retaining segment & internals		SS-304
	Ø Bearing		Self lubricating type
	Ø Companion Flange		
4.11.6	Ball valves		
	i) Body		SA 351 CF8M
	ii) Ball		SA 351 CF8M
	iii) Stem		SS 316
4.12	Debris discharge/ Interconnecting Piping material		
	MATERIAL		a) Up to 150 NB - Carbon steel ERW, IS:1239 (Heavy Grade). b) 200 NB and above - CS to IS 2062 Gr. E-250B, rolled & butt welded, conforming to IS 3589
4.13	Inspection hole		Required
5	COUNTER FLANGES FOR SCS SHELL		In Bidder's Scope
5.1	MATERIAL		
	a) Flanges		IS 2062, Gr. E-250B, epoxy painted



DATA SHEET - A

SPECIFICATION NO.: PE-TS-RC4-165-N004

SELF CLEANING STRAINER (SCS)

REV. NO.: 00. DATE : 22/02/2020

SECTION : I. SUB-SECTION : ID

SL NO	DESCRIPTION	UNITS	TYPE - 6
	b) Fasteners		A 193 & A 194
	c) Gaskets		Min 4 mm thick rubber
5.2	Drilling Standard		ANSI B 16.5 / AWWA C 207 / BS EN 1092 or equivalent
6	OTHER COUNTER FLANGES		In Bidder's Scope
6.1	MATERIAL		
	a) Flanges		IS 2062, Gr. E-250B, epoxy painted
	b) Fasteners		A 193 & A 194
	c) Gaskets		Min 4 mm thick rubber
7	Material of Other components not specified above		Suitable for intended duty & water quality
8	PAINTING		
8.1	External Surface		
	a) Surface preparation		SA 2.5 of Swedish Specification SIS 05.5900.197
	b) Primer		Two coats of epoxy polyimide resin based red oxide-zinc phosphate (primer) of minimum thickness of 30 microns/coat followed up with one coat of epoxy resin based paint with MIO/coal tar based epoxy paint of minimum thickness of 80 microns shall be applied.
	c) Intermediate		
	c) Final paint		The top coat shall consist of two coats of epoxy polyamide enamel suitably pigmented of minimum thickness of 30 microns/coat. Thus total thickness shall be minimum 200 microns.
8.2	Internal Surface		
	a) Surface preparation		SA 2.5 of Swedish Specification SIS 05.5900.197
	b) Primer		One coat of epoxy resin based primer
	c) Final paint		Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns
9	SHOP TEST		
9.1	Hydrostatic test		
	a) Test Pressure	bar (g)	1.5 times design pressure
	b) Test duration	min.	30
9.2	Leakage test		
	a) Test Pressure	bar (g)	Design Pressure
	b) Test duration	min.	30
10	Adequate provision for future installation of cathodic protection required		YES
11	Whether automatic flushing/ back- washing operation effected by the following :		
	i. Differential pressure		YES
	ii. Adjustable timer		YES
	iii. Push button		YES

		DATA SHEET - A	SPECIFICATION NO.: PE-TS-RC4-165-N004
		SELF CLEANING STRAINER (SCS)	REV. NO.: 00. DATE : 22/02/2020
			SECTION : I. SUB-SECTION : ID
SL NO	DESCRIPTION	UNITS	TYPE - 6
12	Whether provision for manual flushing / backwashing operation is made in the event of control system failure.		YES (if required)
13	Whether built in flushing arrangement complete with flushing pump, valves, and associated piping, is provided.		YES (if required)
14	MANDATORY SPARES		As per Annexure-III (After data sheet-A)

Notes Regarding Mandatory spares:

1. Wherever set is mentioned, one set of the spares of that item shall be for complete replacement of that particular item for one equipment.
2. Any fraction of a item shall mean the next higher.
3. Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%) of the total population of the plant. In case, the quantity so calculated happens to be fraction, the same shall be rounded off to next higher whole number.
4. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range, etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid.
5. In case, spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

MANDATORY SPARES - SCS, RC-4						ANNEXURE-III			
	1	2	3	4	5	6	7	8	9
SL.NO.	DESCRIPTION OF EQUIPMENT / ITEM Spares to be supplied under this specification.	DESCRIPTION OF UNIT OF MEASUREMENT	UOM	TYPE-1	TYPE-2	TYPE-3	TYPE-4	TYPE-5	TYPE-6
A.	FOR TYPE-2, TYPE-3, TYPE-5:								
1	MEASURING INSTRUMENTS:								
	Transmitters of all types and model no. (for measurement of pressure, differential pressure, flow, level, temp, etc.). This shall include magnetic/electromagnetic flow meter, mass flow meter also.	10% or 1 no. of each type and model, whichever is more.	1 LOT		1	1		3	
	Local Gauges for Pressure, Differential pressure, flow, level, temp	5% or 1 no. of each type, model and range, whichever is more.	1 LOT		1	1		3	
2	OTHER RELATED CONTROL AND INSTRUMENTATION SYSTEMS / EQUIPMENTS:								
	Electronic card assembly/ PCBs, Moisture/ condensate monitor, power supply modules	10% of each type, model and rating	1 LOT		1	1		3	
3	PROCESS CONNECTION PIPING (For Impulse Piping /Tubing and Air Supply Piping as Applicable):								
	1. Valves of all types and models	10% or 1 no. of each type, class, size and model whichever is more.	1 LOT		1	1		3	
	2. 2 way, 3way, 5way valve manifolds	10% or 1 no. of each type, class, size and model whichever is more.	1 LOT		1	1		3	
	3. Fittings	10% or 1 packet of each type, class, size and model whichever is more.	1 LOT		1	1		3	
	4. Purge meters	5% of each model or 1 no. whichever is more.	1 LOT		1	1		3	
	5. Filter regulators	20% of each model or 2 nos. whichever is more.	1 LOT		1	1		3	
4	ELECTRICAL ACTUATORS:								
	Actuators	1 no of each type and rating	1 LOT		1	1		3	
	Electronic PCB of all types	10% of each type & model	1 LOT		1	1		3	
	Absolute Encoder (replaceable part)	5% of each type & model	1 LOT		1	1		3	
	Electronic Torque sensor	5% of each type & model	1 LOT		1	1		3	
B	FOR TYPE-1, TYPE-4, TYPE-6:								
1	MEASURING INSTRUMENTS:								
	All types of local indicators	1 no. of each make, model and type	1 LOT	2			1		1
	All type of Electronic Transmitters and Ultrasonic Transmitters including sensors.	10% or 1 no. of each type and model whichever is more.	1 LOT	2			1		1
2	PROCESS CONNECTION PIPING (For Impulse Piping / Tubing and Air Supply Piping as Applicable):								
	Valves	1 no. of each type, class, size and model.	1 LOT	2			1		1
	2 way, 3 way, 5 way valve manifolds	1 no. of each type, class, size and model.	1 LOT	2			1		1
	Fittings	5% or 1 no. of each type, class, size and model whichever is more.	1 LOT	2			1		1
3	ELECTRIC ACTUATORS:								
	Actuators	1 no of each type and rating	1 LOT	2			1		1
	Electronic PCB of all types	10% of each type & model	1 LOT	2			1		1
	Absolute Encoder (replaceable part)	5% of each type & model	1 LOT	2			1		1
	Electronic Torque sensor	5% of each type & model	1 LOT	2			1		1
4	OTHER RELATED CONTROL AND INSTRUMENTATION SYSTEMS / EQUIPMENTS:								
	Electronic cards & Power Supply cards	10% or 2 nos. whichever is more.	1 LOT	2			1		1

NOTES:

- Wherever set is mentioned, one set of the spares of that item shall be for complete replacement of that particular item for one equipment.
- Any fraction of a item shall mean the next higher.
- Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%) of the total population of the plant. In case, the quantity so calculated happens to be fraction, the same shall be rounded off to next higher whole number.
- Wherever the quantities have been indicated for each type, size, thickness, material, radius, range, etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid.
- In case, spares indicated in the list are not applicable to the particular design offered by the bidder, the bidders should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

Water analysis for Type-1

CLARIFIED WATER ANALYSIS

Sl. No.	Constituent	as	mg/ litre St-I	mg/Litre St-II
A) COOLING WATER ANALYSIS /CW BLOW DOWN WATER ANALYSIS				
1.	Calcium	CaCO ₃	237	316
2.	Magnesium	CaCO ₃	219	292
3.	Sodium	CaCO ₃	195	260
4.	Potassium	CaCO ₃	18	24
5.	Total Cations	CaCO ₃	669	892
6.	M-Alkalinity	CaCO ₃	120	120
7.	P-Alkalinity	CaCO ₃	0	0
8.	Nitrate CaCO ₃	CaCO ₃	6.6	8.8
9.	Chloride	CaCO ₃	189	252
10.	Sulphate	CaCO ₃	120	160
11.	Total Anions	CaCO ₃	669	892
12.	Silica	SiO ₂	45	60
13.	Iron	Fe	0.36	0.48
14.	pH Value	-	6.5-6.9	6.5-6.9
15.	Turbidity	NTU	4.5	6
16.	Total Dissolved solids	CaCO ₃	735	980
17.	Organic matter (Oxygen absorbed from Acid Permanganate In 4 Hrs.)	mg/l	0.1	0.1

Note : The C.W system is expected to operate at about 3 Cycles of Concentration for St- I and 4 cycles of concentration for St-II.

CLAUSE NO.	Water analysis for Type-2			
	Table-3			
	S.No	Constituent	As	mg/l (except pH & turbidity)
	1.	Calcium	CaCO ₃	131
	2.	Magnesium	CaCO ₃	52
	3.	Sodium + Potassium	CaCO ₃	65
	4.	Total Cations	CaCO ₃	248
	5.	Chloride	CaCO ₃	20
	6.	Sulphate	CaCO ₃	93
	7.	Nitrate	CaCO ₃	10
	8.	Alkalinity	CaCO ₃	125
	9.	Total Anions	CaCO ₃	248
	10.	Iron(total)	Fe	0.3
	11.	Total Silica	SiO ₂	22
	12.	pH value	---	7.0-8.2
	13.	Turbidity	NTU	10
Note: Clarified water is used for CW system as make u p & the CW system is expected to operate at about 5.0 – 5.5 Cycles of Concentration (COC) with suitable chemical treatment progra m using acid, scale & corrosion in hibitor dosing. As CW blow down water is tapped from CW system, the water quality of CW blow down shall accordingly be arrived by the bidder.				
Table-4				
ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER				
Sl.No.		Characteristics	Value	
1.		Silica (Max.)	0.02 ppm as Sio2	
2.		Iron as Fe	Nil	
3.		Total hardness	Nil	
4.		pH value	6.8 -7.2	
5.		Conductivity	Not more than 0.1 micro mhos/cm excluding the effects of free CO2	
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2		SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)
PAGE - 29 - OF 31				

Table-4

DESIGN CLARIFIED WATER ANALYSIS

S.No	Constituent	As	mg/l (except pH & turbidity)
1.	Calcium	CaCO ₃	38
2.	Magnesium	CaCO ₃	22
3.	Chloride	CaCO ₃	20
4.	Sulphate	CaCO ₃	17
5.	Alkalinity	CaCO ₃	54
6.	Iron(total)	Fe	0.1
7.	Total Silica	SiO ₂	07
8.	pH value	---	7.5
9.	Turbidity	NTU	02

Note: Clarified water is used for CW system as make up & the CW system is expected to operate at about 5.0 – 5.5 Cycles of Concentration (COC) with suitable chemical treatment program using acid, scale & corrosion inhibitor dosing. As CW blow down water is tapped from CW system, the water quality of CW blow down shall accordingly be arrived by the bidder.

Table-5

ANALYSIS OF DM WATER

S.N.	Characteristics	Value
1.	Silica (Max.)	0.02 ppm as SiO ₂
2.	Iron (Fe)	Nil
3.	Total hardness	Nil
4.	pH value	6.8 to 7.2
5.	Conductivity	Not more than 0.1 µs/cm

TABLE-3 (NOT USED)

TABLE-4

WATER ANALYSIS

Sl. No.	Constituent	as	mg per litre
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A) COOLING WATER ANALYSIS /CW BLOW DOWN WATER ANALYSIS

1.	Calcium	CaCO ₃	153.6
2.	Magnesium	CaCO ₃	42
3.	Sodium+Potassium	CaCO ₃	75
5.	Total Cations	CaCO ₃	270.6
6.	Bicarbonates	CaCO ₃	107.1
7.	Carbonates	CaCO ₃	0
8.	Nitrate	CaCO ₃	CaCO ₃ 0
9.	Chloride	CaCO ₃	45
10.	Sulphate	CaCO ₃	118.5
11.	Total Anions	CaCO ₃	270.6
12.	Silica		SiO ₂ 33
13.	Iron		Fe 1.0
14.	pH Value	-	7.8-8.2
15.	Turbidity	NTU	60

Note : The C.W system is expected to operate at about 3 Cycles of Concentration.

CLAUSE NO.	Water analysis for Type-5			एनटीपीसी NTPC																																																								
	Table-3																																																											
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LOT-IA PROJECTS FLUE GAS DE-SULPHURIZATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI, PART-A BID DOCUMENT NO.: CS-0011-109(1A)-2		SUB-SECTION-II-A11 PROJECT INFORMATION NABINAGAR TPP																																																								
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CLAUSE NO.

Project Information



Table-4
DESIGN CLARIFIED WATER ANALYSIS

S.No	Constituent	As	mg/l (except pH & turbidity)
1.	Calcium	CaCO ₃	200.5
2.	Magnesium	CaCO ₃	92
3.	Sodium + Potassium	CaCO ₃	96
4.	Total Cations	CaCO ₃	388.50
5.	Chloride	CaCO ₃	106
6.	Sulphate	CaCO ₃	58.5
7.	Alkalinity	CaCO ₃	224
8.	Total Anions	CaCO ₃	388.50
9.	Iron(total)	Fe	0.3
10.	Silica	SiO ₂	10
11.	pH value	---	7.0-8.5
12.	Turbidity	NTU	10

Note: Clarified water is used for CW system as make up & the CW system is expected to operate at about 5.0 – 5.5 Cycles of Concentration (COC) with suitable chemical treatment program using acid, scale & corrosion inhibitor dosing. As CW blow down water is tapped from CW system, the water quality of CW blow down shall accordingly be arrived by the bidder.

Table-5
ANALYSIS OF DM WATER

**ANALYSIS OF DM WATER TO BE USED
FOR
MAKE-UP WATER TO CONDENSER**

S.No.	Characteristics	Value
i)	Silica (Max.)	0.02 ppm as SiO ₂
ii)	Iron as Fe	Nil
iii)	Total hardness	Nil
iv)	pH value	6.8 to 7.2
v)	Conductivity	Not more than 0.1 excluding the effects of free CO ₂

CLAUSE NO.	PROJECT INFORMATION				एनटीपीसी NTPC																																																																										
	----- <table><thead><tr><th>Sl. No.</th><th>Constituent</th><th></th><th>as</th><th>mg per litre</th></tr></thead></table> ----- B) CLARIFIED WATER ANALYSIS <table><tbody><tr><td>1.</td><td>Calcium</td><td>CaCO₃</td><td>51.2</td><td></td></tr><tr><td>2.</td><td>Magnesium</td><td>CaCO₃</td><td>14</td><td></td></tr><tr><td>3.</td><td>Sodium+Potassium</td><td>CaCO₃</td><td>25</td><td></td></tr><tr><td>4.</td><td>Total Cations</td><td>CaCO₃</td><td>90.2</td><td></td></tr><tr><td>6.</td><td>Bicarbonates</td><td>CaCO₃</td><td>35.7</td><td></td></tr><tr><td>7.</td><td>Carbonates</td><td>CaCO₃</td><td>0</td><td></td></tr><tr><td>8.</td><td>Nitrate</td><td>CaCO₃</td><td>0</td><td></td></tr><tr><td>9.</td><td>Chloride</td><td>CaCO₃</td><td>15</td><td></td></tr><tr><td>10.</td><td>Sulphate</td><td>CaCO₃</td><td>39.5</td><td></td></tr><tr><td>11.</td><td>Total Anions</td><td>CaCO₃</td><td>90.2</td><td></td></tr><tr><td>12.</td><td>Silica</td><td>SiO₂</td><td>11</td><td></td></tr><tr><td>13.</td><td>Iron</td><td>Fe</td><td>0.3</td><td></td></tr><tr><td>14.</td><td>pH Value</td><td>-</td><td>6.8-8</td><td></td></tr><tr><td>15.</td><td>Turbidity</td><td>NTU</td><td>20</td><td></td></tr></tbody></table>				Sl. No.	Constituent		as	mg per litre	1.	Calcium	CaCO ₃	51.2		2.	Magnesium	CaCO ₃	14		3.	Sodium+Potassium	CaCO ₃	25		4.	Total Cations	CaCO ₃	90.2		6.	Bicarbonates	CaCO ₃	35.7		7.	Carbonates	CaCO ₃	0		8.	Nitrate	CaCO ₃	0		9.	Chloride	CaCO ₃	15		10.	Sulphate	CaCO ₃	39.5		11.	Total Anions	CaCO ₃	90.2		12.	Silica	SiO ₂	11		13.	Iron	Fe	0.3		14.	pH Value	-	6.8-8		15.	Turbidity	NTU	20	
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TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**

SECTION: **II**

SUB-SECTION: **IIA**

REV. NO. **0** DATE **25/02/2020**

SHEET **1** OF **1**

SUB-SECTION - IIA

STANDARD TECHNICAL SPECIFICATION (MECHANICAL)

STANDARD TECHNICAL SPECIFICATION FOR SELF CLEAING STRAINER

STANDARD QUALITY PLAN



TITLE :
STANDARD TECHNICAL SPECIFICATION
SELF CLEANING STRAINER
(Backwash Type)

SPECIFICATION NO. PE-TS-RC4-165-N004

SECTION : II

SUB SECTION : 2A

REV. NO. 01 DATE : 20.06.2016

SHEET 1 OF 8

1.00.00 GENERAL

This specification covers the Design, Performance and Operational Requirements, Constructional Features, Manufacture, Assembly. Inspection and Testing at the Manufacturer's and/or his Sub-contractor's works and Painting for delivery of Self-Cleaning Strainer (Backwash Type) complete with all accessories as specified hereinafter.

2.00.00 CODES AND STANDARDS

2.01.00 The design, materials manufacture, inspection and testing of the Self Cleaning Strainer complete with all accessories, shall comply with the requirements of the latest revisions of the following appropriate codes and standards :

2.01.01 IS/ BS/ DIN/ US Standards regarding pressure vessels, pipes, flanges and others as necessary.

2.01.02 IS/ BS/ DIN/ ASTM Standards for materials specification and testing procedures.

2.01.03 IS/ BS/ DIN/ AWWA Standards for valves and their testing.

2.02.00 In case of any conflict between the above codes/ standards and this specification, the later shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Engineer shall be final and binding.

3.00.00 DESIGN AND CONSTRUCTION

3.01.00 General Requirements

3.01.01 Unless otherwise necessary manufacturer's standard and proven models of the Self Cleaning Strainer shall be supplied.

3.01.02 The Self Cleaning Strainer shall be capable of safe, proper and continuous operation. Vibration, noise, mechanical stresses shall be kept within allowable limits specified by relevant codes / standards, in design due attention shall be given to ease of maintenance, repair and cleaning.

3.01.03 Suitable corrosion allowance shall be provided wherever necessary. Adequate provision for future installation of cathodic protection shall be provided.

3.01.04 The Self Cleaning Strainer shall be designed to suit installation in on-line or off-line arrangement as specified in Data Sheet-A.

In the on-line arrangement, the inlet and outlet pipes of the Self Cleaning Strainer shall be in line with each other on the same axis without any off-set between the centre lines of inlet and outlet pipes.

In the off-line arrangement, the Self Cleaning Strainer inlet and outlet pipes shall be at right angle (90°) to each other.



TITLE :
STANDARD TECHNICAL SPECIFICATION
SELF CLEANING STRAINER
(Backwash Type)

SPECIFICATION NO. PE-TS-RC4-165-N004

SECTION : II

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SHEET 2 **OF** 8

3.02.00 **Performance Requirements**

The Self Cleaning Strainer with all accessories shall be designed and guaranteed to meet the following requirements:-

- 3.02.01 The Self Cleaning Strainer shall perform satisfactorily under the flow and pressure conditions specified in Data Sheet -A and shall be capable of housing the various forms of debris / sludge i.e., suspended particles / matter, mussels, grass, leaves, wood pieces etc. The performance of the Self Cleaning strainer shall be continuous with minimum number of flushing/ backwashing operations.
- 3.02.02 The Self Cleaning Strainer shall be designed such that the pressure drop across the Self Cleaning Strainer (i.e., between inlet and outlet connections) under clean conditions and partially (50%) choked conditions shall not be more than those specified in Data Sheet -A.
- 3.02.03 Unless otherwise specified in Data Sheet -A, debris discharge / wash water flow rate during flushing/back washing operation shall be limited to 10% of the total flow rate and flushing / backwashing operation shall be completed within a period of maximum three (3) minutes. The pressure drop across the Self Cleaning strainer during flushing/ backwashing operation shall not be more than the pressure drop under partially (50%) choked condition.
- 3.02.04 The coarse particles and floating matter accumulating at the filter section/screen are flushed out of the system by the system by the debris flushing / backwash unit such that the pressure drop across the filter after flushing / backwashing, shall not be more than 1.1 times the pressure drop under clean conditions.

3.03.00 **Operational Requirement**

The Self Cleaning Strainer and other accessories shall be designed for the following flushing/backwashing operation modes:

- 3.03.01 Complete automatic flushing/backwashing operation effected by the following:-
- ◆ differential pressure measuring system at a pre-determined differential pressure across the filter screen.
 - ◆ adjustable timer (0-24 hours)
 - ◆ push button (for manual initiation of sequential flushing / backwashing)
- 3.03.02 Manual operation in the event of failure of control system.

3.04.00 **Filter Housing/ Body**

- 3.04.01 The Self Cleaning Strainer housing/body shall be designed and manufactured as per the applicable codes for pressure vessels. It shall house the filter section / screen assembly and shall have flanged inlet, outlet, flushing/ debris discharge openings and pressure measuring tappings etc.



