Section - VIII

AMENDMENTS AND CLARIFICATIONS-Part-I

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE
FOR
DCRTPP YAMUNA NAGAR (2X300 MW)
BIDDING DOCUMENT NO.: 4/CE/PLG/NTPC/DCRTPP/FGD-251
AMENDMENT NO. 4/CE/PLG/NTPC/DCRTPP/FGD-251-Amdt-01

S.N	Reference			For	Read as
	Section	Clause	Page		
1	Section-V, SCC, Time for Commencement and Completion (GCC Clause 8) GCC 8.2	Special condition (SCC) no. 3	1 of 2	**Time for Completion:** Completion of facilities for first Unit and common facilities shall be attained within 30 months from the date of Notification of Award. The activities specific to subsequent Unit shall be phased at an interval of 3 months, except for engineering activities which shall be completed along with the first unit.	Time to complete the facilities from the date of Notification of Award "Completion of all Facilities" shall be attained within 30 months from the date of Notification of Award.
2	SECTION - VII BOOK 3 OF 3, Appendix-1	-	-		Add a new clause J after the clause I as under: J. **Payment terms for training**: 100% of the training charges shall be paid on completion of the training.

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE
FOR
DCRTPP YAMUNA NAGAR (2X300 MW)
BIDDING DOCUMENT NO.: 4/CE/PLG/NTPC/DCRTPP/FGD-251
Clarification No.-01

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
	Section	Clause	Page			
1.	SECTION - VII BOOK 3 OF 3 Appendix-1	C. Schedule 1, 2 and 6 :		For FOB Price Component of Plant and Equipment (excluding Mandatory Spare and Type Test): (I) **Ten (10%)** of the total FOB price component as Initial Advance Payment on : (II) **Sixty Percent (60%)** of FOB price component of the Contract price for each identified equipment shall be paid progressively on pro-rata basis upon receipt of material and physical verification at site on prorata basis on..... (iii) **Twenty Percent (20%)** of the total FOB price component..... (IV) Ten Percent (10%) of the total FOB price component.....	The bidder request the following payment terms: (I) 20% of the total FOB price component as Initial Advance Payment on : (II) 50% of FOB price component of the Contract price for each identified equipment shall be paid progressively on pro-rata basis upon desptach of material from bidder's port and 10% upon receipt of material and physical verification at site on prorata basis on..... (III) 10% of the total FOB price component..... (IV) 10% of the total FOB price component.....	Provision of document shall prevail.
2.	SECTION - VII BOOK 3 OF 3 Appendix-1	A1. (I) b		Submission of an unconditional Bank Guarantee covering **110% of the advance** amount, which shall be initially kept valid upto (ninety) 90 days beyond the schedule date for successful Completion of the Facilities under the Package.	The bidder request for submission of an unconditional Bank Guarantee covering 100% of the advance amount for Schedules No.1, No.2, No.3 and No.4.	Provision of document shall prevail.
3.	SECTION - VII BOOK 3 OF 3	B. Schedule No. 2,		For Ex-works Price component of Plant and Equipment (excluding Mandatory Spares and	The bidder request the following	Provision of document shall

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
	Appendix-1	**B1**		Type Test) : (I) **Ten (10%)** of the total Ex-works price component as Initial Advance Payment on : (II) **Sixty Percent (60%)** of Ex-works price component of the Contract price for each identified equipment shall be paid progressively on pro-rata basis upon receipt of material and physical verification at site on prorata basis on..... (iii) **Twenty Percent (20%)** of the total Ex-works price component..... (IV) **Ten Percent (10%)** of the total Ex-works price component.....	payment terms: (I) 20% of the total Ex-works price component as Initial Advance Payment on : (II) 60% of of Ex-works price component of the Contract price for each identified equipment shall be paid progressively on pro-rata basis upon receipt of material and physical verification at site on prorata basis on.... (III) 10% of total Ex-works price component..... (IV) 10% of total Ex-works price component.....	prevail.
4.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**C. Schedule 1, 2 and 6 :**		Payment Terms for Mandatory Spares and Recommended Spares (When ordered) (I) **Eighty percent (80%)** of CIF/Ex-works(India) price component of the spares…….. (II) **Twenty (20%)** of CIF/Ex-works(India) price component of the spares…...	The bidder request the following payment terms: (I) 20% of CIF/Ex-works(India) price component of the spares as Initial Advance Payment on : (II) 70% of CIF/Ex-works(India) price component of the spares	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
					(III) 10% of CIF/Ex-works(India) price component of the spares	
5.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (a) Erection Portion**		(I)(A) Five Percent (5%) of the total installation services component of the Contract Price (excluding Civil Works & Structural Works) will be paid to the Contractor **as interest bearing advance payment on.....** (I)(B) Five Percent (5%) of the total installation services component of the Contract Price (excluding Civil Works & Structural Works) will be further paid to the Contractor **as interest bearing advance payment on.....**	**please consider.to delete this provision as the bidder will have to include this interest to their price, which will be borne by HPGCL.**	Provision of document shall prevail.
6.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (a) Erection Portion**		(I) (C) In case the contractor decides not to take interest bearing advance payment, the advance payment shall be proportionately adjusted in the balance payments excluding final payment (i.e. in the progressive payment indicated at E(a) (II) and (III) below).	Please clarify in what proportion, the 10% payment shall be released under clauses E(a) (II) and (III) in case the bidder does not take the advance.	Provision of document is amply clear.
7.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (a) Erection Portion**		(II) Seventy Percent (70%) of the Erection Portion of installation Services component of contract price (excluding Civil & Structural works) will be made on pro-rata basis against progressive erection of the equipment on:	How will 70% installation payment be made? "on pro-rata basis against progressive erection of the equipment" means milestone payment? Please clarify.	Please refer note at the end of E(a).
8.	**SECTION - VII**	**E. Schedule No. 4:**		(I)(A) Five Percent (5%) of the total installation	please consider.to delete this provision	Provision of