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- 3.04.02 In design of SCS housing/ body due attention shall be given for easy removal and replacement of filter section / screen assembly.
- 3.04.03 The Self Cleaning Strainer shall be provided with inspection hole with bolted cover.
- 3.04.04 The SCS body / housing shall be provided with vent and drain connections with isolating valves. It shall be possible to drain unfiltered and filtered water.
- 3.04.05 If specified in Data Sheet-A, filter body/housing shall be epoxy painted.
- 3.05.00 **Filter Section / Screen assembly.**
- 3.05.01 The Self Cleaning Strainer section/screen shall be designed for the maximum differential pressure across the filter and shall be securely positioned by a supporting cage and shall be securely mounted in the housing or body.
- 3.05.02 The perforation/mesh size of the strainer section shall not be more than that specified in Data Sheet-A.
- 3.05.03 The arrangement of the Strainer section shall be such that the forced accumulation of debris on the filter screen / section shall be minimum.
- 3.06.00 **Differential Pressure Measuring System**
- 3.06.01 The Self Cleaning Strainer shall be provided with a measuring system for differential pressure across the filter section/screen, to check debris accumulation and to initiate flushing/ backwashing operation. This shall consist of a differential pressure transmitter for automatic flushing operation, a differential pressure gauge for manual observation with adequate number of tapping with isolating valves and equalising valves.
- 3.06.02 The contacts for differential pressure transmitter and for differential pressure gauge shall be independent so that in the event of failure of one, the other is available.
- 3.06.03 The differential pressure measuring system shall be provided with D.P. transmitter & DPG of remote seal arrangement..
- 3.07.00 **Flushing / Backwash Unit. :**
- 3.07.01 The Self Cleaning Strainer shall be provided with suitable flushing/backwash unit (to be installed at ground floor) and debris discharge/ backwash outlet valve with associated actuator to flush out the accumulated debris/ sludge.
- 3.07.02 The flushing pump shall be provided with mechanical seals to the extent possible. If gland packing is provided it should be of good quality to prevent leakage of water from pump glands.



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3.07.03 The flushing arrangement shall be either fixed type with flushing valves or a rotating debris extractor.

3.07.04 If any water is to be injected for backwashing the filter section/screen, water shall be taken from down-stream side of the filter section/ screen. Necessary pump, valves and piping for water injection shall be supplied.

3.07.05 View glass to be provided in debris outlet pipe to monitor the flushing of debris.

3.08.00 Valves

The flushing valves (if any,) the debris discharge/backwash outlet valve, isolation, vent and drain valves shall conform to appropriate codes / standards.

3.09.00 Instrumentation and Control System

3.09.01 Complete instrumentation and control system for automatic flushing/backwashing operation, protection, interlocking, indication/ annunciation of high differential pressure and other malfunctions etc. shall be provided. This shall consist of adequate operational hardware, local control panel and interconnecting control and power cabling between the control panel and the Self Cleaning strainer and its associated electrical devices.

3.09.02 The control panel shall house all necessary instruments, indicating/ annunciation lamps, alarms, differential pressure indicator, timer, function selector switches, relays, protection and interlocking systems, start/stop push buttons, counter to register number of flushing operations etc., and shall be complete with internal wiring. In addition to the above, the control panel shall meet the requirements of the enclosed specification.

3.09.03 All instrumentation shall be of reputed make and shall meet the requirement of the enclosed specification.

3.10.00 Actuators :

The actuators for flushing arrangement and debris discharge valve shall be electric motor operated and shall meet the requirements of the enclosed specification. The actuators shall be provided with auxiliary hand-wheel for manual operation in the event of power failure.

3.11.00 Electric Motors :

The drive motors for differential pressure measuring system flushing pump and water injected pump (if applicable) shall confirm to the requirements of the enclosed specification.



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STANDARD TECHNICAL SPECIFICATION
SELF CLEANING STRAINER
(Backwash Type)

SPECIFICATION NO. PE-TS-RC4-165-N004

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3.12.00 Other Accessories.

3.12.01 Counter flanges, complete with gaskets, bolts and nuts etc., shall be supplied for the filter inlet, outlet connections and all other terminal points. Fabrication, dimensions and drilling of the flanges shall conform to the codes/standards specified in Data Sheet-A/ Section -C.

3.12.02 Self Cleaning Filter shall be provided with suitable lifting arrangement for handling during erection and maintenance.

4.00.00 SHOP INSPECTION AND TESTS

4.01.00 General:

4.01.01 Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the Self Cleaning strainer and other accessories shall conform to the requirements of this specification and of the applicable codes/standards.

4.01.02 All materials used for manufacture/fabrication of the Self Cleaning Strainer shall be of tested quality. Relevant test certificates for chemical analysis, mechanical tests and heat treatment shall be made available before the final shop inspection. In case the relevant test certificates are not available, the manufacturer shall arrange to carry out the necessary tests as per approved quality plan and applicable codes at his cost, for which samples shall be identified by BHEL's representative.

4.01.03 All shop tests shall be conducted in the presence of BHEL's representative and test certificates / reports for the same shall be furnished to BHEL for approval.

4.01.04 Qualification of welding procedures and welders shall be as per ASME B&PV Code, Section-IX / applicable codes.

4.02.00 Filter Housing / Body

4.02.01 Chemical analysis, mechanical tests shall be carried out on housing/body, strainer/ screen, strainer/ screen shaft and other appurtenances as per the applicable material specification standards.

4.02.02 All butt welded joints shall be subjected to radiographic / ultrasonic testing as per applicable codes. However all welded joints shall be subjected to 100% magnetic particle / penetrant testing to ensure freedom from defects.

4.03.00 Rubber Lining (as applicable)

Rubber lining shall be subjected to surface crack test, 100% spark and hardness tests and shall be checked for layer thickness, defects etc.



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4.04.00 Filter Section/Screen assembly

Supporting cage and filter section/screen materials shall be tested for chemical properties. Checks shall be carried out for perforation/mesh size, defects etc.

4.05.00 Flushing / Backwash Unit

4.05.01 Material of various components of the flushing/Backwash Unit shall be tested for chemical and mechanical properties.

4.05.02 Hollow shaft of backwash rotor shall be ultrasonically tested as per ASTM-A 388 for internal flaws. Penetrant test shall be carried out for surface flaws.

4.06.00 Valves

Inspection and testing of valves including leakage test shall be carried out as per the requirements of the applicable standards. Correlating test certificates for materials of the valve components shall be furnished.

4.07.00 Flanges

4.07.01 In case of fabricated flanges, all the welds shall be subjected to 100% radiography as per ASME B&PV code, section VIII, Division-1.

4.07.02 In case of forged flanges, ultrasonic testing shall be carried out as per ASTM-A 388.

4.07.03 If the thickness of the plate used for flanged is 40mm or more the same shall be checked ultrasonically as per ASTM-A435 to demonstrate the absence of lamination and lack of fusion etc.

4.07.04 Chemical and mechanical test certificates shall be furnished for flange materials.

4.07.05 Flanges shall be checked for edge preparation, fit up and satisfactory working with matching parts.

4.08.00 All materials for various nozzles, seals, pipes, gaskets, nuts bolts etc., shall be of tested quality and correlating test certificates for chemical and mechanical properties shall be furnished.

4.09.00 Dimensional Checks

Dimensional checks of various components of the Self Cleaning Strainer shall be carried out as per the drawings approved by BHEL. Alignment and fit up of movable parts shall be checked.



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SUB SECTION : 2A

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4.10.00 Hydrostatic Test

Hydrostatic test shall be conducted on the Self Cleaning Strainer housing/body at a pressure of 1.5 times the design pressure. The duration of the test shall be minimum 30 minutes.

4.11.00 Leakage Test

Leakage test shall be conducted at the design pressure to demonstrate that the filter assembly is leak tight and no water seepage shall take place at various nozzle and valve connections.

4.12.00 Functional Tests

The Self Cleaning Strainer assembly complete with valves, actuators and other accessories shall be subjected to functional tests and the following shall be checked:-

4.12.01 Smooth and free operation of all movable parts.

4.12.02 Interlocks and sequential operation.

4.12.03 Satisfactory operation of actuator torque switches, limit switches etc.

4.13.0 Performance Test:

Performance Test shall be conducted to ensure that the Self Cleaning Strainer meets the specified performance requirements.

5.00.00 TESTING AT SITE

After completion of installation at site, the Self Cleaning Strainer with complete accessories, will be tested to check that the filter performance meets the requirements of its specification, Rectification of all defects shall have to be done by the supplier at no extra cost to the Owner / Purchaser. However the Owner / Purchaser reserves the right to reject the equipment/ parts not meeting the requirement if the deficiency still persists.

6.00.00 QUALITY ASSURANCE & QUALITY PLAN

6.01.00 The Self Cleaning Strainer and other accessories to be supplied shall have assured quality and workmanship.

6.02.00 Typical quality plans are enclosed herewith this specification for bidder's guidance. The bidder shall comply with these minimum requirements and shall furnish own quality plan based on materials and components of the filter being offered.



TITLE :
STANDARD TECHNICAL SPECIFICATION
SELF CLEANING STRAINER
(Backwash Type)

SPECIFICATION NO. PE-TS-RC4-165-N004

SECTION : II

SUB SECTION : 2A

REV. NO. 01

DATE : 20.06.2016

SHEET 8 OF 8

7.00.00 **NAME PLATE AND TAG NUMBERS**

7.01.00 The Self Cleaning Strainer shall be provided with a permanently attached brass or stainless steel plate indicating the following details:-

- a) Design and maximum flow rates
- b) Design and test pressures
- c) Design temperature
- d) Filter section/screen mesh size
- e) Empty and operating weights
- f) Revolving speed of backwash rotor

7.02.00 Each valve shall be provided with a name plate indicating the following:-

- a) Service
- b) Design and test pressures
- c) Maximum flow and flow direction
- d) Size
- e) Tag Number

Tag numbers will be indicated on the drawing submitted for approval during contract stage.

7.03.00 Each motor / actuator shall be provided with a name plate indicating the following details:

- a) Supply conditions.
- b) KW Rating
- c) Make

8.00.00 **DRAWINGS, DATA & INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT:**

The drawings, data and other documents as required in Data Sheet-C shall be furnished after the award of contract.



TITLE :

DATA SHEET - C
SELF CLEANING STRAINER
(Backwash Type)

SPECIFICATION NO. PE-TS-RC4-165-N004

SECTION : II

SUB SECTION : IIA

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DATE : 08.06.2016

SHEET 1 OF 2

1.00.00 DRAWINGS, DATA AND INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT:

After the award of contract, the following drawings, data and information is to be submitted for review / approval of BHEL.

1.01.00 The drawings to be submitted by bidder in event of award of contract shall be as per NIT.

1.01.01 Data Sheet -B.

1.01.02 Final versions of the following drawings to enable BHEL to finalise the layout and to design foundations and structures.

- a) General arrangement / Installation drawings of the Self Cleaning Strainer with all accessories, indicating the principal dimensions and weights of equipment offered, size and location of various nozzle connections, withdrawal space and scope of supply etc.
- b) Foundation arrangement drawings (wherever applicable) showing load data on supports, size and location of anchor bolts etc.

1.02.00 Within the stipulated time period as per vendor's drawing/document list, the following shall be submitted:

1.02.01 Cross-sectional/detailed drawings of filter housing/body, filter screen/section assembly, flushing / backwash unit, differential pressure measuring system, actuators, motors, control panel etc. indicating bill of quantities and materials of construction.

10.02.02 Flow and control logic diagrams for complete filter during normal and flushing operation and system write-up covering all modes of operation.

1.02.03 Final version of performance evaluation procedures at site.

1.02.04 Detailed schedule of valves indicating tag numbers, type, make, size, pressure & temperature ratings, materials etc.

1.02.05 Detailed schedule of power & control cable.

1.02.06 Detailed schedule of piping and fittings indicating sizes, materials, maximum working pressure & temperatures etc.

1.02.07 Control panel layout and list of instruments provided on control panel and internal wiring diagrams.

1.02.08 List of annunciations, protections and interlocks provided.



TITLE :

DATA SHEET - C
SELF CLEANING STRAINER
(Backwash Type)

SPECIFICATION NO. **PE-TS-RC4-165-N004**

SECTION : II

SUB SECTION : IIA

REV. NO. 01

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SHEET 2 OF 2

- 1.02.09 Detailed drawings of flanges.
- 1.02.10 Quality Plan
- 1.02.11 Material test certificates.
- 1.02.12 Shop tests reports and certificates.
- 1.02.13 Write-up and instruction manuals for erection, operation and maintenance.
- 1.02.14 Storage instructions.
- 1.02.15 Vendor to send 3 sets of final documents (O&M Manual, GA drg, P&ID) direct to site under intimation to PEM.

[illegible]

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN			SPEC. NO		PE-TS-XXX-165-N003 (REV.0)				DATE:	
					CUSTOMER :			QP NO.:		PE-QP-999-165-N003				DATE:	
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Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check		Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks	
1	2	3	4	5	6		7	8	9	10				11	
					M	C/N									
[d]	Nozzle Pipes	Chemical properties	Major	Chemical Analysis	One sample/cast / heat / batch	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg / Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	✓	P	V	V		
		Physical properties	Major	Physical test	One sample/cast / heat / batch	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg / Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	✓	P	V	V		
		Surface defects	Minor	Visual	100%	100%	Approved drg/Data sheet	Approved drg / Data sheet	Mill Test Certificate/ Inspection Report	✓	P	V	V		
		Leak tightness	Major	Hydrostatic test	100%	100%	Approved drg/Data sheet	Approved drg / Data sheet	Mill Test Certificate/ Inspection Report	✓	P	V	V		
1.2.0	Inprocess Quality Control														
1.2.1	Welding procedure specification	Correctness	Critical	Scrutiny	100%	100%	ASME Sec. IX	ASME Sec. IX	QW 482 of ASME Sec.IX	✓	P	V	V	Welders already qualified by BHEL/ BHEL TPI / LRQA / NTPC in the past shall be employed for this job.	
1.2.2	Welding qualification	Weld soundness	Critical	Physical test	100%	100%	ASME Sec. IX	ASME Sec. IX	QW 483 of ASME Sec.IX	✓	P	V	V	Welding procedure already approved by BHEL/ BHEL TPI/ LRQA / NTPC shall be followed.	
1.2.3	Welder performance	Weld soundness	Critical	Physical test	100%	100%	ASME Sec. IX	ASME Sec. IX	QW 484 of ASME Sec.IX	✓	P	V	V	Welders already qualified by BHEL/ BHEL TPI / LRQA / NTPC in the past shall be employed for this job.	
1.2.4	Fit-up of butt weld	Alignment and dimensions	Major	Template, visual	100%	100%	Manufacturing Drawing	ASME Sec.VIII Div. I	Log book/fit up report	✓	P	V	—		
1.2.5	Fit-up of shell flange and nozzle assembly to shell	Orientation, alignment and dimensions	Major	Template, visual	100%	100%	Manufacturing Drawing	ASME Sec.VIII Div. I	Log book/fit up report	✓	P	—	—		
1.2.6	Weld quality for Pressure Parts														
	[a] Root run	Surface defects	Major	Penetrant test / Visual	100%	100%	ASME Sec.VIII Div. I / sec V Appendix 8	ASME Sec.VIII Div. I Appendix 8	DPT Report	✓	P	—	—		
1.2.7	[a] Completed butt welds	1.Surface defects	Major	Penetrant test	100%	100%	ASME Sec.VIII Div. I / sec V Appendix 8	ASME Sec.VIII Div. I Appendix 8	DPT Report	✓	P	V	V		
		2.Sub-surface defects	Critical	Radiography test	10% of total weld length+ 100% T Joints.	10% of total weld length+ 100% T Joints.	ASME Sec.VIII Div. I / sec V Appendix 4 / UW 52	ASME Sec.VIII Div. I Appendix 4 / UW 52	Radiographs and inspection report	✓	P	V	V		
	[b] Completed fillet welds	Surface defects	Major	Penetrant test	100%	100%	ASME Sec.VIII Div. I / sec V Appendix 8	ASME Sec.VIII Div. I Appendix 8	DPT Report	✓	P	V	V		
BHEL															
ENGINEERING							BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL						
Sign & Date			Name		Sign & Date		Name		Sign & Date		Name		Seal		
Prepared by:			Nishant Shekhar		Checked by:		Mohit Kumar		Prepared by:						
Reviewed by:			Vishal Kr. Yadav		Reviewed by:		Ritesh Kr. Jaiswal		Reviewed by:						

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					M	C/N																																																																							
1.2.8	Pickling and Passivation	Protection Layer	Major	Visual	100%	100%	IS : 10117	IS : 10117	Pickling and Passivation Report	✓	P	V	—																																																																
1.2.9	Fabricated Shell (Prior to surface preparation)	1.Dimensions, Orientation	Major	Measurement by visual	100%	100%	Approved Drawing	Approved Drawing	Inspection report	✓	P	W	V																																																																
		2. Hydro test	Critical	Hydrostatic Pr. @ 1.5 times of design pr.(positive) [Duration minutes] 30	100%	100%	Approved Drawing/ Data sheet	Approved Drawing/ Data sheet	Inspection report	✓	P	W	V																																																																
1.3.0	Final tests (completed equipments) - After assembly	1.Dimensions, orientation, workmanship & finish	Major	Measurement by visual	100%	100%	G.A.drawing	G.A.drawing	Inspection report	✓	P	W	V																																																																
		2. Leak tightness for assembly	Critical	Leak test @ design pr.(positive) [Duration minutes] 30	100%	100%	ASME Sec.VIII Div.1	No leakage	Inspection report	✓	P	W	V																																																																
		3.Dry function test	Critical	Operational test	100%	100%	Approved Procedure	Approved Procedure	Inspection report	✓	P	W	V																																																																
1.4.0	Rubber Lining (Shell - Applicable for Sea water Application)																																																																												
1.4.1	Rubber Formulation	Tensile, elongation & hardness	Major	Physical test	One per lot	One per lot	Manufacturer's procedure	BS 6374/Equivalent	Manufacturers Test certificate	✓	P	V	V																																																																
		Polymer Identification	Major	Flame test	One per lot	One per lot	For Semi Ebonite /Ebonite Polymer catches fire and on removal from fire continues to burn	For Semi Ebonite /Ebonite Polymer catches fire and on removal from fire continues to burn	Inspection report	✓	P	V	V																																																																
		% Change in weight after 24 hours of immersion in sea water at 70°	Major	Immersion test (bleeding test)	One per lot	One per lot	ASTM D 471	+ / - 1%	Inspection report	✓	P	V	V																																																																
1.4.2	Surface preparation of items to be lined	Free from rust, scale, dust & grease	Major	Visual	100%	100%	SA 2.5	SA 2.5	Manufacturers Internal Inspection report	✓	P	—	—																																																																
1.4.3	Vulcanising	Temperature, Pressure & Time	Major	Process monitoring	100%	100%	Manufacturer's procedure	Manufacturer Procedure	Process Procedure	✓	P	—	—																																																																
1.4.4	Vulcanised Rubber Lined items	[a] Chip test	Major	Chip test	One per lot	One per lot	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	✓	P	V	V																																																																
		[b] Adhesion, Visual defects, Thickness & Hardness	Major	Measurement, Visual Inspection	100% visual, Thickness/ hardness at random	100% visual, Thickness/ hardness at random	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	✓	P	V	V																																																																
		[c] Spark test for Pin Holes at 5 kv/mm	Major	Spark test for Pin Holes	100%	100%	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	✓	P	V	V																																																																
<table border="1"> <tr> <th colspan="6">BHEL</th> <th colspan="2">BIDDER/ SUPPLIER</th> <th colspan="5">FOR CUSTOMER REVIEW & APPROVAL</th> </tr> <tr> <th colspan="3">ENGINEERING</th> <th colspan="3">QUALITY</th> <th colspan="2">Sign & Date</th> <th colspan="2">Doc No:</th> <th colspan="3"></th> </tr> <tr> <td>Sign & Date</td> <td>Name</td> <td></td> <td>Sign & Date</td> <td>Name</td> <td></td> <td>Seal</td> <td></td> <td>Sign & Date</td> <td>Name</td> <td>Seal</td> <td></td> <td></td> </tr> <tr> <td>Prepared by:</td> <td>Nishant Shekhar</td> <td></td> <td>Checked by:</td> <td>Mohit Kumar</td> <td></td> <td></td> <td></td> <td>Prepared by:</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Reviewed by:</td> <td>Vishal Kr. Yadav</td> <td></td> <td>Reviewed by:</td> <td>Ritesh Kr. Jaiswal</td> <td></td> <td></td> <td></td> <td>Reviewed by:</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>													BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL					ENGINEERING			QUALITY			Sign & Date		Doc No:					Sign & Date	Name		Sign & Date	Name		Seal		Sign & Date	Name	Seal			Prepared by:	Nishant Shekhar		Checked by:	Mohit Kumar				Prepared by:					Reviewed by:	Vishal Kr. Yadav		Reviewed by:	Ritesh Kr. Jaiswal				Reviewed by:				
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Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check		Reference Documents	Acceptance Norms	Format of Record		Agency			Remarks	
1	2	3	4	5	6		7	8	9		M	C	N	11	
					M	C/N					10				
2.0.0	GEARED MOTOR DRIVE	Running Test	Critical	Functional Test	100%	100%	Approved Data Sheet	Approved Data Sheet	Manufacturer's compliance certificate	√	P	V	V		
		No load	Critical	Functional test	100%	100%	Approved Data Sheet	Approved Data Sheet			P	V	V		
		Noise test	Critical	Functional test	100%	100%	Approved Data Sheet	Approved Data Sheet			P	V	V		
		Oil leakage test	Critical	Functional test	100%	100%	Approved Data Sheet	Approved Data Sheet			P	V	V		
		Visual	Critical	—	100%	100%	Approved Data Sheet	Approved Data Sheet			P	V	V		
		Name plate verification	Critical	—	100%	100%	Approved Data Sheet	Approved Data Sheet			P	V	V		
2.1.0	Complete Unit of planetary gear	No Leak Test	Critical	Functional test	One Sample/lot	One Sample/lot	Approved Data Sheet	Supplier Catalogue	Manufacturer's compliance certificate	√	P	V	V		
		Noise Level	Minor	Functional test	One Sample/lot	One Sample/lot	Approved Data Sheet	Approved Data Sheet			P	V	V		
		Visual Name plate Verification	Minor	—	100%	100%	Approved Data Sheet	Approved Data Sheet			P	V	V		
3.0.0	Actuators	Functional test	Major	Electrical test	100%	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Test certificate	√	P	V	V		
		Make, Range, Model	Major	Visual	100%	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Inspection Report	—	P	—	—		
		Assembly check alongwith valves	Major	Visual	100%	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Inspection Report	—	P	—	—		
		Functional Check along with settings / Auxillary Caontacts	Major	Visual	100%	100%	Supplier catalogue	Supplier catalogue/Appd data sheet	Inspection Report	—	P	V	—		
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	Sign & Date	Name		Sign & Date	Name		Seal			Sign & Date	Name	Seal			
Prepared by:		Nishant Shekhar	Checked by:	Mohit Kumar					Prepared by:						
Reviewed by:		Vishal Kr. Yadav	Reviewed by:	Ritesh Kr. Jaiswal					Reviewed by:						

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Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check		Reference Documents	Acceptance Norms	Format of Record		Agency			Remarks
											M	C	N	
1	2	3	4	5	6		7	8	9		**	10		11
					M	C/N								
4.1.0	Internal Fasteners SS													
4.1.1	Stainless Steel Fasteners	Chemical properties	Major	Chemical analysis	1 Per heat/HT Batch	1 Per heat/HT Batch	Approved Drawing	Approved Drawing	Test certificate/Compliance certificate	√	P	V	V	
		Physical properties	Major	Physical test	1 per heat	1 per heat	Approved Drawing	Approved Drawing	Test certificate/Compliance certificate	√	P	V	V	
		Visual Workmanship finish	Major	Visual	Random	Random	Approved Drawing	Approved Drawing	Inspection report	√	P	V	V	
		Dimensions	Major	Measurement	Random	Random	Approved Drawing	Approved Drawing	Inspection report	√	P	V	V	
4.2.0	Carbon steel fasteners	Visual	Major	Visual	Random	Random	Approved Drawing	Approved Drawing	Manufacturer's certificate / Lab Report	√	P	V	V	
		Dimensions	Major	Measurement	Random	Random	Approved Drawing	Approved Drawing	Manufacturer's certificate / Lab Report	√	P	V	V	
		Physical properties	--	Physical test	1 sample per heat	1 sample per heat	IS : 1367	IS : 1367	Manufacturer's certificate / Lab Report	√	P	V	V	
				a) Tensile										
				b) Yield										
				c) Elongation										
				d) Proof load										
5.0.0	All Components / Equipments	Painting Dry film thickness and visual	Major	Measurement	Random	Random	Technical Specification	Technical Specification	Inspection report	√	P	W	V	
		Packing	Major	Measurement	100%	100%	Technical Specification	Technical Specification	Inspection report	√	P	W	-	
BHEL							BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL					
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1	2	3	4	5	6		7	8	9	10			11
					M	C/N							
LEGENDS:													
RECORDS, IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.													
** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER,													
P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE													
MA: MAJOR, MI: MINOR, CR: CRITICAL													
NOTES:													
1) BHEL reserves the right for conducting repeat test, if required.													
2) After packing and prior to issue of MDCC, Photographs of Complete material (to be dispatched) shall be sent to BHEL-Purchase group for review.													
3) For export job, packing shall be witness as per BHEL seaworthy packing specification.													
4) The latest revisions/year of issue of all the IS indicated in the QP shall be referred .													
5) Material shall be packed suitably in order to avoid damage during transit and also during storage at site in tropical climate condition													
6) BHEL reserves the right to conduct PMI of SS componenets.													
BHEL							BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL				
ENGINEERING				QUALITY			Sign & Date		Doc No:				
	Sign & Date	Name		Sign & Date	Name		Seal		Sign & Date	Name	Seal		
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TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**
SECTION: **II**
SUB-SECTION: **IIB**
REV. NO. **0** DATE **25/02/2020**
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SUB-SECTION - IIB

STANDARD TECHNICAL SPECIFICATION (ELECTRICAL)



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO. PE-SS-999-506-E101
VOLUME NO. : II-B
SECTION : D
REV NO. : 00 DATE : 29/08/2005
SHEET : 1 OF 1

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101																														
		VOLUME NO. : II-B																														
		SECTION : D																														
		REV NO. : 00 DATE : 29/08/2005																														
		SHEET : 1 OF 4																														
1.0 INTENT OF SPECIFIATION The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer’s work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station. Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.																																
2.0 CODES AND STANDARDS Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards: <table><tr><td>IS:325</td><td>Three phase Induction motors</td></tr><tr><td>IS : 900</td><td>Code of practice for installation and maintenance of induction motors</td></tr><tr><td>IS: 996</td><td>Single phase small AC and universal motors</td></tr><tr><td>IS: 4722</td><td>Rotating Electrical machines</td></tr><tr><td>IS: 4691</td><td>Degree of Protection provided by enclosures for rotating electrical machines</td></tr><tr><td>IS: 4728</td><td>Terminal marking and direction of rotation rotating electrical machines</td></tr><tr><td>IS: 1231</td><td>Dimensions of three phase foot mounted induction motors</td></tr><tr><td>IS: 8789</td><td>Values of performance characteristics for three phase induction motors</td></tr><tr><td>IS: 13555</td><td>Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment</td></tr><tr><td>IS: 2148</td><td>Flame proof enclosures for electrical appliance</td></tr><tr><td>IS: 5571</td><td>Guide for selection of electrical equipment for hazardous areas</td></tr><tr><td>IS: 12824</td><td>Type of duty and classes of rating assigned</td></tr><tr><td>IS: 12802</td><td>Temperature rise measurement for rotating electrical machnines</td></tr><tr><td>IS: 12065</td><td>Permissible limits of noise level for rotating electrical machines</td></tr><tr><td>IS: 12075</td><td>Mechanical vibration of rotating electrical machines</td></tr></table> In case of imported motors, motors as per IEC-34 shall also be acceptable.			IS:325	Three phase Induction motors	IS : 900	Code of practice for installation and maintenance of induction motors	IS: 996	Single phase small AC and universal motors	IS: 4722	Rotating Electrical machines	IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines	IS: 4728	Terminal marking and direction of rotation rotating electrical machines	IS: 1231	Dimensions of three phase foot mounted induction motors	IS: 8789	Values of performance characteristics for three phase induction motors	IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment	IS: 2148	Flame proof enclosures for electrical appliance	IS: 5571	Guide for selection of electrical equipment for hazardous areas	IS: 12824	Type of duty and classes of rating assigned	IS: 12802	Temperature rise measurement for rotating electrical machnines	IS: 12065	Permissible limits of noise level for rotating electrical machines	IS: 12075	Mechanical vibration of rotating electrical machines
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IS: 12075	Mechanical vibration of rotating electrical machines																															
3.0 DESIGN REQUIREMENTS 3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A 3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above. 3.3 Starting Requirements 3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment. 3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.																																

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 2 OF 4
The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.		
3.3.3 The following frequency of starts shall apply i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature. ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour) iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor		
3.4 Running Requirements		
3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.		
3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.		
3.5 Stress During bus Transfer		
3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.		
3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.		
3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.		
3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.		
4.0 CONSTRUCTIONAL FEATURES		
4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy		
4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362. Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled		
4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.		

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
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		SHEET : 3 OF 4
4.4.	Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.	
4.5	Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.	
4.6	In case Class ‘F’ insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class ‘B’ insulation. In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.	
4.7	Terminals and Terminal Boxes	
4.7.1	Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A. Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet “A”.	
4.7.2	unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.	
4.7.3	Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.	
4.7.4	Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.	
4.7.5	Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.	
4.7.6	Degree of protection for terminal boxes shall be IP 55 as per IS 4691.	
4.7.7	Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.	
4.7.8.	Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.	
4.7.9	Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.	
4.8	Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.	
4.9	General	

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 4 OF 4
4.9.1 Motors provided for similar drives shall be interchangeable. 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors. 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above. 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956. 4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz. 4.9.6 Name plate with all particulars as per IS: 325 shall be provided 4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions. 5.0 INSPECTION AND TESTING 5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied. 5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser. 5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan. 5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A. 6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT a) OGA drawing showing the position of terminal boxes, earthing connections etc. b) Arrangement drawing of terminal boxes. c) Characteristic curves: (To be given for motor above 55 kW unless otherwise specified in Data Sheet). i) Current vs. time at rated voltage and minimum starting voltage. ii) Speed vs. time at rated voltage and minimum starting voltage. iii) Torque vs. speed at rated voltage and minimum voltage. For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling. iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.		

SUB-SECTION-V-QE1

MOTORS

MOTOR

TESTS/CHECKS TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC60034/IEC 60079-1/ IS-12615	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y										
Shaft	Y	Y	Y	Y	Y	Y			Y										
Magnetic Material	Y	Y	Y	Y			Y			Y									
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y										
Stator copper	Y	Y	Y	Y			Y		Y			Y							
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y										
Insulating Material	Y		Y	Y			Y					Y							
Tubes, for Cooler	Y	Y	Y	Y	Y				Y		Y								
Sleeve Bearing	Y	Y	Y	Y	Y				Y		Y								
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y											
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y											
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y										

CLAUSE NO.
QUALITY ASSURANCE


Wound stator	Y	Y					Y	Y											
Wound Exciter	Y	Y					Y	Y											
Rotor complete	Y	Y					Y						Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y												
Accessories, RTD, BTD, CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y																
Complete Motor	Y	Y	Y												Y	Y	Y	Y1	Y

Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant

supporting documents during QP finalization. However, No QP for LT motor upto 50KW.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard

3. Makes of major bought out items for HT motors will be subject to NTPC approval.

4. Y1 = for HT Motor / Machines only.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))	SYSTEM:	SECTION: II	SHEET 1 of 2

S. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	-	MFG. SPEC.	MFG. SPEC.	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	VISUAL	100%	-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK		P	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MFG.SPEC./	MFG.SPEC.	LOG BOOK		P	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	-	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓	P	V	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	-	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓	P	V*	-	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	-	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓	P	V*	-	* NOTE -1 & NOTE-2

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		HEMA KHUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:		PRAVEEN DUTTA	Reviewed by:		RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))	SYSTEM:	SECTION: II	SHEET 2 of 2

		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#)	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-	(#) REFER NOTE-8

NOTES:

1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

*RECORDS, IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,

** **M:** SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **B:** MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C:** CUSTOMER,

P: PERFORM, **W:** WITNESS, **V:** VERIFICATION, AS APPROPRIATE

MA: MAJOR, **MI:** MINOR, **CR:** CRITICAL

D: DOCUMENTATION

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:		HEMA KHUSHWAHA	Checked by:		KUNAL GANDHI			Reviewed by:			
Reviewed by:		PRAVEEN DUTTA	Reviewed by:		RITESH KUMAR JAISWAL			Approved by:			

CABLE SCHEDULE FORMAT

ANNEXURE III

[illegible]

CLAUSE NO.	Bidder's Name 							
	DE-1B	LT MOTORS						
	A.	GENERAL						
	5.	Manufacturer & Country of origin. (Shall be as per approved QA make)						
	6.	Equipment driven by motor						
	7.	Motor type						
	8.	Quantity						
	B.	DESIGN AND PERFORMANCE DATA						
	18.	Frame size						
	19.	Type of duty						
	20.	Type of enclosure /Method of cooling/ Degree of						
	21.	Applicable standard to which motor generally						
	22.	Efficiency class as per IS 12615						
	23.	(a)Whether motor is flame proof	Yes/No					
		(b)If yes, the gas group to which it conforms as per IS:2148						
	24.	Type of mounting						
	25.	Direction of rotation as viewed from DE END						
	26.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)						
	27.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)						
	28.	Maximum continuous load demand of driven						
	29.	Rated Voltage (volts)						
	30.	Permissible variation of :						
		a. Voltage (Volts)						
		b. Frequency (Hz)						
		c. Combined voltage and frequency						
	31.	Rated speed at rated voltage and						
	32.	At rated Voltage and frequency:						
		a. Full load current						
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;"> LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE </td> <td style="width: 33%; text-align: center;"> ATTACHMENT-12 TO SECTION-VII TECHNICAL DATA SHEETS BID DOC. NO. : CS-00111-109(1A)-2 </td> <td style="width: 33%; text-align: center;"> PART-F CHAPTER-II MODULE-II SUB-SECTION:DE1 MOTORS </td> <td style="width: 3%; text-align: center;"> PAGE 13 OF 17 </td> </tr> </table>				LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	ATTACHMENT-12 TO SECTION-VII TECHNICAL DATA SHEETS BID DOC. NO. : CS-00111-109(1A)-2	PART-F CHAPTER-II MODULE-II SUB-SECTION:DE1 MOTORS	PAGE 13 OF 17
	LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	ATTACHMENT-12 TO SECTION-VII TECHNICAL DATA SHEETS BID DOC. NO. : CS-00111-109(1A)-2	PART-F CHAPTER-II MODULE-II SUB-SECTION:DE1 MOTORS	PAGE 13 OF 17				

CLAUSE NO.	Bidder's Name		एनटीपीसी NTPC
	b. No load current		
33.	Power Factor at		
	a. 100% load		
	b. NO load		
	c. Starting.		
34.	Efficiency at rated voltage and frequency,		
	a. 100% load		
	b. 75% load		
	c. 50% load		
35.	Starting current (amps) at		
	a. 100 % voltage		
	b. 85% voltage		
	c. 80% voltage		
36.	Minimum permissible starting Voltage (Volts)		
37.	Starting time with minimum permissible voltage		
	a. Without driven equipment coupled		
	b. With driven equipment coupled		
38.	Safe stall time with 100% and 110% of rated		
	a. From hot condition		
	b. From cold condition		
39.	Torques :		
	a. Starting torque at min. permissible voltage(kg-		
	b. Pull up torque at rated voltage.		
	c. Pull out torque		
	d. Min accelerating torque (kg.m) available		
	e. Rated torque (kg.m)		
40.	Stator winding resistance per phase (ohms at 20		
41.	GD ² value of motors		

LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	ATTACHMENT-12 TO SECTION-VII TECHNICAL DATA SHEETS BID DOC. NO. : CS-00111-109(1A)-2	PART-F CHAPTER-II MODULE-II SUB-SECTION:DE1 MOTORS	PAGE 14 OF 17
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CLAUSE NO.	Bidder's Name			
	42.	No of permissible successive starts when motor is in hot condition		
	43.	Locked Rotor KVA Input		
	44.	Locked Rotor KVA/KW		
	45.	Vibration limit :Velocity (mm/s)		
	46.	Noise level limit (dBA)		
	C.	CONSTRUCTIONAL FEATURES		
	1.	Stator winding insulation		
		a. Class & Type		
		b. Winding Insulation Process		
		c. Tropicalised (Yes/No)		
		d. Temperature rise over specified maximum ambient temperature of 50 deg C		
		e. Method of temperature measurement		
		f. Stator winding connection		
	2.	Main Terminal Box		
		a. Type		
		b. Location(viewed from NDE side)		
		c. Entry of cables(bottom/side)		
		d. Recommended cable size(To be matched with cable size envisaged by owner)		
		e. Fault level (MVA),Fault level duration(sec)		
		f. Cable glands & lugs details (shall be suitable for		
	3.	Type of DE/NDE Bearing		
	4.	Motor Paint shade		
	5.	Weight of		
		a. Motor stator (KG)		
		b. Motor Rotor (KG)		
		c. Total weight (KG)		
	LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		ATTACHMENT-12 TO SECTION-VII TECHNICAL DATA SHEETS BID DOC. NO. : CS-00111-109(1A)-2	PART-F CHAPTER-II MODULE-II SUB-SECTION:DE1 MOTORS
	PAGE 15 OF 17			

CLAUSE NO.	Bidder's Name			
	D.	List of accessories.		
	1.	Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)		
	2.	Terminal Box for Space Heater (Yes/No)		
	3.	Speed switch (Yes/No)		
	4.	Insulation of bearing (Yes/No)		
	5.	Noise reducer(Yes/No)		
	6.	Grounding pads		
		i) No and size on motor body		
		ii) Nos on terminal Box		
	7.	Vibration pads		
		i) Nos and size		
		ii) Location		
	8.	Any other fitments		
	E.	List of curves.		
	1.	Torque speed characteristic of the motor		
	2.	Thermal withstand characteristic		
	3.	Starting. current Vs. Time		
	4.	Starting. current Vs speed		
	5.	P.F. and Effi. Vs Load		
	F.	Additional Data to be filled for each rating of DC Motor		
	1.	Rated armature voltage (Volt)		
	2.	Rated field excitation (Amp)		
	3.	Permissible % variation in voltage		
	4.	Minimum Permissible Starting voltage (volt)		
	5.	At rated voltage		
		i)Full load Armature current.(Amp)		
	LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		ATTACHMENT-12 TO SECTION-VII TECHNICAL DATA SHEETS BID DOC. NO. : CS-00111-109(1A)-2	PART-F CHAPTER-II MODULE-II SUB-SECTION:DE1 MOTORS
	PAGE 16 OF 17			

CLAUSE NO.	Bidder's Name			
		ii) Full load Field current (Amp)		
		iii) No load Armature current (Amp)		
	6.	Full load Field current (Amp)		
	7.	No load Armature current (Amp)		
	8.	Minimum permissible field current (Amp) to avoid		
		i) Maximum permissible voltage		
		ii) Rated voltage		
		iii) Minimum Permissible Voltage		
	9.	Resistance (indicative Values) in ohm		
		i) Armature winding (Arm + IP + Series) at 25		
		ii) Field Winding at 25 deg. C		
	10.	Inductance (indicative values)		
		i) Armature winding		
		ii) Field winding		
	11	Value of trimmer resistance (ohm) to be connected in series with the shunt field to		
		i) 220 V DC		
		ii) 250 V DC		
		iii) 187 V DC		
	12	Value of the external resistance (ohm) required to be connected in series with armature during starting only		
	13	Technical data sheet for external resistance box		
	14	GA drawing of motor		
	15	Starting time calculation		
	16	Starter resistance design calculation		
	17	Electrical connection diagram of motor		
	LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		ATTACHMENT-12 TO SECTION-VII TECHNICAL DATA SHEETS BID DOC. NO. : CS-00111-109(1A)-2	PART-F CHAPTER-II MODULE-II SUB-SECTION: DE1 MOTORS
				PAGE 17 OF 17

	TITLE MOTORS DATA SHEET – C	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE 27.02.2020
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	General	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	Design and Performance Data	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a Voltage	
6	b Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB)	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTORS DATA SHEET – C	SPECIFICATION NO.
		VOLUME II B
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S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	Constructional Features	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	Characteristic curves/ drawings (To be enclosed for motors of rating $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**
SECTION: **II**
SUB-SECTION: **IIC**
REV. NO. **0** DATE **25/02/2020**
SHEET **1** OF **1**

SUB-SECTION - IIC

STANDARD TECHNICAL SPECIFICATION (C &I)



SPECIFICATION FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS -999- 145 -054A

VOLUME II B

SECTION D

REV. NO. 03

DATE : 16-09-2013

SHEET 1 OF 6

1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site, **supervision, erection, and commissioning at site** of Local Panels required for control and monitoring of the Auxiliary Plant & Equipment.

2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.

2.2 As a minimum requirement, the following standards shall be complied with:

- a) IS-6005 : 1998 : Code of practice for phosphating of iron and steel.
- b) IS-5 : 2007 : Colors for ready mixed paints and enamels.
- c) IS-1248:2003 : Direct Acting Indicating Analog Elec Measuring Instruments.
- d) IS/IEC 60947:Part 1:2004 : Low Voltage switchgear & control gear: Part-I (General Rules)
- e) IS-8828:1996 : Circuit breaker for household and similar installations.
- f) IS-13947 (Part-I):1993 : Low Voltage switchgear & control gear : Part-I (General Rules)
- g) ISA-18.1:1979 : Annunciator Sequences and Specification
- h) NFPA-496:2003 : Purged & Pressurised Enclosure for Electrical Equipment in Hazardous Locations.

3.0 TECHNICAL REQUIREMENTS

3.1 Panel Construction

3.1.1 The local panels shall house the secondary instruments, annunciation system, Single loop controller, Control switches / push buttons, indicating lamps/**LED cluster**, relays, timers and other devices required for operation and monitoring of the equipment locally.

3.1.2 The panels shall be of free standing type either welded construction on angle iron (minimum section of 50 x 50 x 4 mm) structure or folded construction by sheet metal formation depending upon the equipments to be mounted on it. The panels shall be robustly built and **stiffeners** as necessary shall be provided.

3.1.3 The panel shall be suitably reinforced to ensure adequate support for all instruments mounted thereon. All welds on exposed panel surfaces shall be ground smooth.

3.1.4 The salient features of construction shall be:

Sheet material: Cold rolled sheet steel

Frame thickness: Not less than 3.0mm

Enclosure thickness: Not less than 2.5 mm for load bearing sections (Mounted with instruments)
1.6 mm for doors and Not less than 2.0 mm for others

Gland plate thickness: 3.0mm

Base channel: ISMC 100 with anti-vibration mounting & foundation bolts.

3.1.5 The panel shall be provided with rear doors with integral lockable handle. The door when locked shall be held at minimum three places. The door width shall not be more than 550mm. The doors shall be provided with suitable **stiffeners** to prevent buckling. The handle shall be on the right side of the door. The door shall be removable type with concealed hinges to facilitate maintenance work. Suitable pocket inside the door shall be provided for keeping the drawings / documents. **Double door shall be provided with suitable glass windows, as per the requirement.**

3.1.6 Suitable neoprene gasket shall be provided on all doors and removable covers. Suitable ventilation **system along with louvers** shall be provided at bottom and top of the doors covered with removable wire mesh.



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- 3.1.7 The class of protection shall be in accordance with IP-42 unless otherwise specified
- 3.1.8 All steel surfaces shall be cleaned by sand / pellet blasting, treated for pickling, degreasing and phosphating etc. by seven tank method. The panel shall have a high quality finish and appearance. The panel shall be painted with two coats of primer followed by two coats of epoxy / synthetic enamel based final paint of color shade and finish. Minimum thickness of the paint shall be 85 microns for external paint and 70 microns for internal paint.
- 3.1.9 The cable glands of the required size and type shall be supplied alongwith the Panel.
- 3.1.10 All operable and indicating devices shall be mounted on the front of the panel while aux. Relays / timers MCBs etc. required for realization of control logics shall be mounted on a mounting plate inside the panel. Auxiliary relays and timers etc. shall be grouped according to the control function. No operable or indicating devices shall be mounted below 750 mm and above 1800 mm (w.r.t. finished ground level). The devices shall be located in such a way so as to ensure easy access for operation / maintenance.
- 3.1.11 Single / dual control power supply feeders of voltage class shall be provided by the purchaser. In case redundant power supply feeders are provided then auto changeover unit shall be mounted on the panel are in the panel supplier's scope. Where DC control power supply is specified an additional 240V, 50 Hz AC supply feeder for powering of space heater and lighting shall be provided by the purchaser. Suitable arrangement shall be provided inside the panel to receive and terminate the power supply feeder(s). For this purpose MCBs of suitable current rating shall be provided by the vendor. A supervisory relay along with a pilot lamp to indicate control supply 'ON' shall be provided on the panel. Any other power supply required for the operation of the devices mounted in the panel shall be arranged by the vendor.
- 3.1.12 The internal wiring shall be carried out with 1100 volt grade PVC insulated copper multi strand wire / flexible of 1.5mm² size. AC & DC wires shall be kept separate from each other. Separate coloured wires to be used for AC and DC circuits. All wires shall be properly numbered and identified with ferrules as per the Control scheme / wiring diagram. Wires shall be routed and run through PVC troughs.
- 3.1.13 Terminal blocks shall be clip on type, 1100 volts grade. Separate terminal blocks shall be used for AC & DC circuits. The terminals shall be suitable for terminating 0.5 mm² to 2.5mm² external cables. **The TB points in terminal block shall be cage clamp type / screw type.** The terminal for ammeters shall be provided with removable links for shorting CTs. Each terminal strip shall be provided with identification strip. The terminal shall not be mounted below 250 mm **height from finished floor. The panel shall have ten (20) percent spare terminal.**
- 3.1.14 The interior of each panel shall be suitably illuminated through fluorescent **lamps / tube lights with shrouded cover of minimum 15W** operable on 240V 50 Hz AC power supply through panel door switch. A 15 Amp. 3-pin Power receptacle shall be provided.
- 3.1.15 Suitable space heaters operable on 240 Volts 50 Hz AC power system shall be provided at the panel bottom. These shall be designed to maintain the panel temperature five (5) deg. C above the ambient temperature during maintenance shutdown. Suitable isolating and control devices comprising of MCB, thermostat etc. shall be provided for the space heater.
- 3.1.16 The panel shall be provided with a copper earth bus of 25 x 6 mm size running throughout the width of the panel. It shall be terminated internally with 10 mm bolts at extreme ends for connection to; main station earth. The panel mounted equipments / devices shall be connected to earth bus through green coloured PVC insulated stranded copper conductor of 2.5 mm² size.
- 3.1.17 Local Panel shall be provided with main name plate of 150 mm x 40 mm size having inscription of 20 mm height. The individual devices on the panels shall be as provided with separate name plate with inscription of 3 mm height. The instrument / devices shall be provided with stick on label plates inside the panel. The material of the main and individual labels shall be three (3) ply 3 mm thick Traffolyte



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Sheet / 2 mm Anodised Aluminium Plate. The inscription shall be with white letters on black background on traffolyte sheet. The labels shall be fixed by self tapping non-rusting screws.