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
	BOOK 3 OF 3 Appendix-1	**(b) Civil Portion**		services component of the Contract Price (excluding Civil Works & Structural Works) will be paid to the Contractor as interest bearing advance payment on: (I)(B) Five Percent (5%) of the total installation services component of the Contract Price (excluding Civil Works & Structural Works) will be further paid to the Contractor as interest bearing advance payment on:	as the bidder will have to include this interest to their price, which will be borne by HPGCL.	document shall prevail.
9.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (b) Cvil Portion**		(I) (C) In case the contractor decides not to take interest bearing advance payment, the advance payment shall be proportionately adjusted in the balance payments excluding final payment (i.e. in the progressive payment indicated at E(b) (II) and (III) below).	Please clarify in what proportion, the 10% payment shall be released under clauses E(b) (II) and (III) in case the bidder does not take the advance.	Provision of document is amply clear.
10.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (b) Cvil Portion**		(II) Seventy percent (70%) of the total Civil Works Price Component shall be paid progressively on	How will 70% civil works payment be made? Please clarify.	Please refer note at the end of Para E(b).
11.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (c) Structureal works portion**		(I)(A) Five Percent (5%) of the total installation services component of the Contract Price (excluding Civil Works & Structural Works) will be paid to the Contractor as interest bearing advance payment on	please consider.to delete this provision as the bidder will have to include this interest to their price, which will be borne by HPGCL.	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				(I)(B) Five Percent (5%) of the total installation services component of the Contract Price (excluding Civil Works & Structural Works) will be further paid to the Contractor as interest bearing advance payment on		
12.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (c) Structureal works portion**		(I) (C) In case the contractor decides not to take interest bearing advance payment, the advance payment shall be proportionately adjusted in the balance payments excluding final payment (i.e. in the progressive payment indicated at E(c)(II) and (III) below).	Please clarify in what proportion, the 10% payment shall be released under clauses E(c) (II) and (III) in case the bidder does not take the advance.	Provision of document is amply clear.
13.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**E. Schedule No. 4: (c) Structureal works portion**		(II) Seventy Percent (70%) of the total Civil Works Price Component shall be paid progressively on:	How will 70% structural works payment be made? Please clarify.	Please refer note at the end of Para E(c).
14.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**G. Schedule - 7 : Payment Terms for Taxes & Duties**		i) **Indian Custom Duties or levies** including Stamp Duty and Import License Fee levied by the Government of India or any State Government in India on the Plant and Equipment including..... which will become the property of the Employer, shall be paid directly by the Employer to the Government of India or the concerned authorities.....	Please modify the line as "Indian Custom Duties & IGST or levies "	Provision of document shall prevail.
15.	**Price schedules for FGD System Package**	**Schedule 4 (IV)**		**Training charge**	the payment procedure for training charges is not mentioned in Appendix-	Refer amendment training.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
					1, please clarify.	
16.	**SECTION - VII BOOK 3 OF 3**	**4.1**		Progressive payment other than that under the letter of credit will become due and payable by the Project Manager within forty five (45) days from the date of receipt of Contractor's bill/invoice/debit note by the Employer, provided the documents submitted are complete in all respects.	The bidder request for 21 days	Provision of document shall prevail.
17.	**SECTION - VII BOOK 3 OF 3 Appendix-1**	**A Schedule No.1 plant and equipment**		A1 &B1.(2) (i) In case Installation Price (excluding Civil/Structural works price) is **less than 15% of the cumulative total of FOB & Ex-works Price** of Main Equipment, the amount by which it is lower shall be retained proportionately from the FOB & Ex-works component of Contract price. (ii) In case the Civil Works Price (including Site Fabricated Structural works price) **is less than 32% of the cumulative total of FOB & Ex-works** Price of Main Equipment, the amount by which it is lower shall be retained proportionately from the FOB & Ex-Works component of Contract price	Bidder request a clarification on details	Provision of document is amply clear. Please refer ITB cl. 10.4(d).

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
18.	SECTION - VII BOOK 3 OF 3 Appendix-1	E Schedule No.4 installation service		Note: The basis for the pro-rata payments above shall be the Billing Break up to be finalised subsequently after award of contract. In case the Installation Price (excluding Civil/Structural works price) is more than 20% of the cumulative total of FOB & Ex-works Price of Main Equipment, the amount by which it is higher shall be retained while releasing progressive payments due on installation of equipment.	In our opinion, for installation, only lower cap shall be applicable, the upper cap is not understandable, please clarify,	Provision of document is amply clear. Please refer ITB cl. 10.4(d).
19.	SECTION - VII BOOK 3 OF 3 Appendix-1	E Schedule No.4 installation service		Note for Para E. (b) & E. (c) In case the Civil Works Price (including Site Fabricated Structural Works Price) is **more than 42% of the cumulative total of FOB & Ex-works** Price of Main Equipment, the amount by which it is higher shall be retained while releasing progressive payments	Bidder request a clarification on details	Provision of document is amply clear. Please refer ITB cl. 10.4(d).
20.	SECTION – VI TECHNICAL SPECIFICATION	3.00.00		iii) Contractor's aggregate liability to pay Liquidated Damages (LD) for failure to attain the functional guarantee shall not exceed twenty five percent (25%) of the Contract Price.	The 25% is very high, request to reduce to 10% of the contract price as per industial practice.	Provision of document shall prevail.
21.	SECTION – IV GENERAL	Clause 14. Taxes		14.2 Notwithstanding GCC Sub-Clauses 14.1	The bidder understood that HPGCL will	Provision of