3.1.18 Vendor shall furnish electric load and heat load list (in case panel is to be placed in ac environment) of each panel.

3.2 Hazardous Area Panel Requirement

3.2.1 The Local Panel located in hazardous area shall be pressurized as per NFPA-496 requirements to render it non-hazardous. Alarms shall be provided for local and remote annunciation when pressurisation falls below 2.5 mm of water column. Protection shall be of type Z of NFPA-496. It shall not be possible to switch ON the power of purged section unless it is purged as per the recommendation of NFPA-496. Vendor must provide a protective device on the panel to protect the panel from over pressurisation.

3.2.2 Vendor shall supply pressurisation kit consisting of valves, restriction orifices, dual filter regulation, pressure gauges, pressure switches, rotameter etc. Pressurisation kit shall be surface mounting on a metal board and located outside the local panel. Pressurisation kit shall further consist of solenoid valve flow switch, timer blow off safety device etc., so as to make purging fully automatic. However final start shall be manual. Panel protection against over pressure to be provided as per NFPA-496.

3.2.3 Pressurised local control panel pressurization kit assembly design shall provide minimum leakage flow through the Local Control Panel. Panel venting shall be as per NFPA-496.

3.2.4 All components in the local panel like indicating instruments, push buttons switches, lamps etc., which are required to be energized without panel pressurization or before completion of purge cycle shall be explosion proof as per NEMA-7 & suitable for area classification.

3.2.5 All push buttons etc. requiring frequent operation during machine running shall have good positive sealing. Weatherproof housing or cover to be provided wherever necessary. Vendor shall provide pressurisation bypass switch outside explosion proof enclosure of pressurized panel with lamp indication. This shall be used only during maintenance. All hinges, screws, other non-painted metallic parts shall be of stainless steel material.

3.2.6 Provision to switch off manually all types of power shall be provided in the panel. In addition, it shall also be possible to switch off power circuits / components which are powered from motor control centre or control room manually in case of pressurization failure. All such cables from MCC and main control room shall be terminated in explosion proof boxes (NEMA-7).

3.3 Control & Monitoring devices

3.3.1 Instruments like Indicators, recorders, single loop controllers etc. as applicable and specified elsewhere for the plant / equipment shall be supplied and mounted on the panel.

3.3.2 Alarm Annunciator System

It shall be solid state discrete facia type having a sequence of ISA-S18.1A or as specified, opaque facia windows of 70 mm x 50 mm size, having two (2) lamps per window, and hooter of 10W, and provision for repeat group alarm at remote. The annunciator shall be provided with ten (10) percent spare windows or minimum two (2) windows along with electronics.

3.3.3 Relays

The relays shall be electromagnetic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable. There shall be ten (10) percent spare contacts.

3.3.4 Timers

The timers shall be electronic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However, minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable.



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3.3.5 Control / Selector Switches

Switches shall be Rotary Cam type with minimum of 5 Amps AC & 2 Amp DC continuous current rating. Selector switches shall be stay put type while control switches shall be spring-return-to-neutral type. Contact configuration and rating shall be as per the control function requirement. The switches shall be lockable type wherever specified. Each switch shall be provided with engraved plates indicating the switch position / functions.

3.3.6 Push Buttons / Indicating Lights

The push buttons shall be momentary action self-resetting type, however stop P.B. for unidirectional drives shall be provided with manual reset facility. Its contact configuration & rating shall be as required for the control function but minimum 2 NO + 2 NC of 5 Amp. AC rating. It shall have round coloured projecting tab and engraved escutcheon plate / inscription plate. Colour coding of push buttons shall be as under:

RED	Motor OFF / Valve CLOSE	YELLOW	Alarm acknowledge	Left Hand Side
GREEN	Motor ON / Valve OPEN	BLACK	Lamp test	Right Hand Side

Indicating lights shall be suitable for direct connections across specified power supplies. It shall be fitted with built in resistance to prevent circuit tripping on shorting of lamp filament. It shall be fitted with LED cluster type lamp replaceable from front.

GREEN	Motor OFF / Valve CLOSED condition	AMBER	Motor tripped	Left Hand Side
RED	Motor ON / Valve OPEN condition	WHITE	Normal / healthy	Right Hand Side

3.3.7 Ammeters

Ammeter shall be 96 x 96 mm size, 90 deg. deflection, 1.5% accuracy, 1 Amp. CT operated or with 4-20mA input and Flush mounting type

Ammeters for motors shall have six (6) times folded scale at upper end to enable motor starting current indication

3.3.8 Miniature Circuit Breaker (MCB)

These shall be instantaneous magnetic trip type for short circuit in addition to current time inverse delayed thermal trip feature for over current protection. The housing of MCB shall be made of non-ignitable, high impact material. It shall have minimum short circuit rating of 9 KA for AC Voltages and 4 KA for DC Voltages.

3.3.9 Makes of various instruments / devices shall be as given below

1.	Alarm Annunciators	:	Procon / IIC
2.	Ammeters	:	AEP / IMP
3.	Control / Selector Switches	:	Alsthom / Kaycee / Siemens / L&T
4.	Push Buttons / Indicating Lamps	:	Siemens / L&T / Teknic / Alsthom
5.	Auxiliary Relays	:	Jyoti / Siemens / L&T / OEN
6.	Timers	:	L&T / Alsthom / Bhartiya Cutler Hammer
7.	MCBs	:	S&S Power Engg. / Indo Asian / MDS
8.	Terminal Blocks	:	Jyoti / Elmex

4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance program to ensure that the equipments offered will meet the specification requirements in full.

4.2 BHEL's standard Quality Plan for LCP is enclosed with the specification. The bidder shall furnish his acceptance to BHEL's QP and submit the signed and stamped copy of QP along with the offer.



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4.3 The vendor shall conduct the following tests as a minimum requirement:

4.3.1 Routine Tests

1. High Voltage (H.V.)
2. Insulation Resistance (I.R.)
3. Functional

4.3.2 Type Tests

1. Enclosure Class Test



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5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

The bidder shall supply all commissioning spares and consumables 'as required' during Start-up, as part of the main equipment supply.

5.2. Mandatory Spares

The bidder shall offer alongwith main offer, the Mandatory Spares as specified elsewhere in the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3. Recommended Spares

The bidder shall furnish a list of Recommended Spares indicating the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation alongwith unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid :

1. Data Sheet
2. General Arrangement Drawing.
3. Catalogue and technical information for instruments and devices.
4. Quality Plan.

6.2 The vendor shall furnish the following documents in required number as agreed after the award of contract:

1. Data Shee
2. GA Drawing indicating layout of instruments, construction details, foundation details, cable gland plate alongwith cable glands and all details mentioned in this specification.
3. Control Schematic Diagram along with grouping of different terminals for various functions.
4. Catalogue and technical information for instruments and devices with selected options clearly marked.
5. O&M Manuals.
6. "As Built" Drawing.
7. CDs.

7.0 MARKING AND PACKING

7.1 Panel with all instruments / devices mounted on it shall be suitably packed & protected for the entire period of despatch, storage and erection against impact, abrasion, corrossion, incidental damage due to vermin, sunlight, high temperature, rain moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in Transit and storage in open.

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	GENERAL:			
1.01.00	Actuators shall be designed for valve operation to ensure proper function in accordance with specifications given below and complying to EN15714-2 or equivalent. All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.			
1.02.00	This sub-section of specification is applicable for following types of electric actuators:			
1.02.01	Modulating duty electric actuators:			
	These shall be provided as per standard practice of OEM of equipment, meeting other requirements of specifications. For specifications of Blade pitch actuators, refer clause no. 5.00.00 of this chapter.			
1.02.02	Electric actuators for valves/ dampers/ gates (other than covered in 1.02.01):			
	These actuators shall be Non-Intrusive type electric actuators. The interface of these actuators with DDCMIS shall be of two types viz. with Hardwired interface and with Fieldbus interface. The common requirements of both these type of actuators are specified at clause 2.00.00, specific requirements of Non-Intrusive hardwired actuators are specified at clause 3.00.00 and specific requirements of Non-Intrusive fieldbus actuators are specified at clause 4.00.00. The applications where these two types of actuators are to be provided is specified in Part-A of Technical Specifications.			
2.00.00	COMMON REQUIREMENTS FOR NON INTRUSIVE ELECTRIC ACTUATORS			
2.01.00	TYPE:			
2.01.01	The actuators shall have integral starters with built in SPP (Single Phasing Preventer). 415 V, 3 phase 3 wire power supply shall be given to the actuator from switch board as applicable through a switch fuse unit. Control voltage of the motor starter shall be 110 V AC / 24 V DC, derived suitably from 415V power supply.			
2.01.02	The actuators shall be Non- Intrusive electric actuator. All actuator settings including torque, limit shall be possible without opening the actuator cover and LCD indication shall be available integral to actuator body.			
2.02.00	RATING:			
	(a) Supply Voltage & frequency: 415V +/- 10%, 3 Phase, 3 Wire & 50HZ +/-5%.			
	(b) Sizing:			
	Open/Close at rated speed against designed differential pressure at 90% of rated voltage.			
	For ON/OFF type: Three successive open-close operations or 15 minutes, whichever is higher.			
	For inching type: 150 starts per hour or required cycles, whichever is higher.			
2.03.00	CONSTRUCTION:			
	(a) Enclosure:			
	Totally enclosed weatherproof, minimum IP-68 degree of protection.			
	(b) Manual Wheel:			
	Shall disengage automatically during motor operation.			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C-8 ELECTRIC ACTUATORS	PAGE 1 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.04.00	MOTOR: (a) Type : Squirrel cage induction motor suitable for Direct On Line (DOL)starting. (b) Enclosure: Totally enclosed, self-ventilated. (c) Insulation Class F. Temperature rise 70 Deg C. over 50 Deg C ambient. (d) Bearings: Double shielded, grease lubricated antifriction. (e) Earth Terminals: Two (f) Protection: Single Phasing Protection, Over heating protection through Thermostat (as applicable) and wrong phase sequence protection shall be provided over and above other protection features standard to bidder's design. Suitable means shall be provided to diagnose the type of fault locally.			
2.05.00	POSITION/TORQUE TRANSMITTER: The Position/ Limit measurement shall be done using absolute encoders which will give information of position/ limit in both the directions. Electronic measurement of torque shall be provided.			
2.06.00	LOCAL OPERATION: It shall be possible to operate the actuator locally also. Lockable local/remote selection shall be provided on the actuator.			
2.07.00	LCD DISPLAY: A local LCD display shall be provided to give information regarding actuator alarms, status and valve position indications as a minimum in local.			
2.08.00	WIRING: Suitable voltage grade copper wire.			
2.09.00	TERMINAL BLOCK: For power cables, the grade of TBs shall be minimum 650V.			
2.10.00	ACCESSORIES: All required accessories (if applicable) for calibration / settings/ configuration of various parameters of actuator shall be provided. For quantities, please refer Part A of technical specifications.			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	SUB-SECTION-IIIC-8 ELECTRIC ACTUATORS	PAGE 2 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.11.00	SIL CERTIFICATION: All actuators shall be certified for SIL 2 or better.			
3.00.00	SPECIFIC REQUIREMENTS FOR NON INTRUSIVE HARDWIRED ACTUATORS			
3.01.00	INTERFACES: For ON-OFF and INCHING type actuators interface with the control system shall be through hardwired signal only. (a) Open/Close command, open/ close status and disturbance monitoring signal (common contact for Overload, Thermostat, control supply failure, L/R selector switch at local & other protections operated) shall be provided hardwired. (b) The actuator shall be able to accept open/close command at 24V DC with max. 2.5VA load from control system. Accordingly suitable isolated interface in the actuator shall be provided. (c) Open/close command termination logic shall be suitably built inside actuator. (d) For typical wiring diagram Refer Tender Drawing No. 0000-999-POI-A-063 (Except plug & socket connector, if not applicable)			
3.02.00	TERMINAL BOX: Suitable terminals/ connectors, integral to actuator, for terminating instrumentation & power cables shall be provided. Necessary glands for power cables and instrumentation cables shall be provided.			
4.00.00	SPECIFIC REQUIREMENTS FOR NON INTRUSIVE FIELDBUS ACTUATORS			
4.01.00	INTERFACES: For ON-OFF and INCHING type actuators interface with the control system shall be through fieldbus network. (a) Open/ close commands, open/ close feedback status, disturbance signal etc. shall be available to the Control System through the fieldbus network along with diagnostics. The detailed diagnostics including the actuator operating data shall be available to the DDCMIS through the fieldbus network. (b) All actuators shall be Foundation Fieldbus/ Profibus compatible. However the exact protocol shall be based on finalized protocol of DDCMIS. If Profibus DP protocol is envisaged then actuator shall have two (redundant) Profibus DP ports for connecting the redundant Profibus DP cables. That is if one profibus cable is cut or not working/ not available, then complete actuator functionality shall be available through the second redundant cable without any manual intervention. (c) Open/close command termination logic shall be suitably built inside actuator.			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	SUB-SECTION-IIIC-8 ELECTRIC ACTUATORS	PAGE 3 OF 4

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
4.02.00	TERMINAL BOX: Suitable terminals/ connectors, integral to actuator, for terminating fieldbus cables and power cables shall be provided. Necessary glands for power cables and armored fieldbus cables shall be provided.		
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	SUB-SECTION-IIIC-8 ELECTRIC ACTUATORS	PAGE 4 OF 4

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
INSTRUMENTATION CABLE, CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY		

CLAUSE NO.	TECHNICAL REQUIREMENTS														
1.00.00	INSTRUMENTATION CABLE, CONTROL & POWER SUPPLY CABLE, INTERNAL WIRING AND ELECTRICAL FIELD CONSTRUCTION MATERIAL (CABLE SUB-TRAYS ETC)														
1.01.00	General requirements														
1.01.01	All cables including special cables, internal wiring and electrical field construction material shall conform to this specification, Employer approved detail engineering drawings & documents and the latest edition of the relevant standards & guidelines. The Bidder shall furnish all material and services required for the completeness of the work identified in his scope as per this specification.														
1.01.02	The Contractor shall supply, erect, terminate and test all instrumentation cables for control and instrumentation equipment/devices/systems included under Contractor's scope and ensuring completeness of the control system.														
1.01.03	Any other application where it is felt that instrumentation cables are required due to system/operating condition requirements, are also to be provided by Contractor.														
1.01.04															
1.01.05	Contractor shall supply all cable erection and laying hardware from the main trunk routes like branch cable trays/sub-trays, supports, flexible conduits, cable glands, lugs, pull boxes etc. on as required basis for all the systems covered under this specification.														
1.01.06	Wherever the quantity has been defined as on as required basis, the same are to be furnished by contractor on as required basis within his quoted lump sum price without any further cost implication to the Employer.														
2.00.00	SPECIFICATION OF INSTRUMENTATION CABLE														
2.01.00	Common Requirements														
	<table><tr><th>S. No.</th><th>Property</th><th>Requirement</th></tr><tr><td>1</td><td>Operating Voltage</td><td>225 V (peak value)</td></tr><tr><td>2.</td><td>Codes and standard</td><td>All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.</td></tr><tr><td>3.</td><td>Continuous operation suitability</td><td>At 205 Deg C for Type-C cables & heat resistant cables, at 70 Deg C for all other type of cables.</td></tr></table>	S. No.	Property	Requirement	1	Operating Voltage	225 V (peak value)	2.	Codes and standard	All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.	3.	Continuous operation suitability	At 205 Deg C for Type-C cables & heat resistant cables, at 70 Deg C for all other type of cables.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS				एनटीपीसी NTPC																																							
	S. No.	Property	Requirement																																									
	4.	Marking :- a.Progressive automatic on-line sequential marking of length in meters to be provided at every one meter on outer sheath. b.Marking to read 'FRLS' to be provided at every 5 meters on outer sheath except for Type-C cable c.Durable marking at intervals not exceeding 625 mm shall include manufacturer's name, insulation material, conductor's size, number of pairs, voltage rating, type of cable, year of manufacturer to be provided on outer sheath.																																										
	5.	Allowable Tolerance on overall diameter	+/- 2 mm (maximum) over the declared value in data sheet																																									
	6.	Variation in diameter	Not more than 1.0 mm throughout the length of cable.																																									
	7.	Ovality at any cross-section	Not more than 1.0 mm																																									
	8.	CAGE-CLAMP suitability	To be provided																																									
	9.	Color	The outer sheath shall be of blue color.																																									
	10.	Others	Repaired cables shall not be acceptable.																																									
	2.02.00	Specific Requirements																																										
	<table><tr><th>Specification Requirements</th><th>Type-A cable</th><th>Type-B cable</th><th>Type F & G cable</th><th>Type-C cable</th></tr><tr><td colspan="5">A. CONDUCTORS</td></tr><tr><td>Cross section area</td><td colspan="4">0.5 sq. mm</td></tr><tr><td>Conductor material</td><td>ANSI type KX</td><td>ANSI type SX</td><td>Annealed bare copper</td><td>ANSI type KX</td></tr><tr><td>Colour code</td><td>Yellow-Red</td><td>Black-Red</td><td>As per VDE-815</td><td>Yellow-Red</td></tr><tr><td>Conductor Grade</td><td colspan="2">As per ANSI MC 96.1</td><td>Electrolytic</td><td>As per ANSI MC 96.1</td></tr><tr><td>No & dia of strands</td><td colspan="4">7x0.3 mm (nom)</td></tr><tr><td>No. of Pairs</td><td>2</td><td>2</td><td>2/4/8/12/16/24 / 48</td><td>2</td></tr></table>					Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable	A. CONDUCTORS					Cross section area	0.5 sq. mm				Conductor material	ANSI type KX	ANSI type SX	Annealed bare copper	ANSI type KX	Colour code	Yellow-Red	Black-Red	As per VDE-815	Yellow-Red	Conductor Grade	As per ANSI MC 96.1		Electrolytic	As per ANSI MC 96.1	No & dia of strands	7x0.3 mm (nom)				No. of Pairs	2	2	2/4/8/12/16/24 / 48
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
	Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
	Max. conductor loop resistance per Km (in ohm) at 20 deg. C	As per ANSI MC 96.1		73.4	As per ANSI MC 96.1
	Reference Standard	As per ANSI MC 96.1		VDE : 0815	As per ANSI MC 96.1
	B. INSULATION				
	Material	Extruded PVC type YI 3			Teflon (i.e. extruded FEP)
	Thickness in mm (Min/Max)	0.25/0.35			0.4 / 0.50 (nominal)
	Volume Resistivity (Min) in ohm-cm	1 x 10 ¹⁴ at 20 deg. C & 1x10 ¹¹ at 70 deg. C.			2.8x 10 ¹⁴ at 20 deg. C & 2x10 ¹¹ at 205 deg. C.
	C. PAIRING & TWISTING				
	Max. lay of pairs (mm)	50			
	Single layer of binder tape on each pair provided	Each core printed with number or Numbered binder tape to be provided on each pair	Yes		Each core printed with number or Numbered binder tape to be provided on each pair
	Bunch (Unit Formation) for more than 4P	N.A	To be provided		N.A
	Conductor /pair identification as per VDE0815	N.A.	To be provided		N.A.
	D. SHIELDING				
	Type of shielding	Al-Mylar tape			
	Individual pair shielding	No	To be provided for F-type cable		No
	Minimum thickness of Individual pair shielding	No	0.028mm (28 micron)		No
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CLAUSE NO.	TECHNICAL REQUIREMENTS					
	Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable	
	Overall cable assembly shielding	To be provided				
	Minimum thickness of Overall cable assembly shielding	0.055 mm (55 micron)				
	Coverage / Overlapping	100% / 20%				
	Drain wire provided for individual shield	N.A.	Yes (for F-type) Size- 0.5 sqmm No of strands-7 Dia of strands- 0.3mm Annealed Tin coated copper		N.A.	
	Drain wire provided for overall shield	Yes, Size- 0.5 sqmm,No of strands-7,Dia of strands- 0.3mm,Annealed Tin coated copper				
	E. FILLERS (if applicable)					
	Non-hygroscopic, flame retardant	To be provided				
	F. OUTER SHEATH					
	Material	Extruded PVC compound YM1 with FRLS properties			Teflon (i.e. extruded FRP)	
	Minimum Thickness at any point	1.8 mm			0.4 mm	
	Nominal Thickness at any point	>1.8 mm			0.5 mm	
	Resistant to water, fungus, termite & rodent attack	Required				
	Minimum Oxygen index as per ASTMD-2863	29 %			N.A.	
	Minimum Temperature index as per ASTMD-2863	250 deg.C			N.A.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
	Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
	Maximum Acid gas generation by weight as per IEC-60754-1	20%			N.A.
	Maximum Smoke Density Rating as per ASTMD-2843	60% (defined as the average area under the curve when the results of smoke density test plotted on a curve indicating light absorption vs. time as per ASTMD-2843)			N.A.
	Reference standard	VDE207 Part 5,VDE-816			VDE207 Part 6 ASTM D2116
	G. Electrical Parameters				
	Mutual Capacitance Between Conductors At 0.8 Khz (Max.)	200 nF/km		120 nF/km for F type 100 nF/km for G-type	200 nF/km
	Insulation Resistance (Min.)	100 M Ohm/Km			
	Cross Talk Figure (Min.) At 0.8 Khz	60 dB		60 dB	60dB
	Characteristic Impedance (Max) At 1 Khz	N.A.		320 OHM FOR F-TYPE 340 OHM FOR G-TYPE	N.A.
	Attenuation Figure At 1 Khz (Max)	N.A.		1.2 db/km	N.A.
	H. COMPLETE CABLE				
	Complete Cable assembly	Shall pass Swedish Chimney test as per SEN-SS 4241475 class F3.			N.A.
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CLAUSE NO.	TECHNICAL REQUIREMENTS				एनटीपीसी NTPC
	Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
	Flammability	Shall pass flammability as per IEEE-383 read in conjunction to this specification			As per manufacturer's standard subject to employer's approval
	I. CABLE DRUM				
	Type	Non-returnable wooden drum (wooden drum to be constructed from seasoned wood free from defects with wood preservative applied to entire drum) or steel drum.			
	Length	1000 m $\pm$ 5% for up to & including 12 pairs 500 m $\pm$ 5% for above 12 pairs			
Note: Heat resistant instrumentation cable shall have same specification as of G/F type instrumentation cable as specified above, except that insulation and outer sheath material shall be Teflon and cable shall be suitable for continuous operation at 205 Deg. C					
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CLAUSE NO.	TECHNICAL REQUIREMENTS																																																					
4.00.00	SPCIFICATION OF CONTROL & POWER SUPPLY CABLES Refer Electrical sub-sections																																																					
5.00.00	INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available, e.g. valves limit & torque switches, switchgear) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A. TABLE A: CABLE TERMINATION TO BE FOLLOWED																																																					
<table><tr><th colspan="2">Application</th><th colspan="2">Type Of Termination</th><th rowspan="2">Type Of Cable</th></tr><tr><th>FROM (A)</th><th>TO (B)</th><th>END A</th><th>END B</th></tr><tr><td>Valves/dampers drives (Integral Junction box)</td><td>Marshalling / Marshalling – cum Termination Cubicle / local group JB</td><td>Plug in connector</td><td>Post mount cage clamp type.</td><td>G</td></tr><tr><td>Transmitters, Process Actuated switches mounted in LIE/LIR</td><td>Integral Junction box of LIE/LIR</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td>F,G</td></tr><tr><td>RTD heads</td><td>Local junction box</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td>F</td></tr><tr><td>Thermocouple</td><td>Local junction box / CJC box (if applicable)</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td>A, B, C*</td></tr><tr><td>Other Field mounted Instrument</td><td>Local JB / Group JB</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td>F,G</td></tr><tr><td>RTD</td><td>Temperature transmitter</td><td>Plug in connector</td><td>Screwed, Cage clamp type</td><td>F</td></tr><tr><td>Thermocouple</td><td>Temperature transmitter</td><td>Plug in connector</td><td>Screwed, Cage clamp type</td><td>A, B, C*</td></tr><tr><td>Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ MCC/SWGR</td><td>Group JB</td><td>Cage clamp (Rail mount) type.</td><td>Cage clamp (Rail mount) type.</td><td>F,G</td></tr></table>						Application		Type Of Termination		Type Of Cable	FROM (A)	TO (B)	END A	END B	Valves/dampers drives (Integral Junction box)	Marshalling / Marshalling – cum Termination Cubicle / local group JB	Plug in connector	Post mount cage clamp type.	G	Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.	F,G	RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.	F	Thermocouple	Local junction box / CJC box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.	A, B, C*	Other Field mounted Instrument	Local JB / Group JB	Plug in connector	Cage clamp (Rail mount) type.	F,G	RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	F	Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	A, B, C*	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G
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	Application		Type Of Termination		Type Of Cable
	FROM (A)	TO (B)	END A	END B	
	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ Group JB / MCC/SWGR	Marshalling / Marshalling – cum Termination Cubicle	Cage clamp (Rail mount) type.	Cage clamp (Post mounted) type.	F,G
	Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp (Post mounted) type.	Plug-in connector / other system as per Mfr.'s Standard	Internal wiring
	Marshalling/ Termination System Cabinets	UCD mounted equipments	Cage clamp (Post mounted) type.	Plug in connector / Cage clamp type (rail mounted).	F,G (with plug-in connect or at one end)
	DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard
Notes 1 Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs, except for pre-fabricated cables which shall be as per manufacturer's standard. 2 For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided. 3 * For high temperature applications only. 4 . For connection between field/JB and DDCMIS marshalling cabinet Minimum 4 pair instrumentation cable shall be used. 5 All the spare cores of instrumentation cable have to be terminated in Marshalling cabinets/ DCS panel end. 6 Not used.					
6.00.00	TERMINAL BLOCKS				
6.01.00	All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg. C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post				
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	mounted cage clamp connection at the field input end. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.		
6.02.00	All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, transparent covers, support brackets, distance sleeves, warning label, marking, etc.		
6.03.00	The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.		
6.04.00	For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc. refer Drg no. 0000-999-POI-A-065.		
6.05.00	The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.		
7.00.00	INTERNAL PANELS/ SYSTEM CABINETS WIRING		
7.01.00	Internal panel/cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath meeting the requirements of VDE 0815.		
7.02.00	All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferules at both ends. All wires directly connected to trip devices shall be distinguished by one additional red colour ferrule.		
7.03.00	All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.		
7.04.00	All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.		
7.05.00	All the special tools as may be required for solder less connections shall be provided by Bidder.		
7.06.00	Wire sizes to be utilised for internal wiring. (i) Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system. (ii) Power supply and internal illumination.	0.5 Sq.mm. 2.5Sq.mm. minimum (shall be as per load requirement.)	
8.00.00	INSTRUMENTATION CABLE INSTALLATION AND ROUTING		
8.01.00	All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Employer.		
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8.02.00	Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows: <table><tr><td>From 11 kV/6.6 kV/3.3 kV tray system</td><td>-</td><td>914 mm</td></tr><tr><td>From 415V tray system</td><td>-</td><td>610 mm</td></tr><tr><td>From control cable tray system</td><td>-</td><td>305 mm</td></tr></table>	From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm	From 415V tray system	-	610 mm	From control cable tray system	-	305 mm	
From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm									
From 415V tray system	-	610 mm									
From control cable tray system	-	305 mm									
8.03.00	Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance. Compression cable glands (double for armoured and single for other cables) shall be provided.										
8.04.00	Not in use										
8.05.00	The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.										
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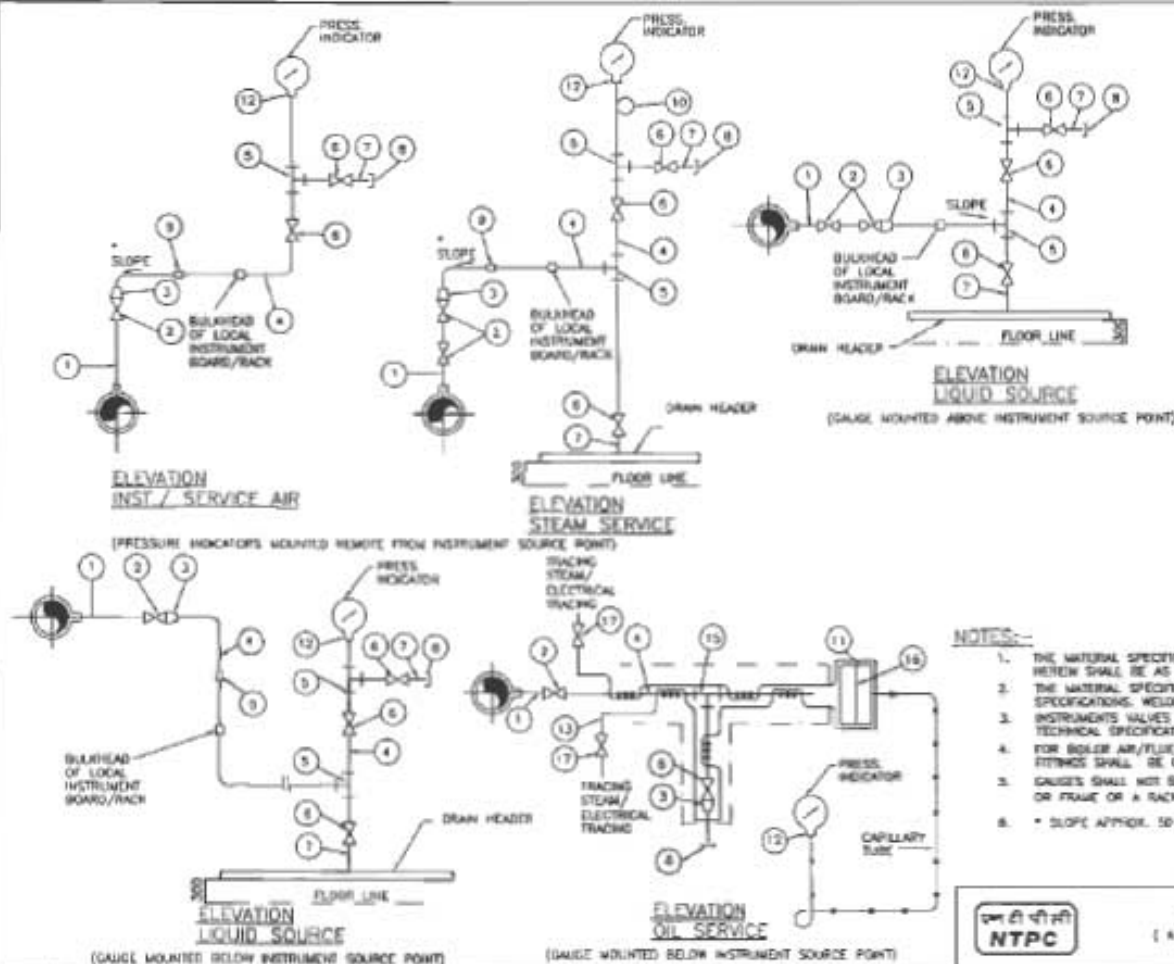
	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
INSTRUMENT INSTALLATION DRAWING		

CLAUSE NO.	TECHNICAL REQUIREMENTS																
	PROCESS CONNECTION AND PIPING 1.01.01 IMPULSE PIPING, TUBING, FITTINGS, VALVES AND VALVE MANIFOLDS 1.01.02 All impulse pipes shall be of seamless type conforming to ANSI B36.10 for schedule numbers. The size of impulse pipe shall be ½" for Steam & Water Application and ¾" for Air & Flue Gas applications. The rating of material of impulse pipes, tubes, fittings, valves and their installation thereof shall conform to the latest edition of standards as per following table: <table> <tr> <td>Impulse Pipes, Tubes (Material, Rating)</td><td>ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70</td></tr> <tr> <td>Valves (Material, Pr. Class, Size)</td><td>ASTM A182/ASTM A105 as per ASME 16.34</td></tr> <tr> <td>Fittings (Size, Rating, Material)</td><td>ANSI B31.1, ANSI B31.1a, ASME B16.11-2009</td></tr> <tr> <td>Installation Schemes</td><td>BS 6739-2009, ANSI/ISA 77.70</td></tr> </table> Stainless steel tube shall be provided inside enclosures & racks from tee connection to valve manifold and then to instrument. The source shut-off (primary process root valve) and blow down valve shall be of 1/2 inch size globe valve type for all applications except for air and flue gas service wherein no source shut-off valves are to be provided. Two root valves are to be used wherever pressure is more than 40 Kg/cm² or Temp>280 °C. The end connections of valves shall be of socket welded type. Typical installation scheme of DP Transmitter (inside LIE/LIR) mounted below instrument source point is indicated in Drg. No. 0000-999-POI-A-036. Same scheme with necessary changes shall be applied for other instruments. 1.01.03 The valve manifolds of 316 SS with pressure rating suitable for intended application shall be provided as given below: <table> <tr> <th>Manifold</th><th>Application/Measurement</th></tr> <tr> <td>2 Valve</td><td>Pressure measurements using pressure transmitters/pressure switches</td></tr> <tr> <td>3 Valve</td><td>Pressure measurements using differential pressure transmitter/ switches</td></tr> <tr> <td>5 Valve</td><td>Differential Pressure, Flow and Level Measurements</td></tr> </table> For Pr./D.P gauges, two-way globe/gate valve shall be provided on each impulse line to the instrument in Fluid/Air & Flue Gas applications respectively . 2.00.00 AIR SUPPLY PIPING 2.01.01 All pneumatic piping, fittings, valves, air filter cum regulator, purge rotameter and other accessories required for instrument air for the various pneumatic devices/ instruments shall be provided. This will include as a minimum air supply to pneumatically operated control valves, actuators, instruments, continuous and intermittent purging requirements etc. 2.02.00 Instrument air and Service air supply shall be provided for continuous and intermittent purging respectively for all transmitters of mill, dirty air and flue gas applications. Purging Scheme shall be as per Drg. No. 0000-999-POI-A-036. 2.03.00 The Contractor shall also provide SS Tubing and associated fittings (screwed type) of suitable sizes for all pneumatic equipments/actuators (including supply air, signal air and output to actuators) conforming to ANSI 31.1 and 31.3 standard. All other air supply lines shall be of mild steel hot dipped galvanized inside and outside as per IS-1239, heavy duty	Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70	Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34	Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009	Installation Schemes	BS 6739-2009, ANSI/ISA 77.70	Manifold	Application/Measurement	2 Valve	Pressure measurements using pressure transmitters/pressure switches	3 Valve	Pressure measurements using differential pressure transmitter/ switches	5 Valve	Differential Pressure, Flow and Level Measurements
Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70																
Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34																
Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009																
Installation Schemes	BS 6739-2009, ANSI/ISA 77.70																
Manifold	Application/Measurement																
2 Valve	Pressure measurements using pressure transmitters/pressure switches																
3 Valve	Pressure measurements using differential pressure transmitter/ switches																
5 Valve	Differential Pressure, Flow and Level Measurements																

CLAUSE NO.	TECHNICAL REQUIREMENTS 
	with threaded ends. Fittings for air supply line shall be of forged carbon steel A234 Gr. WPB galvanized inside and outside, screwed as per ASA B2.1. Dimensions of fittings shall be as per ASA B16.11 of rating 3000 lbs. Air supply piping shall be adequately sloped to prevent accumulation of condensed water within the pipe. The air supply headers, sub-headers and branch pipes shall be supported properly by clamps or supports.
2.04.00	The instrument/service air supply to each equipment/devices requiring air supply shall be provided by a well designed air distribution scheme comprising of 2" GI Pipe Header feeding 1" GI Pipe sub-header feeding ½" pipe at each equipment/device. Instrument air filters cum regulator set with mounting accessories shall be provided for each pneumatic device requiring air supply except for Ash Handling System wherein it shall be provided on instrument air header at each location.
2.05.00	All the isolation valves in the air supply line shall be gate valves as per ASTM B62 inside screw rising stem, screwed female ends as per ASA B2.1. Valve bonnet shall be union type & trim material shall be stainless steel, body rating 150 pounds ASA. The valve sizes shall be ½ inch to 2 inch.
2.06.00	Instrument air filters cum regulator set with mounting accessories shall be provided for pneumatic device requiring air supply. The filter regulators shall be suitable for 10-kg/ sq.cm max. Inlet pressure. The filter shall be of size 5 microns and of material sintered bronze. The air set shall have 2-inch size pressure gauge and built in filter housing blowdown valve. The end connection shall be as per the requirement to be finalized during detailed engineering.
3.00.00	INSTALLATION AND ROUTING
3.01.01	All instrument piping, tubing and its accessories shall be supported in a safe manner to prevent excessive vibrations and anchored sufficiently to prevent undue strain on connected equipment. Impulse piping shall be supported at an interval not exceeding 1.5 meters. The slope of the impulse pipe from the process connection to the instrument shall be as per ANSI/ISA 77.70 latest edition and BS 6739-2009. All impulse piping shall be installed to permit free movement due to thermal expansion. Wherever required expansion loops shall be provided.
	Condensate pots shall be provided for all level measurements in steam and water services, all flow measurement in steam services and for flow measurements in water services above 120 Deg. C. Colour coding of all impulse pipes shall be done by the Contractor in line with the colour coding being followed for the parent pipes.
4.00.00	SHOP AND SITE TESTS
4.01.01	The equipment and work performed as per this Sub-section shall be subject to shop and site test as per requirements of Sub-section-III E-04 (Quality Assurance & Inspection) other applicable clauses of this Sub-section and Employer approved quality assurance plan.
4.01.02	Hydrostatic and Pneumatic leakage tests shall be performed on all pipes, tubing and systems and shall conform to ANSI B31.1.
5.00.00	LOCAL INSTRUMENT ENCLOSURE AND RACKS All transmitters, switches etc. for FGD system and other system being provided under the contract shall be suitably grouped together and mounted inside (i) local instruments enclosures in case of open areas of the plant and (ii) In local instrument racks in case of covered areas. The GA of LIE with purging indicated in the Drg. No. 0000-999-POI-A-036 is to be followed by contractor. The GA of LIR shall be similar to LIE except for front/rear doors and side panels.

CLAUSE NO.	TECHNICAL REQUIREMENTS 
5.01.00	The internal layout shall be such that the impulse piping/ blow down lines are accessible from back side of the enclosure / rack and the transmitters etc. are accessible from front side for easy maintenance. Bulkheads, especially designed to provide isolation from process line vibration shall be installed on instrument enclosures/racks to meet the process sensing line connection requirement. Vibration dampeners shall be installed for each enclosure / rack. The Degree of Protection of LIE and JB of LIE/LIR shall be IP-55. The enclosures shall be constructed of 3 mm sheet plate and shall be of modular construction with one or more modules and two end assemblies bolted together to form an enclosure. Double inter locking doors shall be provided. The doors shall be the three-point locking type constructed of not less than 1.6 mm thick steel. Doors shall have concealed quick removal type pinned hinges and locking handles. Door locks shall accept the same key. The instrument racks shall be free standing type constructed of suitable 5 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel, and extended beyond the ends of the rack. Enclosures/Racks shall be reinforced as required to ensure true surface and to provide adequate support for instruments and equipment mounted therein. Centre posts or any member which would reduce access shall not be provided. Contractor shall provide not more than three variants for LIE/LIR with respect to max. no. transmitters mounted in each LIE/LIR. ENCLOSURE / RACKS FOR DUAL I/P TEMPERATURE TRANSMITTERS All Dual Input temperature transmitters for FGD system and other system being provided under the contract shall be suitably grouped together and mounted inside (i) Enclosures in case of open areas of the plant and (ii) Racks in case of covered areas. Integral JB shall be provided with each Enclosure and Rack. The internal layout shall be such that the transmitters are accessible from both front and back side of the enclosure / rack for easy maintenance. Enclosure/ Racks shall be of robust and rugged design. Vibration dampeners shall be installed for each enclosure / rack. The Degree of Protection of Enclosure and JB shall be IP-55. Enclosure and Racks shall be free standing type. Enclosures/Racks shall be reinforced as required to ensure true surface and to provide adequate support for instruments and equipment mounted therein. Contractor shall provide not more than five variants for Enclosure/ Rack with respect to max. no. transmitters mounted in each Enclosure/ Rack. However, the maximum number of Transmitters that can be grouped in one Enclosure/ Rack shall be decided during detail Engineering.

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LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2" x 3/4" x 1" NPS SCH 40/80/160/XXX/PS1 (AS PER PROCESS REQUIREMENT) RIFPLE OF MATERIAL SAME AS THAT OF MAIN PIPE.
2.	1/2" / 3/4" / 1" SW GLOBE VALVE/GATE VALVE
3.	3/4" / 1" x 1/2" SW REDUCING INSERT
4.	1/2" / 3/4" PIPE
5.	1/2" / 3/4" SW EQUAL TEE
6.	1/2" / 3/4" SW GLOBE VALVE
7.	1/2" / 3/4" NPS SW x 1/2" / 3/4" NPT(M) CARBON/ALLOY STEEL RIFPLE.
8.	1/2" / 3/4" NPT(F) CAP.
9.	1/2" / 3/4" PIPE UNION.
10.	8" SS SYRCON
11.	1/2" BLIND 300lb RT FLY FLANGE DRILLED AND TAPED FOR 1" NPT PIPE.
12.	SUITABLE ADAPTER
13.	1/4" CHROME MOXY STEEL TUBE.
14.	
15.	1" / 3/4" SW EQUAL TEE.
16.	INSTRADUM(RAFER ELEMENT)
17.	ISOLATION VALVE 316 SS, 1/4" SW

NOTES:-

1. THE MATERIAL SPECIFICATION AND SCHEDULE NO. OF IMPULSE PIPE & RIFPLE AS LISTED HEREIN SHALL BE AS PER TECHNICAL SPECIFICATIONS.
2. THE MATERIAL SPECIFICATION AND RATING OF FITTINGS AS LISTED SHALL BE AS PER SPECIFICATIONS. WELDED/THREADED FITTINGS SHALL CONFORM TO ANSI-B16-11.
3. INSTRUMENTS VALVES BODY STEM MATERIAL AND PRESSURE CLASS SHALL BE AS PER TECHNICAL SPECIFICATIONS.
4. FOR BOILER AIR/FLUE GAS SERVICES SOURCE CONNECTIONS IMPULSE PIPING AND ALL FITTINGS SHALL BE OF 3/4" MIN SIZE.
5. GAUGES SHALL NOT BE MOUNTED ON THE PIPE. IT WILL BE MOUNTED ON A CHANNEL OR FRAME OR A RACK.
6. * SLOPE APPROX. 50 MM / METRE.

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NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT **TYPICAL THERMAL POWER PROJECT**

TITLE **INSTRUMENT INSTALLATION DIAGRAM
(FOR PRESSURE GAUGE)**

REV. NO. **A** FIRST ISSUE

DESCRIPTION

DRAWN

DESIGN

CHKD.

M

E

C

CM

ARCH.

APPRO

DATE

21.01.12

CHECKED BY

SIZE

A3

SCALE

N.T.S.