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
	CONDITION OF CONTRACT	**and Duties**		above, the Employer shall bear and promptly pay/reimburse all Customs and Import duties, if imposed on the Plant and Equipment including Mandatory Spares supplied from abroad and specified in Price Schedule No. 1..... Further, if the Custom Duty, Import Duty & GST on Imports levied are more than as specified in Schedule-7A , contractor shall bear the same.	pay the Custom duty & IGST and Import to Customs authorities directly. The bidder also understand that this clause is applicable for wrongly declaration of Custom duty by bidder, if case of any increase of custom duty rate after the deadline set for price bid as per Clasue 14 GCC, the bidder shall not bear the payment.	document is amply clear. Please refer cl. No. 14.2 and 36 of GCC.
22.	**SECTION – IV GENERAL CONDITION OF CONTRACT**	**Clause 27.8.1**		At the end of the Defect Liability Period, the contractor liability ceases except for latent defects. The contractor's liability for latent defects warranty shall be limited to **a period of five (5)** years from the end of Defect Liability Period.	The bidder request for 2 years	Provision of document shall prevail.
23.	**Section-VII, Attachment 3A-8,**			In the format, it is mentioned that" Average Annual Turnover of our Collaborator /Associate for the preceding three (3) Financial Years of 2017-2018/2018-2019/2019-2020"…….	Turnover for 2019-2020 is not available. We will provide 2016-2017/2017-2018/2018-2019.	Proved turnover for the preceding three (3). FY as on the date of Bid opening.
24.	**SECTION – VI TENDER DRAWINGS**				Please provide AUTOCAD FORMAT the layout drawing for total power plant and elevation plant drawing of flue duct	AUTOCAD FORMAT layout drawings shall be made available to the individual bidders separately as per their requirement.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
						Kindly refer Appendix-D for Flue Duct drawing.
25.	SECTION-I-IFB-	CLAUSE NO. 5		Bid Security for an amount INR 100,000,000/- (Indian Rupees One Hundred Millions only) shall be submitted offline prior to date and time for online bid submission. IF ANY BIDDER DOES NOT SUBMIT ACCEPTABLE BID SECURITY IN A SEPARATE SEALED ENVELOPE PRIOR TO THE DATE AND TIME FOR ONLINE OPENING BID SUBMISSION, HIS BID SHALL BE REJECTED BY THE EMPLOYER AS BEING NON-RESPONSIVE AND SHALL NOT BE OPENED.	As per etenders.hry.nic.in Portal payment mode is online and as per tender document EMD payment mode is offline. As per online portal in bidders manual kit if tender fees need to pay at same time EMD details need to provide. Bidder wants to confirm is their any option that first tender fees can be paid and after that EMD details can be uploaded later but before bid submission. Kindly confirm.	Bidders have to follow instructions mentioned in online e-tender portal.
26.	Section- VII Book 1 of 3	ANNEXURE-I to ATTACHMENT-8			As per Serial No. xvi and xxi both the equipments mentioned are same 'Belt Filter Wash Water Pump' Bidder want to confirm both are same equipmets or different. Kindly confirm.	S.N. XXI stand deleted.
27.	SECTION –V (SCC)	clause No. 3		Time for Completion: Completion of facilities for first Unit and common facilities shall be attained within 30 months from the date of Notification of Award. The activities specific to subsequent Unit shall be phased at an interval of 3 months, except for engineering	As per BDS Clause No.10 'Time to complete the facilities from the date of Notification of Award "Completion of all Facilities" shall be attained within 30 months from the date of Notification of Award. Bidder wants to confirm Total	Refer amendment.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				activities which shall be completed along with the first unit.	completion time.	
28.	**Section- VII Book 1 of 3**	**ANNEXURE-I to ATTACHMENT-8**			After ANNEXURE-I to ATTACHMENT-8 the next attachment is 12A,13A,14A, and after that Attachment 9 start. Bidder assume this is a Typo error. Kindly confirm.	Confirmed.
29.	**SECTION –IV (GCC)**	**5.1 Governing Laws**	**7 of 68**	The Contract shall be governed by and interpreted in accordance with laws in force in India. The Courts of Panchkula shall have exclusive jurisdiction in all matters arising under the Contract	……in accordance with the laws of the England and Wales."	Provision of document shall prevail.
30.	**SECTION –IV (GCC)**	**6 Settlement of Disputes**	**7 of 68**	All the disputes shall be settled as per HPGCL rules and regulations. In case dispute or disagreement relating to this Contract arises during the contract/ implementation and the understanding is not reached between the two parties, either of the parties may invoke the arbitration clause for which MD, HPGCL or his nominee shall be Sole Arbitrator. All arbitration proceedings under this regulation shall be governed by the provisions of the Arbitration and	Any dispute arising out of or in connection with this Contract, including any question regarding its existence, validity or termination, shall be referred to and finally resolved by arbitration administered by the Singapore International Arbitration Centre ("SIAC") in accordance with the Arbitration Rules of the Singapore International Arbitration Centre ("SIAC Rules") for	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				Conciliation Act, 1996 and the Rule there under, with any statutory modifications thereof for the time being in force. The award of the Arbitrator shall be final and binding on both the parties. The Arbitration proceedings shall take place at Panchkula, Haryana	the time being in force, which rules are deemed to be incorporated by reference in this Clause. The seat of the arbitration shall be Singapore. The Tribunal shall consist of three arbitrators. The language of the arbitration shall be English."	
31.	**SECTION –IV (GCC)**	**27.8.1**	**41 of 68**	At the end of the Defect Liability Period, the contractor liability ceases except for latent defects. The contractor's liability for latent defects warranty shall be limited to a period of five (5) years from the end of Defect Liability Period. For the purpose of the this clause, the latent defects shall be the defects inherently lying within the material or arising out of design deficiency which do not manifest themselves du	Kindly delete this article.	Provision of document shall prevail.
32.	**SECTION –IV (GCC)**	**42.1.1**	**60 of 68**	42.1.1 The Employer may at any time terminate the Contract for any reason by giving the Contractor a notice of termination that refers to this GCC Sub-Clause 42.1	Kindly delete this article.	Provision of document shall prevail.
33.	Section-II, ITB	10.7	17 of 33	Price Basis Prices quoted by the Bidder shall be on price firm basis. The contract price shall remain firm during the currency of the contract.	Since the contract period is two & half years, we request the Employer to consider price variation based on suitable indices as per mutually agreed formulae.	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
34.	Section-II, ITB	13.2	19 of 33	The bidder is required to keep the prices of recommended spares covered under Price Schedule No.6 valid for a period of Five (5) years after Notification of Award for main equipment and mandatory	We would like to clarify that the spares will have to be procured from different OEMs. Hence, we request the Employer to consider validity of prices of recommended spares shall 180 days from the date of submission of Price bid for main equipment and mandatory spares.	Provision of document shall prevail.
35.	Section-II, ITB	21.3	19 of 33	Compliance with the Provisions of Bidding Documents No deviation, whatsoever, is permitted by EMPLOYER to any provisions of Bidding Documents. The Bidders are advised that while making their Bid proposals and quoting prices, all conditions may appropriately be taken into consideration. Bidders shall certify their compliance to the complete Bidding Documents by accepting the declaration as per attachment-19. Acceptance of above shall be considered as	We would like to request you kindly allow techno-commercial deviations. Which will be mutually resolved during post bid discussion.	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				Bidder's confirmation that any deviation to the any Provisions found anywhere in their Bid Proposal, implicit or explicit, shall stand unconditionally withdrawn, without any cost implication whatsoever to the Employer, failing which the bid security shall be forfeited.		
36.	Section-II, ITB	27.0 (iii)	29 of 33	Third Contract: For providing all services i.e. port handling, port clearance and port charges for the imported goods, further loading, inland transportation for delivery at site, inland transit insurance, unloading, storage, handling at site, installation, insurance covers other than inland transit insurance, testing, commissioning and conducting Performance Guarantee Tests in respect of all the equipments supplied under the 'First Contract' & the `Second Contract' and all other services as specified in the Contract Documents.	We understand civil and allied works will be part of this third contract. Please confirm.	Confirmed.
37.	Section-II, ITB	31.1	31 of 33	Within twenty-eight (28) days after receipt of the Notification of Award, the successful Bidder shall furnish performance securities, in the form of bank guarantee, for ten percent (10%) of Contract Price for all the contracts and in the form provided in the section "Forms and Procedures" of the bidding documents.	We request to consider performance security of 5% of Contract Price instead of 10% of contract Price.	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
38.	SECTION – IV (GCC)	9.2	12 of 68	The Contractor confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the Facilities (including any data as to boring tests) provided by the Employer, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site (if access thereto was available) and of other data readily available to it relating to the Facilities as at the date twenty-eight (28) days prior to deadline set for price bid submission. The Contractor acknowledges that any failure to acquaint itself with all information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities. such data and	We would like to clarify that the bidder will submit his bid based on the bidding documents and other data, documents and information made available to it by the Employer. Any changes, errors or omissions in the same leading to additional time and cost implications on the contractor after award of contract shall be suitably compensated by the Employer.	Provision of document shall prevail.
39.	SECTION-VII, BOOK 3 OF 3	APPENDIX – 1 to Form of Contract Agreement	--	TERMS AND PROCEDURES OF PAYMENT	We request the Employer to consider the following payment terms in connection with the subject tender. A) 10% interest free mobilisation advance against submission of Bank Guarantee of equal value. (Supply + services) B) Supplies:- i) 70% against dispatch of	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
					equipment on pro-rata basis, ii) 10% after receipt of material at Site on pro-rata basis, iii) 2.5% against Completion of mechanical erection iv) 2.5% against completion of commissioning v) 5% against completion of PG Test C) Services (civil and installation services):- i) 82.5% prorate basis against monthly RA Bill ii) 2.5% against completion of commissioning. iii) 5% against completion of PG Test.	
40.	SECTION-VII, BOOK 3 OF 3	SCHEDULE – III		All the Payments due under the Contract will be released by the Employer to the Contractor in this Escrow Account as per Terms of Payment	We request all payments for Civil and Installation services shall be paid directly to the Contractor's Bank	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				agreed in the Contract.	Account instead of ESCROW account.	
41.	Section-Vi, Part-A, Sub section-VI	3.00.00, Note (iii)	6 of 15	Liquidated damages- Performance-25% of the contract value.	We request LD for performance of 10% of the Contract Price shall be considered.	Provision of document shall prevail.
42.	Section-IV, GCC	7.3.1.4	9 of 68	To enable the Employer to finalise the requirement of recommended spares which are ordered subsequent to placement of order for main equipment/plant, in addition to necessary technical details, catalogue and such other information brought-out herein above, the Contractor will also provide a justification in support of reasonableness of the quoted prices of spares which will, inter-alia, include documentary evidence that the prices quoted by the Contractor to the Employer are not higher than those charged by him from other customers in the same period.	It is stated that the details of prices quoted by the Contractor to other customers is confidential data of the contractor, and hence disclosing the same would not be befitting to the contractor.	Provision of document shall prevail.
43.	SECTION – IV (GCC)	27.8.1	41 of 68	At the end of the Defect Liability Period, the contractor liability ceases except for latent defects. The contractor's liability for latent defects warranty shall be limited to a period of five (5) years from the end of Defect Liability Period. For the purpose of this clause, the latent defects shall be the defects inherently	Please delete the sub-clause.	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				lying within the material or arising out of design deficiency which do not manifest themselves during the Defect Liability Period in this GCC clause 27, but later.		
44.	SECTION – IV (GCC)	30	44 of 68	Limitation of Liability	Request for inclusion of the following and the clause to be read as: "(a). The Contractor shall not be liable to the Employer, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs or loss of revenue, provided that this exclusion shall not apply to any obligation of the Contractor to pay liquidated damages to the Employer and"	Provision of document shall prevail.
45.	SECTION – IV (GCC)	40.4	59 of 68	The following documents shall form the principal basis for consideration of Time Extension pursuant to GCC clause 40 with or without LD, levy of liquidated damages pursuant to GCC clause 26 and settlement of extra claims during the execution of contract:	5. In addition to the specified documents, the relevant correspondences exchanged between the parties should also be considered for time extension.	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				1. The joint recordings in the weekly meetings register 2. Records of Technical Coordination Meetings. 3. Records of Contract Review meetings. 4. Written notices issued by the "Project Manager" or his authorized representative to Contractor in the relevant period.	6. In case, the time extension is due to reasons solely attributable to the Employer, the contractor shall be compensated for additional expenses incurred during extended period. Please confirm.	
46.	Section-V, SCC	Completion Time Guarantee (GCC Clause 26) GCC 26.2	1 of 2	a) Liquidated Damages for delay in successful Completion of Facilities shall be as under: If the contractor fails to achieve the successful Completion of Facilities within the agreed work schedule, the Contractor shall pay to the Employer as liquidated damages and not as penalty, a sum calculated at the following rates: One percent (1%) of the contract value (excluding cost of mandatory spares) for each week of delay or part thereof.	We request LD @0.25% per week on undelivered/uncompleted portion of work of Contract Price shall be considered up to a maximum of 5% of total Contract Price. This shall also apply for delay in supply of spares also.	Provision of document shall prevail.