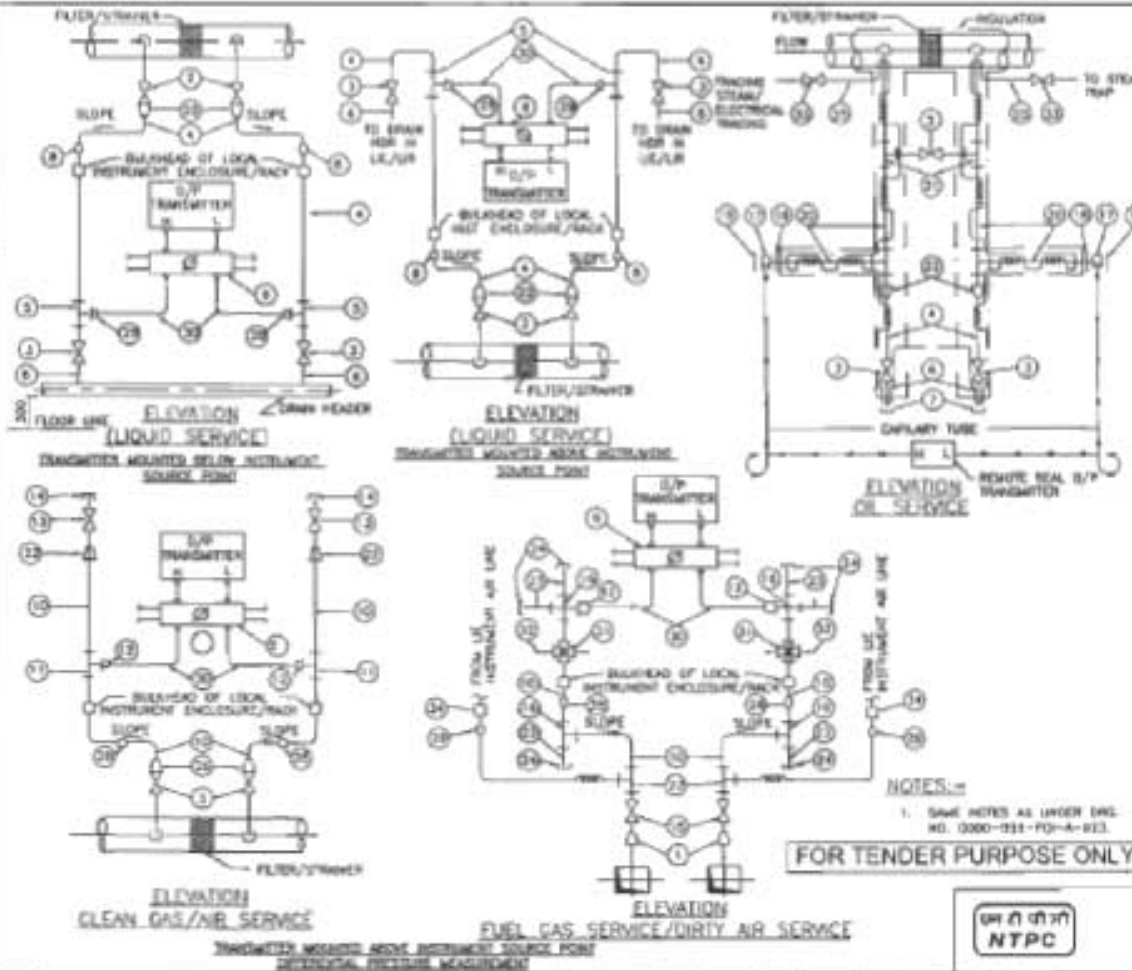
ORIG. NO.

0000-999-POI-A-022

REV. NO.

A

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NOTES:-
1. SAME NOTES AS UNDER ENCL. NO. 0000-999-POI-A-033.

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LIST OF MATERIALS	
ITEM NO.	DESCRIPTION
1.	4KX2 TO 3/4" SW REDUCING INSERT.
2.	3/4" SW GLOBE VALVE.
3.	1/2" SW GLOBE VALVE FOR LIQID APPLICATION & 3/4"/1" IN (FOR AIR APPLICATION)
4.	1/2" SW GLOBE VALVE FOR GAS PROCESS REQUIREMENT
5.	1/2" SW EQUAL TEE.
6.	1/2" NPS SW x 1/2" NPT (M) NIPPLE.
7.	1/2" NPT (F) CAP.
8.	1/2" PIPE x 1/2" PIPE UNION.
9.	1" VALVE MANIFOLD FOR DETAIL RECDY DRAWING NO.0000-999-POI-A-033.
10.	3/4" SCH 40 CARBON/ALLOY STEEL PIPE.
11.	3/4"/1/2" SW CORAL TEE.
12.	3/4"x1/2" TUBE UNION.
13.	1/2" SCREENED GLOBE VALVE.
14.	1/2" NPT (M) PLUG.
15.	3/4" SW GATE VALVE.
16.	3/4" SW EQUAL CROSS.
17.	WATER ELEMENT FOR USE WITH 3"AND 4" VALVE.
18.	3"X2" SCH. 40, WELD NECK FLANGE DRILLED FOR 1" SCH. 40/50 PIPE.
19.	3" BLIND FLANGE.
20.	1" NPS SCH. 40/50 (NO PER PROCESS REQUIREMENT) CS PIPE.
21.	1" SW CORAL TEE.
22.	3/4" x 1/2" SW REDUCING INSERT.
23.	3/4" SW x 3/4" NPT (M) CS/AS NIPPLE.
24.	3/4" NPT (F) CS/AS CAP.
25.	1/4" NPS ALLOY STEEL PIPE.
26.	1" x 3/4" SW REDUCING INSERT.
27.	3/4" SW x 1/2" PSW BRANCH TEE.
28.	3/4" PIPE UNION.
29.	1/2" CLAMP UNION (BREADED) SUITABLE FOR FLETCHER CONNECTION OR FOUN REINFORCED PVC TUBE.
30.	CS TUBE.
31.	3/4" SW 4 WAY VALVE.
32.	QUICK DISCONNECT FITTINGS.
33.	1/4" SW ISOLATION VALVE 21659.
34.	1/2" x 1/2" SS PIPE UNION.



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ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM
DIFF. PRESS. MEASUREMENT (LIQUID, OIL, AIR/GAS SERVICE)

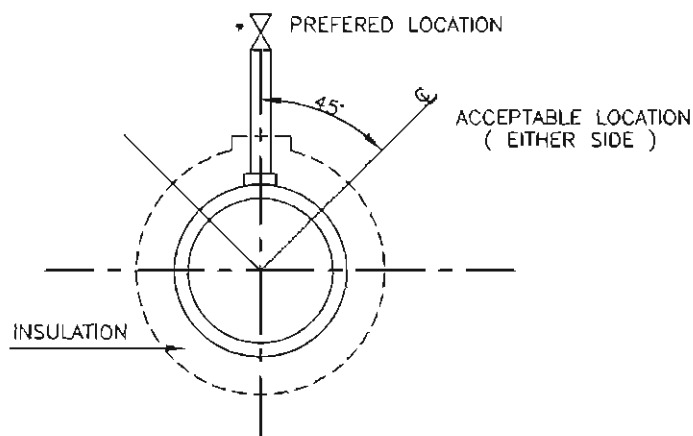
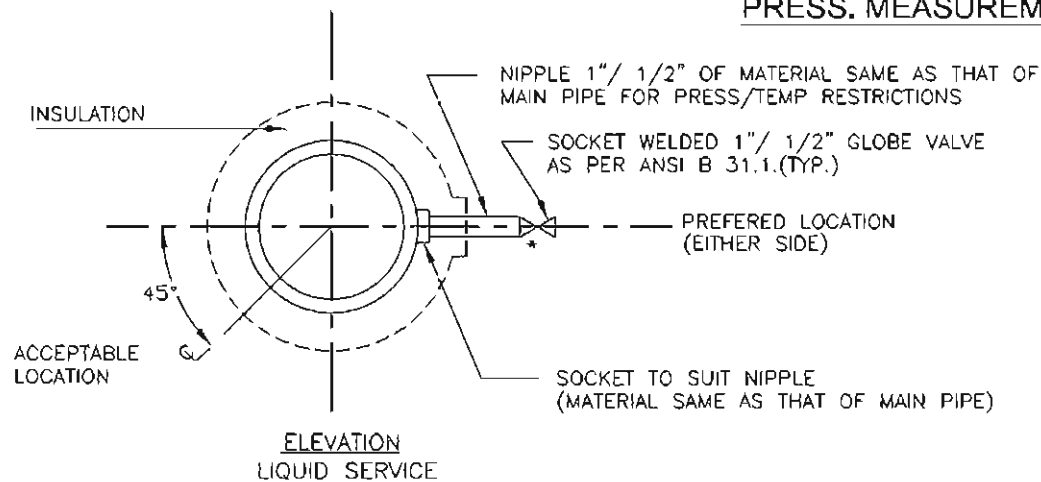
REVISED	DESCRIPTION	DATE	BY	CHKD	APPD	DATE	SIC	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE						AS	N.T.S.	0000-999-POI-A-030	A

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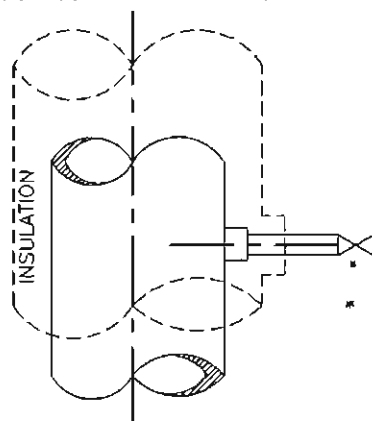
	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
INSTRUMENT STUB DETAILS		

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PRESS. MEASUREMENT



PRESSURE CONNECTION ON HORIZONTAL PIPE



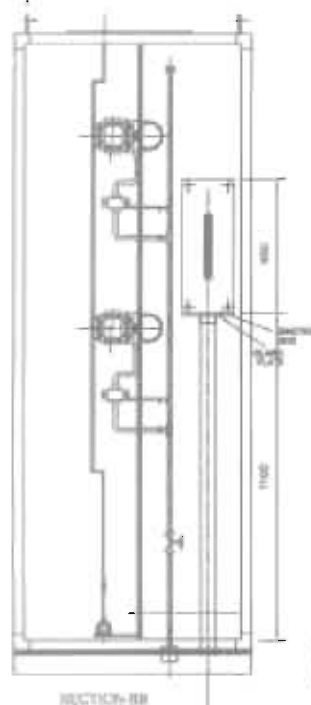
PRESSURE CONNECTIONS ON VERTICAL PIPES

* USE DOUBLE ISOLATION VALVES FOR PRESSURE EQUAL TO OR EXCEEDING 40 Kg/Cm2.

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प्रा. नि. को. नि. NTPC NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION															
PROJECT TYPICAL THERMAL POWER PROJECT															
TITLE INSTRUMENT SOURCE CONNECTION DETAILS															
A	FIRST ISSUE	DRWN	DESIGN	CHKD.	M	E	C	CHJ	ARCH.	APPD.	DATE	SIZE A4	SCALE N.T.S.	DRG. NO. 0000-999-POI-A-035	REV. NO. A
Cleared by														SH-1 OF 14	

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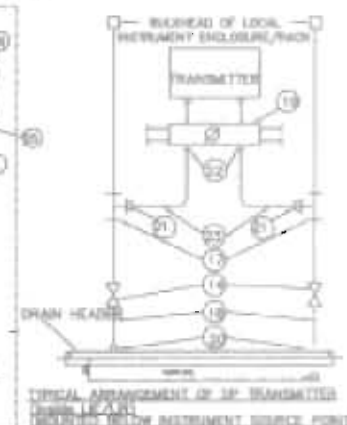
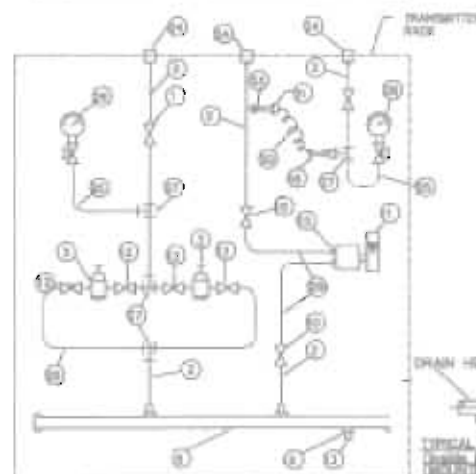


LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	ISOLATION VALVE (gate/globe) SS
2.	SEAMLESS SS PIPE
3.	AIR FILLED REGULATOR
4.	BEST AIR HEATER SS
5.	COMP NEEDLE VALVE SS
6.	AIR PURGE SET
7.	COMP VALVE SS
8.	PLATE SS
9.	TUBE SS CONNECTION
10.	TUBE COMP. EQUAL TEE UNION
11.	FLANGEHEAD-SS SUITABLE FOR O-RING CONNECTION
12.	SEAMLESS TUBE SS
13.	BRANCH TEE SS
14.	FL. GAUGE
15.	NYLON FLX. HOSE BRANED WITH SS WEL.
16.	HOSE BARBS CORR. SS
17.	SAFETY DISCONNECT SS (PURGE AIR CONNECTION TO INSTRUMENT SOURCE UNIT)

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
14.	SW GLOBE VALVE
17.	SW EQUAL TEE
18.	2.5" RIFPLE
19.	5 VACUUM MANIFOLD
20.	SW HALF COMPLET CR
21.	PIPE & TUBE UNION
22.	SUBMATE ADAPTER
23.	SW TUBE



Typical purge air connection across the inlet (enclosure applicable for HLL, AIR & FLUE GAS SERVICE INSTRUMENTS REQUIRING PURGE AIR)
(Drain Header of each L.E./A/I should be connected to nearest plant drain.)

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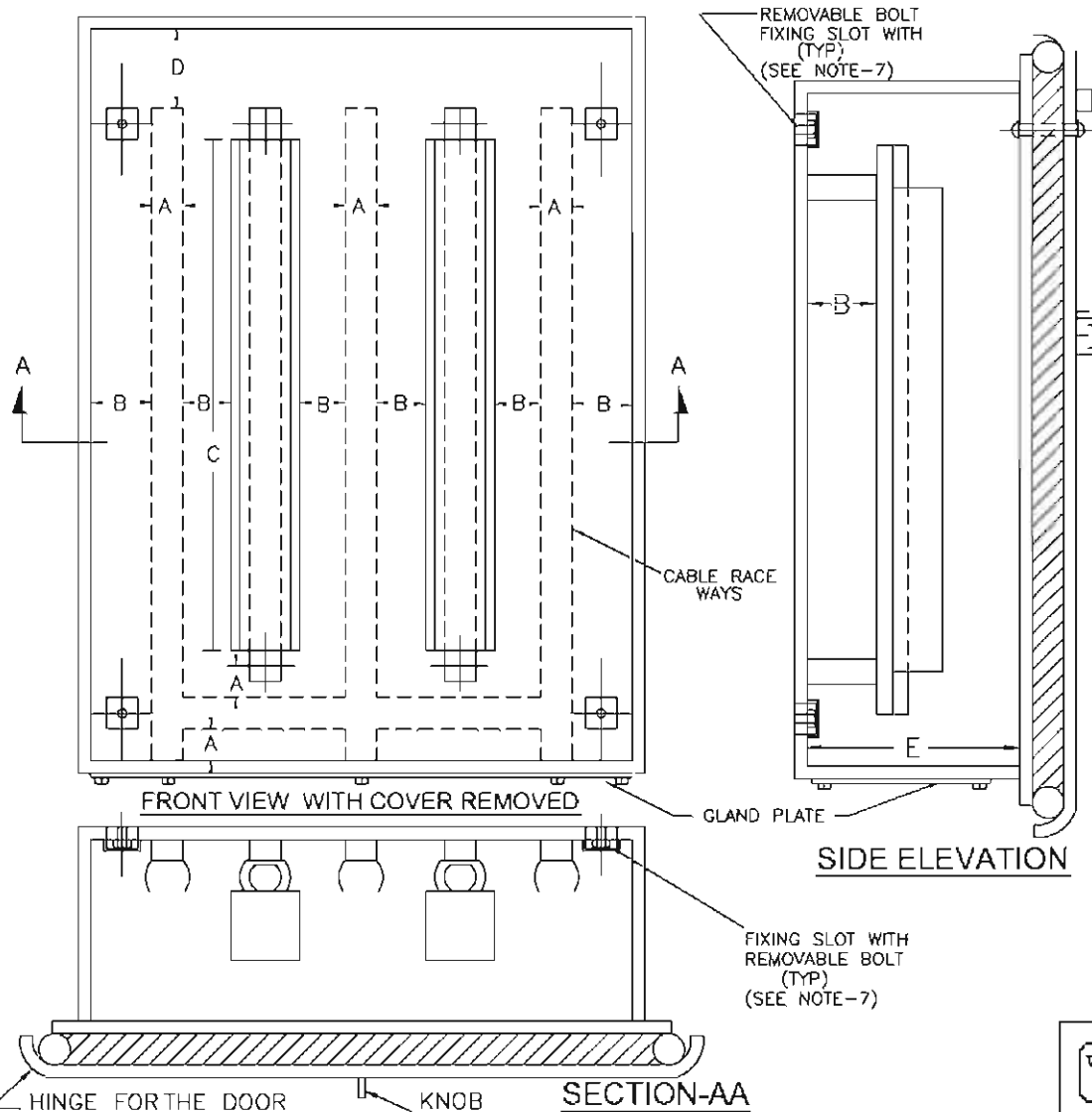
NTPC LIMITED
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NATIONAL THERMAL POWER CORPORATION LIMITED

750	TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE, PURGING SCHEME, OP TRANSMITTER
-----	--

0000-0000-0000-0000

10

[illegible]



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ENGINEERING DIVISION

PROJECT

TYPICAL THERMAL POWER PLANT

TITLE

G.A. OF JUNCTION BOX

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
D	GENERALLY REVISED		JM	KS							21.08.12
C	GENERALLY REVISED		JM	KS							04.08.08
B	GENERALLY REVISED	S.K.	A.R	PS							
A	FIRST ISSUE	S.K.	A.R	PS							04.05.05

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SIZE

A4

SCALE

N.T.S.

DRG. NO.

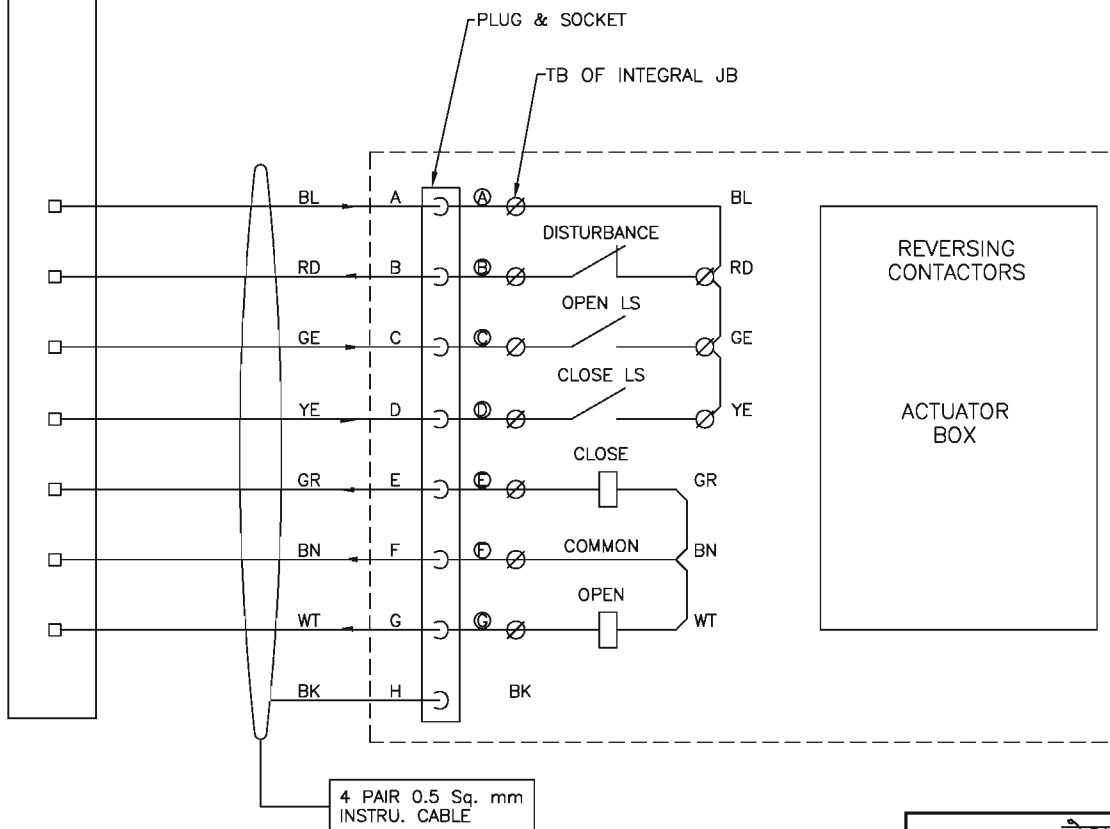
0000-999-POI-A-017

REV. NO.