S.N	Specification Reference			Specification Requirement	Bidder's Query	HPGCL REPLY
				b) The liquidated damages for delay in supply of spares beyond the dates stipulated under the Contract shall be as follows: One percent (1%) of Ex-works (India) price of undelivered spares, per week or part thereof of delay subject to maximum of Ten percent (10%) of the total Ex-works of all spares included in the scope of work of the contractor under the contract. (c) The total amount of liquidated damages for delay under the contract will be subject to a maximum of Ten percent (10%) of the total Contract Price [total of First / Second Contract & Third Contact (as applicable)].		

AMENDMENT NO. 2 TO TECHNICAL SPECIFICATION

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB-SEC.	PAGE NO.	CLAUSE NO.		
STEAM GENERATOR (SG)						
1.	VI/A	V	3 of 13	2.00.02	Single-flue **or twin-flue** chimney shall be provided away from the…	Single-flue chimney shall be provided away from the…
CIVIL						
2.	VI/A	II	15 of 24	7.02.03 xv)	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	Routine pile load tests to be performed on 0.5% of the total number of piles provided for each diameter/allowable capacity. High Strain dynamic load test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests. In case agency wish to carry out only static routine vertical load test on 0.5% of total number of piles, he may adopt the same.
3.	VI/A	II	-	Annex-ure-II	-	ERT (Electrical resistivity test) result added as part of Annexure-II, Clause 7.00.01, Part-A **(Refer Appendix-A)**
4.	VI/A	II	11 To 24 of 24	7.00.0	**Foundation system and geotechnical data**	**"Foundation system and geotechnical data"** given in Annexure-1 to this amendment shall replace the contents of clause no 7.00.00- **Foundation system and geotechnical data** to Tech Spec, Part-A, Sub-Section-II. **(Refer Appendix-B)**

AMENDMENT NO. 2 TO TECHNICAL SPECIFICATION

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB-SEC.	PAGE NO.	CLAUSE NO.		
5.	VI/B	IV-D	3.14.09 Para 7	13 of 68	**(v)** The entire external surface of chimney shell shall be painted with epoxy phenolic coating as specified in **(iv)** above in alternate bands of 'signal red' and 'bright white' colours.	**(iv)** The entire external surface of chimney shell shall be painted with epoxy phenolic coating as specified in **(iii)** above in alternate bands of 'signal red' and 'bright white' colours.
ELECTRICAL						
6.	Section-VI	Part-E	Single Line Diagram	9.	6.6/0.433KV SERVICE TRF SHALL BE OUTDOOR OIL FILLED.	6.6/0.433KV SERVICE TRF SHALL BE OUTDOOR OIL FILLED/ INDOOR DRY TYPE. **(Refer Appendix-C)**
MATERIAL HANDLING (MH)						
7.	VI/A	IIIA-5	2 of 7	1.02.00	Gypsum handling system shall be provided with 2x100% conveyor stream for conveying dewatered gypsum from gypsum vacuum belt filter to closed storage shed. The storage shed shall be sized for **7 days** of gypsum production with all the units in operation……..	Gypsum handling system shall be provided with 2x100% conveyor stream for conveying dewatered gypsum from gypsum vacuum belt filter to closed storage shed. The storage shed shall be sized for **15 days** of gypsum production with all the units in operation……..

AMENDMENT NO. 2 TO TECHNICAL SPECIFICATION

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB-SEC.	PAGE NO.	CLAUSE NO.		
8.	VI/A	VI	14 of 16	5.00.00	To be added.	xxiv. Power consumption of lime stone unloading, conveying, crushing , storage & reclaiming system (Single stream) except Lighting, Hoists, sampling unit, Sump Pumps, Elevators, DE, Ventilation, SW System, Portable water system: Duty factor for above system to be considered as 0.1. Accordingly, Power consumption for the same shall be duty factor x power consumption. xxv. Power consumption of Gypsum conveying system (Single Stream) except Lighting, Hoists, Sump Pumps, DE, Ventilation, SW System, Potable water system. Duty factor for above system to be considered as 1. Accordingly, Power consumption for the same shall be duty factor x power consumption.
CONTROL & INSTRUMENTATION (C&I)						
9.	**SECTION – VI, PART-A**	**III-C (C&I)**	**3 OF 3**	1.02.01	Fieldbus based control system for fieldbus based actuators and fieldbus based instruments (PT/DPT/TT) shall be provided for all applications. In case non fieldbus based actuator or transmitters are required for few applications then the same shall be discussed and finalized during detailed engineering. A. For fieldbus based instruments/ actuators …	Fieldbus based control system for fieldbus based non-intrusive electrical actuators and fieldbus based instruments (PT/DPT/TT) shall be provided for all applications except for Booster Fan blade pitch controls for which conventional controls and devices (Actuators, Instruments) shall be provided. A. For fieldbus based instruments/ actuators …
10.	**SECTION – VI, PART-A**	**-III-C (C&I)**	**3 OF 3**	3.03.04	Comprehensive Annual Maintenance Contract (AMC) for five (05) years after warranty period shall be provided by the contractor for CEMS and Analysers of FGD System	Comprehensive Annual Maintenance Contract (AMC) for five (05) years after **Comprehensive Operation & Maintenance period** shall be provided by the contractor for CEMS and Analysers of FGD System.

CLARIFICATION TO TECHNICAL SPECIFICATIONS (SECTION VI)

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE
FOR
DCRTPP YAMUNA NAGAR (2X300 MW)
BIDDING DOCUMENT NO.: 4/CE/PLG/NTPC/DCRTPP/FGD-251
Clarification No.-02

S.N.	Section/ Part	Sub-Section	Page No.		Tender Specifications	Bidder's Query	HPGCL/NTPC Reply
1	Part- A, Section - VI	Sub- Section- III-A1 (FGD)	2 of 10	2.04.00.	Provision shall be made for facilitating operation of unit with FGD bypass through existing stack. All modifications required including providing bypass damper is included in the scope of the Contractor.	For DCRTPP, YAMUNA NAGAR 2x300 MW project, we request Customer to provide the **Layout of ID System ducting drawing (Elevation & Plan)** of the existing boiler package to know the dimensions of the FGD Bypass Duct (duct connecting ID Fans to the existing chimney). This is required to know the duct size of FGD Bypass Damper (required for estimation and supply of this damper). Only "General Layout Plan" drawing is enclosed with the tender document. (Please note that ID System drawing was shared for the recent HPGCL Hisar FGD project. Similarly, we require ID System drawing for Yamuna Nagar project).	Kindly refer Appendix-D for Flue Gas Duct Drawing .
2	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	6 of 52	3.01.00 Sl. no: 5	**Flue Gas Velocity:** Maximum flue gas velocity through the Absorber (m/s)- Not more than 4 m/s at design point	**Clarification:** As per our FGD design practice, maximum gas velocity through the Absorber shall be 4.0-4.5m/s. Kindly confirm	Specification requirements shall be considered by the bidder.
3	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	7 of 52	3.01.00 Sl. no: 6	**Recirculation Slurry pH:** Not Less than 5.5 under all operation conditions	**Clarification:** Based on our FGD design practice, slurry pH in the Absorber is between 5 and 6.5. FGD will be designed for the same. Kindly confirm.	Specification requirements shall be considered by the bidder.
4	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	17 of 52	5.06.02	The design of flue gas ducts and inlet and outlet hoods of the FGD as well as guide vanes and baffle plates shall ensure a homogeneous flue gas flow with respect to the distributions of: (i) temperature (ii) velocity (iii) dust content (iv) slurry injection and distribution. The above shall be proven by two phase Computa-tional Fluid Dynamics simulations (liquid and gas). The scope of modelling shall include flue gas path inside the absorber vessel including inlet and outlet duct. Homogeneity shall be ensured, if the devia-tion from average is less than +10%. Further, in the Absorber outlet hood no internals such as guide vanes and baffle plates shall be allowed.	**Clarification:** Customer's requirement "deviation from average: less than ±10%" is too strict and it is not required for the stable operation at the actual plants based on MHPS' experi-ences. The deviation from average is generally 15-20% and MHPS designed and delivered FGD plants based on the deviation from the av-erage for approx. ±15%. Bidder requested to change deviation from "±10%" to "±20%".	Specification requirements shall be considered by the bidder.
5	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	17 of 52	5.06.06	Mist Eliminator: Three stage chevron type Mist Eliminators (ME) made of Polysulfone or stainless steel shall be provided at the exit of the absorber.	**Clarification:** As per our proven practice, Mist Eliminator will be made of polypropylene (PP) or FRP. Kindly confirm.	Specification requirements shall be considered by the bidder.

6	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	19 of 52	5.06.11	The complete absorber vessel (absorber oxidation tank, absorber tower & absorber outlet duct upto absorber outlet flange) shall be made of clad sheet of C276 / Alloy 59 (minimum 2 mm thickness) having minimum 7 mm thick carbon steel as base material.	**Clarification:** Welding of clad sheet of C276 at site is difficult. C276 Clad sheet suppliers are not expressing interest to do field welding of clad sheet. In contrast, C276 Wall paper erection is relatively simple. Our collaborator has experience in C276 wall paper.We request customer to accept C276 wall paper also.	Specification requirements shall be considered by the bidder.
7	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	19 of 52	5.06.14	All internal members shall be lined with minimum 2 mm Alloy 59/C276	**Clarification:** We understand that this specification is for the support members of internals (i.e Mist Eliminator supports, Spray Pipe supports) As per proven design practice, since spray pipes are in contact with slurry we will provide C276/Alloy59 2 mm lining whereas the mist eliminator area is not in contact with slurry. However to take care of corrosion, it is proposed to use Carbon steel support members with 4mm thk rubber / 2mm thk Glass flake lining. This is being installed in many FGD plants and working successfully.	Specification requirements shall be considered by the bidder.
8	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	20 of 52	5.06.23	For the agitators a flushing system for startups shall be provided.	**Clarification:** Maximum Slurry concentration is 30% in Limestone Slurry & Auxiliary Absorbent Tanks. Agitator Impeller will be kept well above slurry sedimentation level (above LL). Hence Emergency flushing system during start up is not required for all slurry tanks. Kindly Accept.	Specification requirements shall be considered by the bidder.
9	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	29 of 52	7.08.03	Agitation shall be provided to prevent settlement of slurry by side entry agitators with emergency flush start system.		
10	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	32 of 52	10.01.00	Coarse-screen(s) of suitable material at suction-side of the pumps shall be provided.	**Clarification:** Coarse screens are generally considered at the suction side for Slurry Recirculation slurry pumps. Suction screen will be provided inside the Absorber for Recirculation slurry pumps. All other slurry pumps are handling fine slurry only. Hence coarse screens are not envisaged for other slurry pumps and also process water pumps. Please accept.	Bidder to consider coarse-screen(s) at suction-side of slurry recirculation pumps as per specification requirement.
11	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	34 of 52	12.02.00	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The Contractor can provide slurry pipes of size lower than 300 NB made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same. Outer surface of the pipes should be fire retardant.	**Clarification:** As per proven practice, all the pipes handling slurry shall be provided with FRP material. FRP pipes are highly corrosive & abrasion resistant material and widely used for slurry application. Since we are using spray headers inside Absorber made up of FRP. Requesting customer to allow all pipes handling slurry(> 300NB) with FRP option.	Specification requirements shall be considered by the bidder.
12	Section - VI, Part-B	Sub- Section- I- M1 (FGD SYSTEM)	20 of 52	5.06.24	It should be possible to discharge the absorber sump into the Auxiliary Absorbent tank within 2 hours.	**Clarification:** We propose 8 hours to discharge the slurry from absorber / absorber sump into the emergency drain tank to have optimum design of pumps. Please confirm	Specification requirements shall be considered by the bidder.

13	Part-B	SUB-SECTION-I-M1 (FGD)	30 of 52	7.08.03	Agitation shall be provided to prevent settlement of slurry by side entry agitators with emergency flush start system.	**Deviation:** As per proven practice, vertical agitators used for all slurry tanks except Absorber. Side entry agitator will be used for Absorbers. This is being followed in all NTPC tenders. Kindly accept.	Any design specific issues shall be discussed and resolved during detailed engineering.
14	Part-B	SUB-SECTION-IV Civil Works	35 of 71	19.00.00	All steel structures shall be fabricated in factory, transported and erected at site. All factory fabricated structures shall have bolted field connections.	**Deviation:** Since, the project is being constructed in existing plant, structures like duct and pipe rack are to be routed near to the existing building and structures. Hence it is requested that welding connections may be permitted for these structures in view that the modification of these structures can be done at site which may be arise due to unforeseen obstructions (both above and below grounds) Kindly Accept.	All steel structures shall be fabricated in factory, transported and erected at site. All factory fabricated structures shall have bolted field connections. Site welding shall be permitted in cases where final inputs are not available prior to dispatch of supporting/connecting members. Absorber vessel can be fabricated at site. In case bidder offers chimney flue liner cladding of C276/Titanium, it has to be fabricated in factory in segments, transported and welded at Site. However, in case the bidder offers chimney lining material as MS with Boro-silicate, the same can be fabricated at site.
15	VI/E		6 of 69	9944-250-POM-A-005	Tender Drawing	Bidder proposes Reversible belt feeder instead of Plough feeder in the "Limestone Day storage silo" area	Bidder to provide any of the following system to feed Limestone Day Silos & Storage Silos directly from Bucket elevators 1) Travelling tripper 2) Plough System 3) Fixed Trippers 4) Reversible Belt Feeder
16	VI/E		7 of 69	9944-250-POM-A-006	Tender Drawing	It is not feasible to provide dust extraction system at Gypsum storage shed since volume is very high and locating DE hood is not possible. Bidder propose for plain water dust seperation system. Please confirm	Bidder to comply with technical specification requirement.
17	VI/A	III-A5	1 of 7	1.03.00	A brief scope of Limestone handling plant & Gypsum handling facilities has been elaborated in the relevant paragraphs and shall be engineered based on the storage requirement of crushed limestone of 7 days & gypsum produced for 15 days based on the design criteria of major equipment specified in the Technical speciation.	Both the clauses are contradictory . Request customer to confirm the no. of days of gypsum storage. Hpwever, bidder proposes 7 days Gypsum Storage Facility as per Industry Practice.	Bidder to refer amendment in ths regard.
	VI/A	III-A5	2 of 7	1.02.00	The storage shed shall be sized for 7 days of gypsum production with all the units in operation.		