D

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
SIGNAL EXCHANGE BETWEEN DRIVES AND DCS		

TERMINATION AT
CONTROL SYSTEM END



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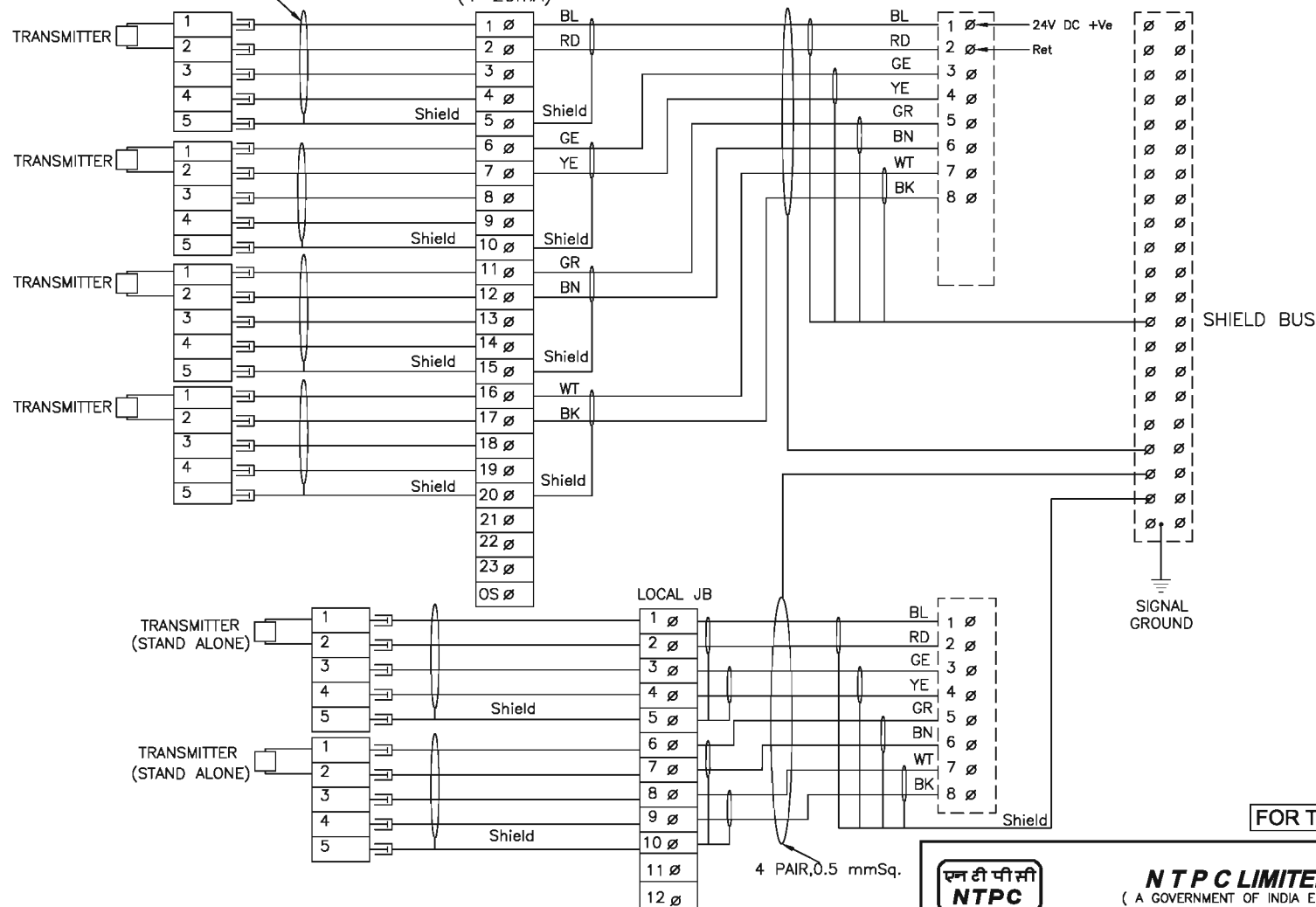
 नेशनल थर्मल पावर कॉर्पोरेशन लिमिटेड <i>National Thermal Power Corporation Ltd.</i> (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION			
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF ACTUATORS	
REV. NO.	DESCRIPTION	SIZE	SCALE
D	FIRST ISSUE	A3	N.T.S.
DRAWN		DRG. NO.	
DESIGN		0000-999-POI-A-063	
CHKD.		REV. NO.	
M		D	
E			
C			
C&I			
ARCH.			
APPD			
DATE			
21.08.12			

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INTERNAL WIRING/2 PAIR,0.5 mmSq.(TYP)

INTEGRAL JB OF LIE/LIR
(4-20mA)

MARSHALLING/TERMINATION
CUBICLE



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ENGINEERING DIVISION

												PROJECT TYPICAL THERMAL POWER PROJECT			
B	INTERNAL WIRING FOR LIE/LIR MOUNTED SHOWN WIRING OF STAND ALONE TXTR SHOWN										21.08.12	TITLE INTERFACING OF FIELD INSTRUMENTS 4-20mA			
A	FIRST ISSUE										12.1.05				
REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
					CLEARED BY							A3	NTS	0000-999-POI-A-065	B
SH 04 OF 15															

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS SWITCH TERMINATION DETAILS NO/NC	
SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065	A
		SH 02 OF 15	

MARSHALLING/ TERMINATION CUBICLES

4 PAIR,
0.5 Sq. mm

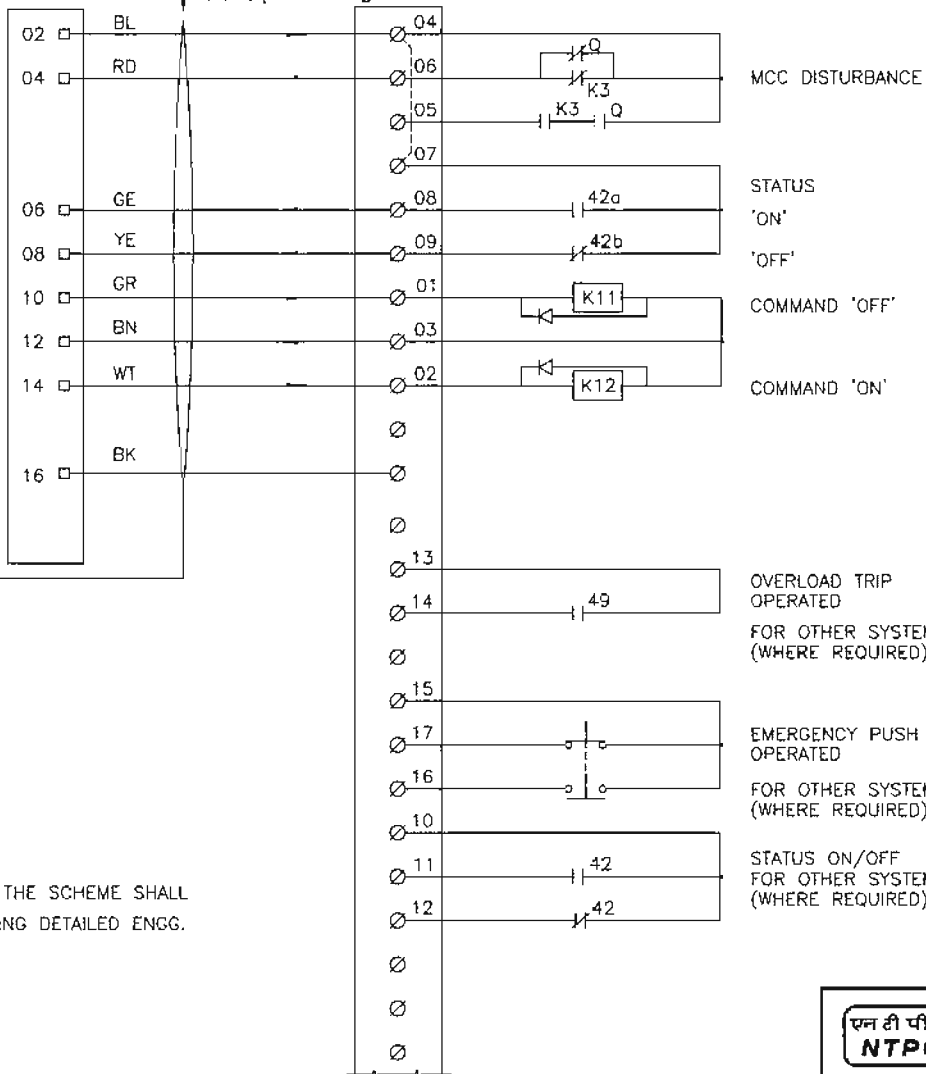
MCC/SWGR
D

SHIELD
BUS

SIGNAL
GROUND

NOTE

1. FOR CHP DRIVES, THE SCHEME SHALL
BE FINALISED DURING DETAILED ENGG.



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ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS INTERFACE OF DDCMIS WITH MCC/SWGR/ACTUATOR (LT MOTORS)	
REV. NO.	DESCRIPTION	SIZE	SCALE
A	FIRST ISSUE	A3	NTS
DRAWN		DRG. NO.	
DESIGN		0000-999-POI-A-065	
CHKD.		REV. NO.	
M		A	
E		SH 05 OF 15	
C			
C&I			
ARCH.			
APPD			
DATE			
21.08.12			

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	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
QUALITY ASSURANCE FOR INSTRUMENTS & LCP AND TYPE TEST REQUIREMENTS		

CLAUSE NO.	TECHNICAL REQUIREMENTS 
	TYPE TEST REQUIREMENTS 1.00.00 TYPE TEST REQUIREMENTS 1.01.00 General Requirements 1.01.01 The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard. (a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests. (b) For the rest, submission of type test results and certificate shall be acceptable provided. i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment. ii. There has been no change in the components from the offered equipment & tested equipment. iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening but not more than five (5) year back. (c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account. 1.01.02 As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer. 1.01.03 The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.

CLAUSE NO.	TECHNICAL REQUIREMENTS 
1.01.04	For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.
1.01.05	The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project. The cost shall only be payable after conduction of the respective test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.
2.00.00	SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS
2.01.00	The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems Analyzer instruments, various PLCs etc. shall be as indicated below: i) Surge Protections for Solid State Equipments/ Systems All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90a/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90a/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted alongwith the proposal. As an alternative to above, suitable class of IEC-60255-4 which is equivalent to ANSI 37.90a/ IEEE-472 may also be adopted for SWC test. ii) Dry Heat test as per IEC-68-2-2 or equivalent. iii) Damp Heat test as per IEC-68-2-3 or equivalent. iv) Vibration test as per IEC-68-2-6 or equivalent. v) Electrostatic discharge tests as per IEC 61000-4-2 or equivalent. vi) Radio frequency immunity test as per EN 50082-2 or equivalent.

CLAUSE NO.	TECHNICAL REQUIREMENTS 
	vii) Electromagnetic immunity as per EN 61131-2 or equivalent. Test listed at item no. v, vi, vii, above are applicable for front end cards only as defined under item (i) above.

3.00.00

TYPE TEST REQUIREMENT FOR C&I SYSTEMS

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes	
2	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes	
3	INSTRUMENTATION CABLES TWISTED & SHIELDED			No	Yes	
4	Pressure gauge	Degree of protection test	IS-2147	No	No	
		Temp interference test	IS -3624	No	No	
5	Temperature gauge	Degree of protection test	IS-2147	No	No	
6	Pressure & DP switch	Degree of protection test	IS-2147	No	No	
		As per standard (col 4)	BS 6134	No	No	
7	Level switch	Degree of protection test	IS-2147	No	No	
8	Control valves	CV Test	ISA 75.02	No	Yes	
9	Flow Nozzles & Orifice plate	Calibration	ASME PTC , BS 1042	No	Yes	
10	PLCs	All tests as per IEC-1131	IEC-601131	No	Yes	

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
11	Junction Box	Degree of protection test	IS-13947	No	Yes	
12	Battery charger (Not required for inbuilt chargers)	Degree of protection test	IS-13947	No	No	
		Short circuit current capability	IEC-60146-2	No	Yes	
		Temp rise test without redundant fans	Approved procedure, IEC 60146-2	No	Yes	
		SWC test	Approved procedure	No	Yes	
		Burn-in-test	Approved procedure	No	Yes	
		Efficiency	IEC-60146-2,	No	Yes	
		Audible Noise Test	IEC 60146-2	No	Yes	
		Fuse Clearing Capability	Approved procedure	No	Yes	
		Relative harmonic content	Approved procedure	No	Yes	

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
		ESD immunity test	IEC-61000-4-2-9(1)	No	Yes	
		Radio interference	IEC 60146-2	No	Yes	
		Over Load Test on Inverter & charger	Approved procedure	No	Yes	
		Restart Test	IEC 60146-2	No	Yes	
		Output voltage tolerance	Approved	No	Yes	
		Output voltage Harmonic content	Approved procedure	No	Yes	
		Insulation test	IEC 60146	No	Yes	
		Load Tests	Approved procedure	No	Yes	
		Preliminary light load test	IEC 60146	No	Yes	
		Current division / Voltage division	IEC 60146-2	No	Yes	
13	Battery	As per standard (col 4)	IEC –623 / IS 10918 for Ni-Cd IS-1652 for Plante Lead Acid	No	Yes	
14	Voltage stabilizers	Over Load Test	Approved procedure	No	Yes	

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
		Temp rise test without redundant fans	Approved procedure	No	Yes	

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)

ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard (R)	Insulation Resistance (R)	IBR Certification (if applicable) (R)	Hydro Test (R)	Material Test certificate ®
1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y				
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch (BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter (IEC-60770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Recorder (IS-9319/ANSI C-39.4)	Y	Y	Y	Y	Y	Y			
7. Vertical indicators	Y	Y	Y	Y		Y			
8. Digital Indicators	Y	Y	Y	Y		Y			
9. Integrators	Y	Y	Y	Y					
10. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
11. Transducer (IEC-688)	Y	Y	Y	Y	Y	Y			
12. Thermocouples (IEC – 754 / ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
13. RTD (IEC-751)	Y	Y	Y	Y	Y	Y			
14. Thermowell	Y		Y				Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable									

: Note: 1) Detailed procedure of Environmental Stress Screening shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure (if required) finalized during QP finalization

2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)												
TESTS ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)
15. Cold junction compensation box	Y	Y	Y	Y					Y			
16. Orifice plate(BS-1042)	Y	Y	Y	Y *	Y	Y **	Y **			Y	Y **	Y
17. Flow nozzle(BS-1042)	Y	Y	Y	Y *	Y	Y	Y			Y	Y	Y
18. Impact head type element	Y	Y	Y					Y				Y
19. Level transmitter/float type switch	Y	Y	Y	Y					Y	Y	Y	Y
20. Analysers	Y	Y	Y	Y								
21. Dust emission monitors	Y	Y	Y	Y								
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.												
** If applicable												
R-Routine Test	A- Acceptance Test				Y – Test applicable							
Note: 1) Detailed procedure of Environmental Stress screening test shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure (if required) finalized during QP finalization 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.												

Process, Connection & piping FOR C&I SYSTEMS

ITEMS	Visual ⑥	GA, BOM, Layout of component & construction feature⑥	Dimension ⑥	Paint Shade/thickness ⑥	Flattening, flaring, hydrotest, hardness check as per ASTM standard	Component Ratings ⑥	Wiring ⑥	Make, Model, Type, Rating⑥	IR & HV ⑥	Review of TC for instrument/devices (R)	Accessibility of TBs/Devices ⑥	Illumination,grounding ⑥	Tubing ⑥	Leak/Hydro test(A)	Chemical/physical properties of material (A)	Proof pressure test,Dismantling & reassembly test,Hydraulic impulse and vibration test (R)	Tests as per standards & specification
Local Instrument enclosure	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			
Local instruments racks	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			
Junction Box	Y	Y	Y	Y *		Y		Y	Y								
Gauge Board	Y	Y	Y	Y		Y		Y		Y			Y	Y			
Impulse pipes and tubes	Y		Y		Y			Y							Y		
Socket weld fittings ANSI B-16.11	Y		Y					Y							Y		Y
Compression fittings	Y		Y					Y						Y	Y	Y	
Instrument valves & Valve manifolds	Y		Y					Y						Y	Y		
Copper tubings ASTM B75	Y							Y									Y

*-applicable for painted junction boxes.

Note: R-Routine Test

A- Acceptance Test

Y – Test applicable

Note: This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.

INSTRUMENTATION CABLE

ITEMS	TESTS												
	Conductor Resistance ® & (A)	High Voltage ® & (A)	Insulation Resistance ® & (A)	Constructional detail, dimensions (A)	Outer-Sheath/core marking, end sealing (A)	Thermal Stability (A) +	Visual, Surface finish (A) +	Electrical Parameters ** (A) +	Persulphate Test (A) +	Overall/Coverage/Continuity (A)	Swidesh chimney Test (SS-4241475) (A) ++	FRLS Test * (A) ++	Tensile & Elongation before & after aging (A) ++
1. Instrument cable twisted and shielded													
Conductor(IS-8130)	Y			Y			Y						
Insulation(VDE-207)				Y	Y	Y	Y						Y
Pairing/Twisting				Y	Y		Y						
Shielding				Y			Y			Y			
Drain wire	Y			Y			Y		Y	Y			
Inner Sheath				Y	Y	Y	Y					Y	Y
Outer Sheath				Y	Y	Y	Y					Y	Y
Over all cable	Y	Y	Y	Y	Y		Y	Y			Y		Y
Cable Drums(IS-10418)				Y			Y						

Note : High Temp. cables shall be subjected to tests as per VDE-207(Part-6) Compensating cables shall be checked for Thermal EMF/Endurance test as per IS 8784.

Note : This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating his practice & Procedure along with relevant supporting documents during QP finalization for all items.

Note : ® - Routine Test A - Acceptance Test Y - Test Applicable

Note : Sampling Plan for Acceptance test shall be as per IS 8784 (As applicable)

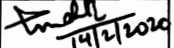
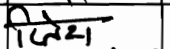
- * FRLS Tests: Oxygen / Temp Index (ASTM D-2863), Smoke Density Rating (ASTM – D 2843), HCL Emission (IEC-754-1)

- ** Characteristic Impedance, Attenuation, Mutual Capacitance, Cross Talk (As applicable)

+ Sample size will be One No. of each size/type per lot.

++ Sample size will be One No. sample for complete lot offered irrespective of size/type.

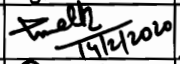
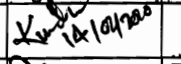
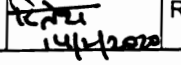
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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	**			REMARKS
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	
1.0	RAW MATERIAL Sheet Steel (CRCA & HR)	1. Chemical Composition	MA	Chemical analysis	Sample	Sample	IS:1079 IS:513	IS:1079 IS:513	Test Certificate	√	P/W	V		
		2. Bend Test	CR	Mech. test	Sample	Sample	IS:1079 IS:513	IS:1079 IS:513	Test Certificate	√	P/W	V		
		3. Surface finish	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	---		
		4. Waviness	MA	Visual	100%	10%	Manufacturing Standard	No Waviness	Inspection Report	√	P/W	---		
		5. Thickness	MA	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	V		
		6. Mill marking	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
2.0	Flats / Angles / Channels	1. Dimensions	MA	Measurement	Sample	Sample	IS:2062	IS:2062	Test Certificate	√	P/W	---		
		2. Surface Defects	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	---		
		3. Straightness	MA	Measurement	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	---		
		4. Mill marking	MA	Visual	100%	10%	IS:2062	IS:2062	Inspection Report	√	P/W	V		

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHE TAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		RK RAINA	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Approved by:			

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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	
3.0	Cables / Wires	1. Visual / Surface defects	MA	Visual	100%	10%	IS:1554 or IS:694	IS:1554 or IS:694	Inspection Report	√	P/W			
		2. IR and HV	MA	Electrical	100%	10%	IS:1554 or IS:694	IS:1554 or IS:694	Inspection Report	√	P/W			
		3. Conductor a) Resistance b) Size c) Sheet colour	MA MA MA	Electrical Measuremen t Visual	100% 100% 100%	10% 10% 10%	IS:1554 or IS:694	IS:1554 or IS:694	Inspection Report	√	P/W			
		4. Type / Routine Test Certificates	MA	Verification	100%	10%	IS:1554 or IS:694	IS:1554 or IS:694	Inspection Report	√	P/W			
4.0	Electrical Components like Annunciator Transformers Lamps Switches PBs Contactors Relays	1. Verification at make and Type	CR	Visual	Sample	Sample	Approved Drg/Datasheet	Approved Drg/Datasheet	Test Certificate	√	P/W			
		2. Verification of Test Certificates	CR	Scrutiny of Type / Routine T.Cs.	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	√	P/W			
		3. Operation / Functional check	CR	Electrical	Sample+ 100% @	Sample+ 10% @	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	√	P/W			+ for relay & contactors only

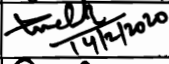
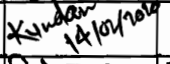
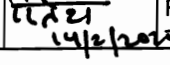
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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF RECORD	*	**			REMARKS
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	
	Timers, Space Heaters, Thermostat, Indicating meters etc.	4. I.R.	MA	Electrical	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	√	P/W			@ for all components except relays & contactors.
		5. H.V.	MA	Electrical	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	√	P/W			
		6. Calibration	MA	Electrical	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	√	P/W	V		
		7. Pick up / Drop off Voltage	MA	Electrical	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	√	P/W			
5.0	Misc. Components like Gaskets, Terminal Blocks etc.	1. Verification of Type / Make	MA	Visual	Sample	Sample	Manufacturing Standard	Manufacturing Standard	Test Certificate	√	P/W			
		2. Surface defects	MA	Visual	Sample	Sample	Manufacturing Standard	Manufacturing Standard	Test Certificate	√	P/W			
		3. IR / HV on Terminal Blocks	MA	Electrical	Sample	Sample	Manufacturing Standard	Manufacturing Standard	Test Certificate	√	P/W			
	IN PROCESS INSPECTION													

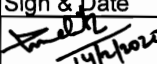
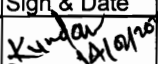
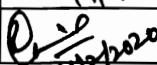
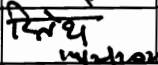
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ITEM: LOCAL CONTROL PANEL					SYSTEM: C&I		SECTION: C		SHEET 4 OF 9			

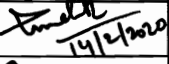
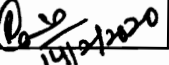
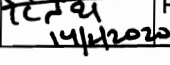
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					M	C/N				D	M	C	N	
6.0	Blanking / Bending / Forming	1. Dimensions	MI	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	✓	P/W			
		2. Surface defects after bending	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	✓	P/W			
7.0	Nibbling / Punching	1. Cutout Sizes	MI	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	✓	P/W			
		2. Deburring	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	✓	P/W			
8.0	ASSEMBLY Frame Assembly & Sheet fixing	1. Dimensions	MA	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	✓	P/W			
		2. Alignment	MA	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	✓	P/W			
		3. Welding Quality	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	✓	P/W			
		4. Surface defects	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	✓	P/W			

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		RK RAINA	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

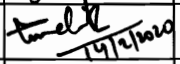
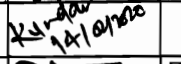
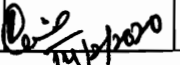
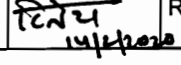
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				CUSTOMER :				QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020				
						PROJECT:				PO NO.: --		DATE: --		
						ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I		SECTION: C		SHEET 5 OF 9		
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	
9.0	Pre-treatment and Painting	1. Pretreatment Process	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
		2. Process parameters like bath temp. concentration etc.	MA	Measuremen t	Perio dic	Perio dic	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
		3. Dipping / Removal Time	MA	Measuremen t	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
		4. Surface quality after every dip	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
		5. Primer after phosphating	MA	Visual, Thickness	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
		6. Putty Application & Rubbing after primer	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
		7. Paint first coat	MA	Visual, Thickness	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		RK RAINA	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

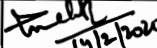
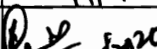
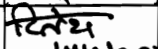
बी एच ई एल BHEL		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN				SPEC. NO :		DATE:			
					CUSTOMER :				QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020			
					PROJECT:				PO NO.: --		DATE: --			
					ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I		SECTION: C		SHEET 6 OF 9			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	
		8. Putty Application and Rubbing after first coat of paint	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
		9. Paint second coat	MA	Visual, Thickness, Scratch test Colour adhesion	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	V		
10.	Panel Wiring	1. Wiring Layout	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W			
		2. Wiring Termination (Crimped Lugs)	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W			
		3. Ferrule numbers	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W			
		4. Colour of wiring	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	V		
		5. Size of Conductor	MA	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	V		
11.	Component Mounting	1. Correct components	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W			
		2. Fixing	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W			

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		RK RAINA	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN			SPEC. NO :		DATE:				
					CUSTOMER :			QP NO.: PE-QP-999-145-I056		DATE: 07.02.2020				
					PROJECT:			PO NO.: --		DATE: --				
					ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I		SECTION: C		SHEET 7 OF 9			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
12.	FINAL TESTING Final Inspection	1. Workmanship	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	W		At Random by BHEL, based on 100 % internal test reports by Mfr.
		2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		
		3. Components identification Marking / Name plates	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		
		5. Dimensions	MA	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		At Random by BHEL, based on 100 % internal test reports by Mfr.
		6. Door functioning	MA	Functional	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		
		7. Paint Shade	CR	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		RK RAINA	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN			SPEC. NO :		DATE:				
					CUSTOMER :			QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020				
					PROJECT:			PO NO.: --		DATE: --				
					ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I		SECTION: C		SHEET 8 OF 9			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		8. Paint Thickness	CR	Measuremen t	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		
		9. Workmanship of Gaskets	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	√	P/W	W		
		10. Wiring Layout	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		
		11. Wire Termination	MA	Pulling manually	Samp le	Samp le	----	Firm termination	Inspection Report	√	P/W	W		
		12. Continuity	MA	Electrical	100%	10%	----	Continuity OK	Inspection Report	√	P/W	W		
13.	TYPE TEST	Degree of Protection	CR	Mech. Protection	Samp le	Samp le	Approved Drg/Datasheet Relevant IS- 13947 Part-1, IS-2148.	Approved Drg/Datasheet Relevant IS- 13947 Part-1, IS-2148.	Type Test Certificate	√	P/W	V		
14	ROUTINE TEST	IR before & after HV Test	CR	Electrical	100%	10%	Approved Drg/Datasheet Relevant IS.	Approved Drg/Datasheet Relevant IS.	Inspection Report	√	P/W	W		

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	<i>[Signature]</i> 14/02/2020	CHETAN MALIK	Checked by:	<i>[Signature]</i> 14/02/2020	KUNDAN PRASAD
Reviewed by:	<i>[Signature]</i> 14/02/2020	RK RAINA	Reviewed by:	<i>[Signature]</i> 14/02/2020	RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

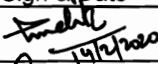
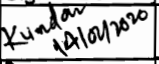
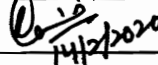
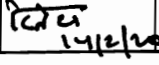
		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN			SPEC. NO :		DATE:				
					CUSTOMER :			QP NO.: PE-QP-999-145-I056		DATE: 07.02.2020				
					PROJECT:			PO NO.: --		DATE: --				
ITEM: LOCAL CONTROL PANEL					SYSTEM: C&I		SECTION: C		SHEET 9 OF 9					
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	D	**			
					M	C/N					M	C	N	
15	FUNCTIONAL TEST	1. Control Logic Operation	CR	Electrical	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		
		2. Instrument Calibration	CR	Electrical	10%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	√	P/W	W		
		3. Temperature rise	CR	Electrical	100%	10%	Approved Drg/Datasheet Relevant IS.	Approved Drg/Datasheet Relevant IS.	Inspection Report	√	P/W	W		

NOTES:

- Customer's specification for painting shall be included in the technical specification. In the absence of Customer's spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
- Copies of all TC's (Test Certificates) for components shall be submitted to BHEL for verification and acceptance.
- BHEL reserves the right to conduct repeat tests, if required.