18	VI/A	III-A5	4 of 7	2.01.15	Suitable number of ploughs and its actuating mechanism shall be mounted on each conveyor to feed limestone into limestone mill bunkers/Day Silo. Alternatively, suitable nos. fixed Trippers on each conveyor to feed limestone into limestone mill bunkers/Day Silo. Bidder can also offer bucket elevator's for transferring crushed limestone to mill bunkers/Day silo.	As per the clause bidder proposes to feed Limestone Day Silos & Storage Silos directly from Bucket elevators via chutes.	Refer Reply at Sl. No 15.
19	VI/B	I-M6	9 of 41	2.0.0	Idlers	Please Specify the idler bearing life?	CEMA shall be followed for Idler Bearing Life.
20	VI/B	I-M6	9 of 41	1.0.0	General	Please specify whether counter weight of conveyor shall be made of cast iron or concrete	Counter weight of conveyor shall be made of concrete.
21	VI/A	III-A5	2 of 7	1.02.00	Gypsum from storage shed shall be loaded to user's trucks using front end loader/ payloader.	Bidder understand pay loader/ Front end loader shall be in Customers scope. Plesae confirm. If the same is not in customer scope, please furnish Specification	Bidder understanding is correct. Trucks/ pay loader/ Front end loader/ dozers are not in Bidder's Scope.
22	-	-	-	-	General	Please clarify the final location of waste water discharge from Sump pump of Gypsum storage shed.	Bidder to refer Sub Section IV Part-A Section VI of Technical Specifications.
23	VI/A	VI	12 of 15	5.00.00	Auxiliary Power consumption	1. Please furnish the duty factor to be considered for computing Auxilary power consumption in LHP & GHP. 2. Please furnish the list of equipments to be considered for Aux. Power calculation	Bidder to refer amendment in ths regard.
24	Sec VI- Part E	Tender SLD	69/69	-	SLD- Note-Sr.no -3	Transformer rating only upto 1.6MVA indicated. However in other NTPC projects same are used upto 2.5MVA	As per specifications, you can provide matching transformer of higher rating also. The table suggests only standard ratings upto 1600kVA.
25	Sec VI- Part E	Tender SLD	69/69	-	SLD- Note-Sr.no- 9- Transformer outdoor oil filled	Dry type indoor proposed by Bidder	Acceptable for indoor application, as the same is in line with specifications. Necessary amendment will be issued in this regard.
26	Sec VI- Part E	Tender SLD	69/69	-	-	Crusher feeders not indicated in 6.6KV SLD board. Same may be required during detailed engg. Bidder proposes to use single DOL feeders per crushers for reversible crushers.	Typical motor feeders are marked in existing SLD. Actual feeder allocation shall be done as per system requirement.
27	Sec VI- Part E	Tender SLD	69/69	-	-	Emergency DC lighting for LHP-GHP shall not be from emergency board	Clause 3.03.00 of sub section II E 10 is clear in this regards.
28	Sec VI- Part E	Tender SLD	69/69	-	-	Local control panels cum starter panels proposed for Scoop panels, Sump pumps, DE system etc.	Noted.
29	General	-	-	-	-	No interconection with existing plant considered for LHP-GHP systems	Electrical power scheme shall be in line with SLD.
30	Sec VI- Part B	M6	15/41	-	Conveyor drive above 160KW, HT drive to be considered	Crushers rating above 160KW & upto 200KW, LT motor shall be considered. Please confirm	Noted.
31	Sec VI- Part B	M6	27/41	-	LSU	LSU PLC shall be located near crushers in Crusher house & not in MCC control room building	Bidder's proposal is not acceptable. Specification requirements to be complied.

32	Sec VI- Part B	M6	29/41	-	Limestone crushers -VMS	VMS shall be considered only for Crusher equipment & not for HT motors	Bidder to also refer TECHNICAL SPECIFICATION SECTION – VI, PART-A,SUB-SECTION-III-C (C&I) Clause no. 3.01.01 (c)
33	Sec VI- Part B	III-C8 Electric actuators	3/4	4.0	Fieldbus actuator interfaces	LHP-GHP has flap gate actuators for which normal hardwire connections are proposed as interface with DDCMIS & not profibus PA/Foundation field bus shall be considered since same is not required for LHP-GHP flap gate actuators	Actuators specified in this package are fieldbus based non-intrusive Electrical actuators. Accordingly Bidder to comply the specification requirements.
34	Sec VI- Part B	III-C9 Control desks	-	-	-	No control desk envisaged for LHP-GHP systems	Specification requirement is clear in this regard.
35	Sec VI- Part B	II-E6	2/23	2.00	Interplant cabling	LHP GHP cables shall be laid in conveyor gallery since lime is not inflammable material & like other FGD projects same is proposed for this project also.	Power cable can be routed along the conveyor gallery taking support structure on sides of side walkway.
36	VI-B	IV-D	3 OF 71	3.01A.00	Silo Supporting Structure	We understand that NO SIDE Colour coated metal Cladding is required in Crushed Limestone Silo structure. Please confirm.	Bidder's understanding is correct.
37	VI-B	IV-D	9 OF 71	03.12.02	Fencing	Please mention the list of structures under LHP and GHP which require peripheral Fencing.	The specification requirements are clear in this regard.
38	VI-B	IV-D	4 OF 71	3.02.00	The walkways shall be chequered plate con-struction with anti-skid arrangement..	Please provide the thickness of chequered plate applicable for conveyor galleries.	Minimum thickness of chequered plate shall be 6 mm. Bidder is requested to refer clause 7.00.00, page 23 of 71, Civil works, Part B, Sub-Section IV in this regard.
39	VI-A	III-A5	1 OF 7	1.01.01	The layout/area selected shall have free movement of incoming and outgoing trucks, ample space for parking of trucks and area shall be paved area.	1. Please confirm the minimum width of paving required around Truck hopper area for parking. 2. Please confirm whether Normal duty paving or Heavy duty paving is applicable for above. 3. Please confirm whether metallic hardener finish is to be provided for above paving.	Extent of paving shall be finalized with successful Bidder after award. Paving shall be suitable in view of movement of heavy duty trucks in the area.Bidder to consider accordingly. Further Bidder is requested to refer clause 7.00.00, page 23 of 71, Civil works, Part B, Sub-Section IV in this regard.
40	VI-A	II	9 OF 24	4.00.00	CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES……	We understand that Cyclonic factor k4 under WIND LOADS (IS 875-PART-3 2015) will be equal to 1.00. Please confirm.	Bidder's understanding is correct.
41	VI-A	III-D	2 OF 3	1.05.00 && 1.03.00	Site levelling shall be done by Owner as per the levels specified in GLP in tender document. However, site clearance and minor grading as required is in bidder's scope.	We understand that any existing temporary/permanent structures (including foundations) fouling with the spac-es marked for FGD/LHP/GHP will be removed/relocated by the Owner. Please confirm.	Site levelling of FGD area shall be done by owner as per level sepcified in GLP. Bidder shall also refer cl.no. 1.11.00, page 5 of 6, sub section III part A.
42	VI/B	II-E9	**11 OF 59**	4.17.00	All draw-out modules shall be provided with “Closed door operation” feature wherein movement of the module from “Isolated” position to “Service” position & vice-versa and power ON / OFF operation of the module shall be possible only with the module door closed condition.	We propose all draw-out modules shall be as per normal conventiontional design instead of "Closed door operation" feature.	Specifications are clear in this regard. Bidder to comply specification requirements.

43	VI/B	II-E9	14 of 59	7.03.00	All busbars and jumper connections shall be of high conductivity Aluminium alloy / Copper of adequate size.	We have considered Aluminum Bus bar.	Specifications are clear in this regard. Bidder to comply specification requirements.
44	SLD 9999-000-POE-J-001	-	-	-	1) Modification of spare feeders at existing 11 kV Unit Switchgear for Booster fan. 2) Modification of existing feeders at existing 11 kV Unit Switchgear as incomer for 6.6kV FGD swicthboard	(a) Customer is requested to confirm the Make & furnish the GA, Layout, scheme drawings of existing switchgear, to enable us to ascertain the extension requirements. (b) We shall be offering extension panels of Bidder's make only & donot recommend modification in existing panels. The extension panels required for existing Switchboards shall be joined using Bidder make adaptor panels, which shall be included in our offer.	a)Bidder is requested to VISIT site to take necessaty details. Refer Specification Part-A, chapter-I, Intent of Specification. B) Bidder to meet specification requirement.
45	Section-VI, Part-B	II-E-6	8 of 23	04.01.00		Cable from Station Switchboard to FGD Control Room shall run on customer's existing racks. Please confirm. Also provide the layout of Cable racks.	Bidder to meet specification requirements of clause 4.01.00 reffered here. Bidder is requested to VISIT site to take necessaty details like layout of cable racks. Refer Specification Part-A, chapter-I, Intent of Specification.
46	Section-VI, Part-B	II-E-14	1 of 9	02.01.00	Type A fire sealing system ……. in CER & CCR.	Since CER & CCR is not in scope of this tender, so Type A fire sealing system is not applicale. Only Type B fire sealing system shall be provided. Please confirm.	Type-A fire sealing shall be provided in line with specification requirements for Control Equipment Rooms (a room housing control equipments).
47	Section-VI, Part-B	II-E-17	4 of 6	3.01.00 & 3.02.00	19/33 kV Grade Power Cable 11/11kV & 6.6/6.6kV Grade Power Cable	33kV, 11KV & 3.3 kV Grade Power Cable is not applicable. Please confirm.	Cables shall be supplied as per system requirements.
48	Section IV/ Part B	Sub-Section-II-E17	4 of 6	3.02.00	For single core armoured cabe,the armouring shall constitute metallic part of the screening.	Specification clause number 2.05.00 - "all the cables shall have distinct extruded PVC inner sheath of black colour as per IS: 5831" is in contradiction with clause number 3.02.00. As per mentioned clause for single core armoured cable the armouring shall constitute metallic part of the screening , hence copper tape and inner sheath shall not be applicable for single core cable. Please confirm.	Specification requirements are clear in this regards. Bidder to meet the specification requirements.
49	Section-VI, Part-B	II-E-12	28 of 29	3.00.00	Auxiliary Transformers - Core shall be…. M4 garde or better quality.	Core shall be supplied as per IS:3024 of 30CG130 grade in place of M4 grade. Please confirm.	Specification requirements are clear in this regards. Bidder to meet the specification requirements.
50	Section-VI, Part-E	Tender Drawing	69 of 69	-	Electrical SLD Note: Point No. 9	As per SLD note no. 9 Outdoor transformer shall be oil filled Kindly confirm that Sevice Transformer can be Dry Type Transformer also. Please confirm.	In case service transformer is kept indoor, then it has to be dry type transformer.

CLARIFICATION TO TECHNICAL SPECIFICATIONS (SECTION VI)

51	Section-VI, Part-B	II-E-10	11 of 17	04.07.00	Occupancy based Passive Infra Red Sensors	Please mention areas where sensors are to be used. As there is no office area, conference rooms etc. in FDG scope so these sensors are not being considered.	Bidder to comply specification requirements.
52	Section-VI, Part-B	II-E-10	7 of 17	04.00.00 - 10 (h)	Each Lighting Panel…… shall be 2.5kV	Kindly specify the load/area to cater with the said Lighting Panel.	Bidder to meet specification requirements.
53	Section-VI, Part-B	II-E-1 & E-8	E1 - 3 of 8 E8 - 1 of 39	E1 - 2.01.00 E8 - 1.00.00	E1 - Transformers E8 - Sizing for Load Current Duty	Margin of 10% is already mentioned for sizing of Auxiliary Transformers so further margin of 10% on HT Switchgear is not required. Please confirm.	Specification requirements are clear in this regards. Bidder to meet the specification requirements.
54	Section-VI, Part-B				Electrical SLD	Kindly confirm that bidder shall have flexibility to connect LT side of 11/0.433kV Transformer through LT Bus Duct or Cable.	Specification requirements are clear in this regards. Bidder to meet the specification requirements.
55	Section-VI, Part-B	II-E6	13 of 23	5.01.00	Earthing system network/earthmat shall be interconnected mesh of mild steel rods buried in ground in the plant. All areas under contractor scope of supply shall be interconnected together by minimum two parallel conductors.	Ring electrode type grounding system is envisaged using mild steel rod material for limiting the ground resistance below 1 ohms, which will be connected to main plant ground grid mesh at two points. Hence, ground grid mesh for FGD area not considered. Please confirm.	Specification requirements are clear in this regards. Bidder to meet the specification requirements.
56	Section-VI, Part-B	II-E10	4 of 17	3.01.00	The illumination of various indoor and outdoor areas in the main plant & offsite area shall be provided as described here	Illumination of only FGD area in scope are being considered. Please confirm.	Noted.
57	Section-VI, Part-B	II-E10	9 of 17	4.00.00 (14)	In the hazardous areas lighting shall be flame proof	No hazardous area is considered as Illumination of only FGD area is in scope. Please confirm.	Noted.
58	Section-VI, Part-B	II-E10	5 of 17	3.03.04	18W, 220V DC LED Lighting fixture shall be provided……..and each local control area	As per market availibility DC LED lighting fixture is not available of reputed manufacturers. Hence 18W CFL DC LED fixture is considered. Please confirm.	Bidder to comply specification requirements.
59	Section-VI, Part-B	II-E10	5 of 17	4.00.00 (3)	The system shall include ……lighting pole/masts, conduits, cables and wires, etc	Number of Lighting Masts is not specified in the specification. Please confirm the minimum number of mast and also the quantity and type of lamps to be used in each mast.	The number of lighting mast and fixures in the lighting mast shall be as per the design calculation requirement for area lighting, to achieve required lux level as specified in the Technical Specifications.
60	Section-VI, Part-B	II-E6	7 of 23	3.08.01 4.04.04	Trefoil clamps shall have adequate mechanical strength, when installed at 1 mtr intervals, & Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every two metre.	There is a contradiction in the specification. We are considering that the trefoils shall be clamped at every 2 meters. Please confirm.	Noted.
61	VI/A	V	2 & 3 of 13	1.00.00 point no. 11 & 2.01.02	Clause 1.00.00 pont no 11: Chimney height (m)-Single flue. clause 2.01.02: Single flue or twin flue chimney shall be provided….previous clause.	There is discripency in techincal specification regarding type of flue (Single / twin) for chimney. However, as per techincal specification single absorber is applicable for both units hence single flue chimney shall be applicable. Please confirm.	Bidder's understanding is correct. Bidder to refer Amendment in this regard.

62	V- SCC		5	2 of 2	The Performace Guarantee Test of the Facilities shall be successfully completed within 12 months from the date of completion.	In order to complete PG test and handover of packages within reasonable time, following modification to this clause is proposed. The Performace Guarantee Test of the Facilities or the relevant part thereof shall be successfully completed within 3 (three) months from the date of completion. If for reasons attributable to the Employer, the Performance Guarantee (PG) Test of facilities or relevant part thereof cannot be successfully completed within the period of 3 (three) months from the date of completion of respective facility, PG test will be deemed to be completed and the payment towards successful completion of guarantee test shall be released to the contractor without submission of any bank guarantee.	Specification requirements shall be considered by the bidder.
63	PART-E SECTION – VI		69 of 69	DWG NO:9944-000-POE-J-001 REV.01	Key Single Line diagram	The tender electrical SLD indicates that 4 No's of Booster fan feeders (1 feeder in each bus section UNIT SWBD#1CA, UNIT SWBD#1CB, UNIT SWBD#2CA & UNIT SWBD#2CB) However as per Technical specification, only Two No's of booster fans are applicable for the both the Boilers. Hence we will consider only Two feeders, (one feeder in each Unit SWBD'S). Customer may review and accept.	Noted. The SLD shows 4 number of spare feeders, which have been identified for booster fans. These are to be used as per system requirements.
64	PART-E SECTION – VI		69 of 69	DWG NO:9944-000-POE-J-001 REV.01	Key Single Line diagram	The tender electrical SLD indicates individual MCC for Limestone & Gypsum system. In line With Practice being followed for other FGD projects, Bidder shall provide a COMMON MCC for both system (limestone & gypsum) based on system requirement. Customer may review and accept.	Refer note 5 of SLD, the number of MCC is typical and common MCC is acceptable.
65	PART-E SECTION – VI		69 of 69	DWG NO:9944-000-POE-J-001 REV.01	Key Single Line diagram	The feeder ratings are indicated in FGD MCC-1 & MCC-2 (125A & 250A) for Outgoing feeders for customer future use. Bidder shall consider these feeder ratings for MCC sizing.	Noted.
66	SECTION-VI, PART-B		11 OF 59	4.17.00	All draw-out modules shall be provided with "Closed door operation" feature wherein movement of the module from "Isolated" position to "Service" position & vice-versa and power ON / OFF operation of the module shall be possible only with the module door closed condition.	Bidder proposes switchgear panel without "closed-door" operation feature because of a) Easy availability of spares and more vendor base b) Less than half the cost Customer may review and confirm.	Bidder to comply specification requirements.
67	VI-B III-C5		9 OF 23	3.09.00	The Control Desk mounted hardwired devices & stations shall be interfaced through the I/O modules. No signal multiplication shall be done at marshalling end input termination end.	We understand no separate hardwired back up consoles are required in FGD control room. The entire operation in FGD control room shall be through DCS/HMI. Kindly confirm.	Bidder's understanding is correct

68	VI-B III-C1		3 of 4	3.04.00	In any case, Bidder shall be required to ensure supply of spare parts for lifetime of the plant.	Normally Electronic cards/module phased out in 8-10 years due to continuous up-gradation in technology, hence we request Customer to suitably modify the given clause as given below: *"Bidder shall ensure availability of Spares for 10 years. Beyond this period, in case of phasing out of production of spares parts, a notice of 12 months in advance regarding this shall be provided to Owner in order to enable them to order & stock bulk requirement of spares.*	Bidder to also refer TECHNICAL SPECIFICATION SECTION – VI, PART-A,SUB-SECTION-III-C (C&I) Clause no 2.04.05
69	VI/B III-C5 VI B C&I ITEMS-INDICATIVE SUB-VENDOR LIST		1 OF 23 363 of 447 (pdf page no.)	1.00.00 C&I ITEMS-INDICATIVE SUB-VENDOR LIST	DISTRIBUTED DIGITAL CONTROL, MONITORING AND INFORMATION SYSTEM (DDCMIS) DDCMIS SYSTEM	Bidder's in-house manufactured DCS which is field proven in power plants gives the Customer following advantages: (i) Better immunity to noise. (ii) Scalable and Flexible system (iii) Comprehensive Diagnostics (iv) Centralised alarms, events and historian (v) Faster inter communication (vi) Unified Information Management, (vii)Common engineering platform & Unified diagnostics, (viii) Single family hardware solution, Reduction of hardwired interface or soft links, (ix) Ergonomic and user friendly man-machine interface. (x) Effective spares and inventory manage-ment. (xi) Better response time. (xii) Single window for future expansion. (xiii) Better Spares Management & Inventory reduction. etc. (xiv) Supports renovation and modernization. Hence Customer is requested to accept Bidder make DCS based controls also for FGD.	Bidder to comply specifications' requirement
70	III-C5		2 of 6	1.01.08	All the Laptop will also be used as pluggable temporary programmer's station and operator station functionalities of the programming stations mentioned in the specifications shall be provided (including requisite license).	Engineering station is a powerful tool with capability to modify / download any configuration of the controllers / control system. These systems are expected to be placed in highly protected environment to avoid any misuse / unwarranted hazardous situations. Hence engineering station on a Laptop is not recommended. Hence we request Customer to accept desktop based engineering station instead	Bidder to comply specifications' requirement
71	General				Mandatory spares	As mandatory spares list is not given, we understand mandatory spares are not required to be supplied for this project. Kindly confirm.	Bidder to refer Sub Section VII/Part A Section VI of technical specifications for Mandatory Spares.
72	VI/A----III-C		5 OF 18	2.04.02	A redundant station-wide LAN for connecting the unitized and common systems of FGD DDCMIS as well for connecting to Employer's Station LAN through firewall. This shall include all cables and accessories required for connecting Contractor's system upto the Employer's systems such as Station LAN, etc	we understand modification and changes required at the Customer's station LAN for FGD interface is not in the scope of the Bidder. Kindly confirm	Bidder to comply specifications' requirement

	VI/A----III-C		5 OF 18	2.04.04	Suitable hardware/software for interfacing of FGD DDCMIS with following systems (i) Employer's Station LAN.		
73	VI A -----III-C		11 OF 18	3.03.04	Comprehensive Annual Maintenance Contract (AMC) for five (05) years after warranty period shall be provided by the contractor for CEMS and Analysers of FGD System.	Period of Comprehensive AMC is not clear. Kindly clarify.	Refer Amendment
	VI A -----III-C		12 OF 18	3.05.01	The Contractor shall provide complete maintenance services for each System under comprehensive Annual Maintenance Contract (AMC) for an additional period of two years after the end of Comprehensive Operation & Maintenance period.		
74	VI/A---III-C		15 OF 18	10.01.00	Hardwired Signal exchange: Hardwired signal exchange between BOP DDCMIS/ CHP DDCMIS (under Employer's scope) and FGD DDCMIS (under Contractor's scope) ……shall be provided on as required basis, for implementation of protections and interlocks. Contractor to consider IOs and cables for minimum number of hardwired signal exchange per unit as follows DI – 130, DO – 130, AI – 50 and AO – 50.	we understand modification and changes required at the Customer's DCS end for FGD interface is not in the scope of the Bidder. Kindly confirm	Bidder's understanding is correct.
	VI/A---III-C		15 OF 18	10.03.00	The Contractor shall provide all assistance to the BOP C&I (in Employer's scope) supplier including co-ordination and flow of required information etc.		
75	VI B Subsection IV		10 of 71	3.14.01	The center to center distance between the proposed chimney(s) and the existing chimney(s) & NDCT in any direction shall not be less than 150 meters.	Bidder understands that the center of new chimney/chimneys shall be minimum 150m away from existing chimney & NDCT center. Please confirm.	Bidder's understanding is correct.
76	VI B Subsection IV		15 of 71	3.14.09	The entire external surface of chimney shell shall be painted with epoxy phenolic coating as specified in (iv) above in alternate bands of 'signal red' and 'bright white' colors.	Bidder understands that the entire external surface of chimney shell shall be painted with epoxy phenolic coating as specified in (iii) above in alternate bands of 'signal red' and 'bright white' colors. Please confirm.	Bidder to refer Amendment in this regard.
77	VI B Subsection IV		14 