LEGENDS:

*RECORDS, IDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION, D: DOCUMENTATION,
 ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER,
 P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
 MA: MAJOR, MI: MINOR, CR: CRITICAL

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD			Reviewed by:			
Reviewed by:		RK RAINA	Reviewed by:		RK JAISWAL			Approved by:			



STANDARD CHECK LIST FOR C&I INSTRUMENTS(for MSE& Max pkgs)

CHECK LIST FOR TRANSMITTER

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECKS FOR	SEE NOTE-1 BELOW	APPROVED DATA SHEETS	P	W	V	
	VISUAL.						
	MODEL/TAG No						
2	PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	REPEATABILITY			P	W	V	
5	HYSTERESIS	P		W	V		
6	EFFECT OF TEMP VARIATION ON ACCURACY	P		W	V		
7	SPAN / ZERO ADJUSTMENT	P		W	V		
8	EFFECT OF SUPPLY VOLTAGE VARIATION	ONE / TYPE		P	W	V	
9	EFFECT OF LOADING (500 OHM METERS)			P	W	V	
10	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
11	BURN-IN TEST	ONE / TYPE		P	W	V	
12	DEGREE OF PROTECTION			P	W	V	
13	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- When material correlation are not available manufacturer's compliance to be provided.
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same along with test certificates to be verified by BHEL.

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		VIPUL KUMAR VERMA	Checked by:		KUNAL GANDHI
Reviewed by:		SURESH CHAND SHARMA	Reviewed by:		RITESH KUMAR JAISWAL



STANDARD CHECK LIST FOR C&I INSTRUMENTS(for MSE& Max pckgs)
CHECK LIST FOR PRESSURE & DP GAUGE

Sl. No	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED - DATA SHEETS	P	W	V	
	SENSOR TYPE						
	DIAL SIZE						
	MODEL NO/TAG NO						
	RANGE/SCALE						
	SWITCH CONTACT RATING & NOS.						
	END CONNECTION						
2	CALIBRATION			P	W	V	
	ACCURACY						
	REPEATABILITY						
	SET POINT ADJUSTMENT						
3	OVER PRESSURE & LEAK TEST	P	W	V			
4	OPERATION OF PRESSURE. RELIEF DEVICE	ONE	P	W	V		
5	REVIEW OF TC FOR	FOR LOT	V	V	V		
	MATERIALS OF SENSOR						
	MOVEMENT						
	PROCESS CONNECTION						
	HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST	V	V	V		
7	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW	V	V	V		

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL,
P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below : 100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- When material correlation is not available, MFR's compliance to be provided
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same along with test certificates to be verified by BHEL.

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:		VIPUL KUMAR VERMA	Reviewed by:		KUNAL GANDHI
		SURESH CHAND SHARMA			RITESH KUMAR JAISWAL

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
SUB VENDOR LIST		

SI No	Package Name	Supplier Name	Supplier Communication Address
1	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Kaustubha Udyog,	S.No. 36/1/1, Sinhgad Road, Vadgaon Khurd, Near Lokmat Press, Pune, Phone- 020-24393577, Pincode : Email : pressure@vsnl.com,
2	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com
3	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SWITZER PROCESS INSTRUMENTS PVT. LTD.	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincode : 600050 Email : sales@switzerprocess.co.in
4	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	GENERAL INSTRUMENTS CONSORTIUM	Mr. Amarendra Kulkarni 194/195, Gopi Tank Road, Off. Pandurang Naik Marg, Mahim Mumbai Phone- 9323195251 Pincode : 400016 Email : amarendra@general-gauges.com
5	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Barksdale GmbH, Germany	Michael Weileder Dorn Assenheimer, Strasse 27 Reichelsheim Phone- +91-9999107840 Pincode : D-61203 Email : msingh@barksdale.de
6	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	DRESSER INDUSTRIES INC.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 02764-233682 Pincode : 382729 Email : Nishit.patel@ashcroftindia.com
7	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SOR INC.	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com,
8	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS INDUSTRIES LIMITED	B-20-21, INDUSTRIAL AREA, MEERUT ROAD, GHAZIABAD Phone- 0120-2712016 Pincode : Email : mktg@indfos.com
9	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS (INDIA) LIMITED	MR.L.C.VENKATRANGAN/MR.B.KANNAN New No.17, II Floor, Adwave Towers, Dr.Sevalia Shivaji Salai, T.Nagar Chennai Phone- +91 44 24353407 Pincode : 600017 Email : delhi@indfos.com
10	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	BOSE PANDA INSTRUMENTS PVT.LTD.	Mr. Partha Bose 44, Saheed Hemanta Kumar Bose, Sarani, Kolkata Phone- +91 33 2548 7220 Pincode : 700074 Email : parthabosebpi@gmail.com; bosepanda@vsnl.net
11	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in
12	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INDUSTRIES	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHI-MINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mguru@vsnl.net
13	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	FORBES MARSHALL (HYD) LTD.	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com
14	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com
15	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com
16	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@hgurusouth.com
17	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com,
18	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	Nesstech Instruments Private Limited	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in
19	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com
20	TRANSMITTERS	TOSHNIWAL INDUSTRIES PVT. LTD.,	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,

21	TRANSMITTERS	YOKOGAWA INDIA LIMITED,	PLOT NO.96, ELECTRONICS CITY COMPLEX, HOSUR ROAD, BANGALORE, Phone- 080-41586000, Pincode : Email : uday.shankar@in.yokogawa.com,
22	TRANSMITTERS	ABB INDIA LIMITED	MR. RAJIV GOVIL 14, MATHURA ROAD, FARIDABAD Phone- 09971085678 Pincode : 121003 Email : vipin.swami@in.abb.com
23	TRANSMITTERS	V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com
24	TRANSMITTERS	Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com
25	TRANSMITTERS	PANAM ENGINEERS	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com,
26	TRANSMITTERS	SBEM PVT. LTD.	MR.N.K. BEDARKAR/MR. VISHWANATH KARANDIK 39, ELECTRONIC CO.OP. ESTATE, PUNE SATARA ROAD PUNE, Phone- 912041030100 Pincode : 411009 Email : newdelhi@sbem.co.in
27	TRANSMITTERS	Endress + Hauser (India) Pvt. Ltd.,	Mr. Prakash Vaghela 215-216, DLF Tower 'A', Jasola District Centre, New Delhi, Phone- 9717593001, Pincode : 110025, Email : prakash.vaghela@in.endress.com,
28	TRANSMITTERS	Moore Industries International Inc.	Leonard.W. Moore/ Matt Moren 16650 Schoenborn St. North Hills Phone- +1 818 830 5548 Pincode : 91343 Email : mmoren@miinet.com
29	TRANSMITTERS	EMERSON PROCESS MANAGEMENT (INDIA) PVT.LTD.	Mr. Amit Paithankar/Vikram Raj Singh 206-210,BALARAMA BUILDING 2ND FLR. BANDRA EAST MUMBAI Phone- 9619121500 Pincode : 400051 Email : vikramraj.singh@emerson.com
30	TRANSMITTERS	NIVO CONTROLS PVT. LTD.	Mr. Praveen Toshniwal 104-115, Electronic Complex, Indore Phone- 0731-4081305 Pincode : 452010 Email : sales@nivocontrols.com
31	TRANSMITTERS	SMART INSTRUMENTS LTD, BRAZIL	Agents: Digital Electronic Ltd. 74/11 'C' Cross Road MIDC Andheri (East) MUMBAI Phone- 28208477 Pincode : 400093 Email : corp@delbby.rpgms.ems.vsnl.net.in
32	TRANSMITTERS	SIEMENS LIMITED	Dr. Armin Bruck/Sandeep Mathur 130, Pandurang Budhkar Marg Worli Mumbai Phone- 0124 383 7377 Pincode : 400018 Email : ankit.varshney@siemens.com
33	TRANSMITTERS	Honeywell Automation India Limited	Mr. Ritwij Kulkarni 917, INTERNATIONAL TRADE TOWER, NEHRU PLACE, NEW DELHI Phone- 9890200584 Pincode : 110019 Email : rajesh.chaudhary@honeywell.com
34	JUNCTION BOX	K.S.INSTRUMENTS PVT.LTD.	S Raghavan No. 72, 3rd Main, 1st Stage Industrial Suburb, Yeshwanthpur Bangalore Phone- 9880385770 Pincode : 560022 Email : sales1@ksinstruments.net
35	JUNCTION BOX	SUCHITRA INDUSTRIES	NO-2,OPP-27 AECS LAYOUT 2ND STG REJAMAHALVILAS EXTN 2ND STG BANGALORE Phone- Pincode : Email : suchitra.industriesblr@gmail.com
36	JUNCTION BOX	FLEXPRO ELECTRICALS PVT. LTD.	Mr. Dineshbhai Zaveri C-1/ 27&37, GIDC, Kabilpore, Navsari Phone- 02637-265140,265003 Pincode : 396424 Email : flexpro@flexproltd.com
37	JUNCTION BOX	Shrenik & Company,	Mr. Mitesh Shah/Mr. Pulin Shah 39 A/3 ,Panchratna Industrial Estate, Sarkhej-Bavla Road Ahmedabad Phone- 9825024921 Pincode : 382213 Email : sales@pustron.com, pulin@sumip.com
38	JUNCTION BOX	AJMERIA INDUSTRIAL & ENGINEERING WORKS	JIGNESH MAHENDRA AJMERA DENA BANK BLDG.,SHREE NAGESH INDL. ESTATE,STATION ROAD, MUMBAI Phone- 022 67973578 Pincode : 400 088 Email : ajmera@ajmera.net, jmajmera@yahoo.com
39	INSTRUMENTS TUBE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com
40	INSTRUMENTS TUBE FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com
41	INSTRUMENTS TUBE FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com

42	INSTRUMENTS TUBE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
43	INSTRUMENTS PIPE FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com
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46	INSTRUMENTS PIPE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
47	INSTRUMENT FITTINGS	HP VALVES & FITTINGS INDIA PVT. LTD.	S. Harichandran/P.S. Pandi B-11, Mugappair Industrial Estate, CHENNAI Phone- 044 26252537 Pincode : 600037 Email : sales@hpvalvesindia.com
48	INSTRUMENT FITTINGS	Perfect Instrumentation Control (India) Pvt. Ltd.	MD Hussain Shaikh/Shahanawaz Khan Gala No. 168, Loheki Chwal,216/ 218, Maulana Azad Rd. Nagpada Junction Mumbai Phone- 91-9324383121 Pincode : 400008 Email : shahanawaz.khan@perfectinstrumentation.com
49	INSTRUMENT FITTINGS	Comfit & Valve Pvt. Ltd.	Mr. Jeetu Jain/Mr. Vinay Sosa Survey No. 23/1, Part 2, Ahmedabad-Mehsana Highway Laxmipura, Nandasan Phone- 02764-267036/37 Pincode : 382705 Email : marketing@com-fit.com
50	INSTRUMENT FITTINGS	Arya Crafts & Engineering Pvt. Ltd.	Mr.Sanjay Brahman/Mr.Shyam Vazirani 102, Vora Industrial Estate No.4 Navghar, Vasai Road (E) Dist.Thane, Mumbai Phone- +91-250-2392246 Pincode : 401210 Email : arya@aryaengg.com
51	INSTRUMENT FITTINGS	FLUIDFIT ENGINEERS PVT. LTD.	Mr. Abbas Bhola Potia Building No. 2, Office No. 3,292, Bellasis Road,Mumbai Central (East) Mumbai Phone- 9920044113 Pincode : 400008 Email : ab@fluidfitengg.com
52	INSTRUMENT FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com
53	INSTRUMENT FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
54	INSTRUMENT FITTINGS	PANAM ENGINEERS	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com,
55	INSTRUMENT FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com
56	INSTRUMENT FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com

	NTPC FGD PACKAGES LOT - 1A, 2 & 3	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER SYSTEM	
KKS NUMBERING PHILOSOPHY		

**KKS NUMBERING PHILOSOPHY**

For identifying (tagging) an instrument / equipment in Power plant KKS numbering scheme is used. The purpose is to assign a unique number to every equipment in the power plant. For C&I equipment unique number are to be provided up to the signal level so that a unique number Input / Output exist in DCS for every signal.

Normally KKS number is a 10 digit alpha-numeric code and is typically split into the following:

X	X	X	A	A	Y	Y	B	B	B
---	---	---	---	---	---	---	---	---	---

First three digits indicate the Sub-System. The Code for the major system are given as per **Annexure-1**.

Fourth and Fifth digits are the **Numerical Keys at System Code Level** and used to distinguish between main systems having same Alpha Codes.

Sixth and Seventh digits are the **Equipment / Apparatus / Measuring Circuit Code**. The code of various Equipment / Apparatus / Measuring Circuit is shown in **Annexure-2**

Eight, Nine and tenth digits are the **Numerical Keys at Equipment / Apparatus / Measuring Circuit Code** and used to distinguish between various instruments in the same sub-group. Numerical keys at System / Equipment / Apparatus / Measuring Circuit is shown in **Annexure-3**.

**ANNEXURE-1****List of System / Sub-System Codes used in Power Plant:**

- 1) Self-Cleaning Strainer System: PCA, PCB

ANNEXURE-2**Standard Equipment Codes:**

AA	Valves including drives, also hand operated
AB	Seclusions, Lock, Gates, Doors
AC	Heat Exchanger
AE	Turning, Driving, Lifting equipment
AF	Continuous conveyors, Feeders
AG	Generator Units
AH	Heating and Cooling Units
AK	Pressing and Packaging equipment
AM	Mixer, Stirrer
AN	Blower, Air Pumps / Fans, Compressor Units
AP	Pump Units
AT	Purification, Drying, Filter
AV	Combustion Equipment e.g. grates

Standard Apparatus Codes:

BB	Vessels and Tank
BF	Foundation
BG	Boiler Heating Surfaces
BN	Injector, Ejector
BP	Flow and throughput limitation equipment (Orifice)
BQ	Holders, Carrying Equipment, Support
BR	Piping, Ducts, Chutes, Compensator
BS	Sound Absorber
BU	Insulations, Sheatings

Standard Measuring Circuits Codes:

CD	Density
CE	Electrical Quantities
CF	Flow, throughput
CG	Distance, Length, Position
CK	Time
CL	Level



CM	Humidity
CQ	Analysis (SWAS)
CS	Speed, Velocity, Frequency
CT	Temperature
CY	Vibration, Expansion

ANNEXURE-3

Numerical Keys

A) Numerical Keys at System Code Level

- i) Use 10, 20, 30... To distinguish between main systems having same Alpha Codes. Examples:
 - a) Main Steam (Left) and Main Steam (Right)
 - b) BFP – A/B/C
 - c) ID Fan – A/B, FD Fan A/B, AH – A/B
- ii) For branch off from main system path having code say 10, keep the same alpha code and use 11, 12, 13 etc. Similarly for other branch off from main system path having code say 20, keep the same alpha code and use 21, 22, 23 etc and shall carry on further in the same way.
- iii) If the branch off from main system / sub system path is used for some other system, where different alpha codes can be applied, then in that case the said branch line will be designated by the alpha codes of the system to which it is providing the input.

B) Numerical keys at Equipment Code level:

There are three numerical keys available for each type of equipment code. Following has been agreed upon considering present practice, better flexibility and ease in sorting.

i) Valves and Dampers --- Equipment Code – AA

		<u>N1</u>	<u>N2 N3</u>
Motorised (<i>on/off duty</i>)	-	0	01 to 50
Motorised (<i>inching duty</i>)	-	0	51 to 99
Pneumatic (Control)	-	1	01 to 50
Motorised (<i>thyrestor Control</i>)	-	1	51 to 99
Sol. Operated	-	2	01 to 99
(Open / Close duty (Valves, NRVs, Gate)			
Hydraulic	-	3	01 to 99



DOCUMENT TITLE

KKS NUMBERING PHILOSOPHY

NTPC FGD PACKAGES LOT - 1A, 2 & 3

NRV (Without actuation)	-	4	01 to 99
Manual	-	5	01 to 99
Manual	-	6	01 to 99
Relief & Safety Valves	-	7	01 to 99
Reserve	-	8	01 to 99
Reserve	-	9	01 to 99

ii) Field Instruments

Field Transmitters & Analog Signals	-	0	01 to 99
Field Switches & Binary Signals	-	1	00 to 99
PG Test Point	-	4	00 to 99
Gauges	-	5	00 to 99
Automatic Turbine Tester (ATT)-HWR	-	2	00 to 99
(Reserved for protection Signals used by Hardwar)			

Example of Numerical Key Usage:

In line with the philosophy adopted for Valves / Dampers /instruments etc. pumps and fans in the main systems (having different system code) can be numbered as AP/N100 and as AP/N101, 102, Where system code is same.



TITLE:
**TECHNICAL SPECIFICATION FOR RATE
CONTRACT OF
SELF CELAING STRAINER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-RC4-165-N004**
SECTION: **III**
SUB-SECTION:
REV. NO. 0 DATE 25/02/2020
SHEET 1 OF 1

SECTION III

DOCUMENTS TO BE SUBMITTED BY BIDDER

	TITLE : COMPLIANCE CERTIFICATE FOR SELF CLEANING STRAINER	SPEC. NO.	SPEC. NO. PE-TS- RC4-165-N004
		DATE:	25/02/2020
		SHEET:	1 OF 2

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions with regard to same.
- b) There are no other deviations w.r.t. specification other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer/Customer's Consultant approval and customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. Charges for 3rd party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself.
- d) Any drawing/ document/ data-sheet/ calculation/ Quality plan/ Instrumentation etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
- f) The commissioning spares shall be supplied on 'As Required Basis' and to be supplied at the time of commissioning of SCS & prices for same included in the base price itself. Prices for special tools & tackles, if any, shall also be included in the base price. Recommended spares for 3 years shall be quoted separately with price indicated separately.
- g) Charges for Installation Checks, commissioning of equipment and Performance Testing at site shall be included by bidder in the base price itself.
- h) The main flanges for SCS shall be suitable for the forces and moments as per the specification.
- i) The hydrostatic test pressure shall be 1.5 times the design pressure.
- j) All sub - vendors shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
- k) The Performance guarantees of equipment shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Customer/Customer's Consultant.
- l) The orientation of piping around SCS shall be finalised during detailed Engg.
- m) Electrical/ C&I :
 - All selected motor ratings have minimum 15 % margin over maximum continuous demand of the driven equipment including voltage and frequency variations, temperature rise and other factors.
 - Supply of electrical viz. LT power cables, instrumentation and control cables, cable glands, lugs, cable trays etc. shall be as per specification. Their erection shall be done by BHEL



**TITLE : COMPLIANCE CERTIFICATE
FOR SELF CLEANING STRAINER**

SPEC. NO.

SPEC. NO. PE-TS- RC4-165-N004

DATE:

25/02/2020

SHEET:

2 OF 2

- The junction boxes for termination of DPT/ DPS/ Actuator LS/ solenoid valves are included in bidder's scope. The instrumentation cable and cabling from instruments/ actuators to junction boxes is also included in bidder's scope.
- Valve actuators and controls shall be provided as specified in Data Sheet-A and Project specific requirements as specified in Section I-B & Section I-C.
- Alarms/ annunciations/ instruments shall be finalised during detailed engineering in the event of order which shall be subject to BHEL/ Customer/Customer's Consultant approval and shall be without any commercial implications to BHEL.
- Switch gear panel should have suitable arrangement like bus coupler for providing redundancy to incoming supply feeder.



TITLE : **SCHEDULE OF PERFORMANCE GUARANTEES
FOR
SELF CLEANING STRAINER (SCS)**

TECHNICAL SPECIFICATION NO. **PE-TS- RC4-165-N004**

SECTION : **III**

SUB SECTION : **IIIA**

Sheet **1** of **1** Date- **25/02/2020**

S.N O.	DESCRIPTION	UNITS	TYPE-1	TYPE-2	TYPE-3	TYPE-4	TYPE-5	TYPE-6
1.	Pressure drop across the SCS (i.e. between inlet & outlet nozzle) under clean condition and Normal flow condition	MWC						

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL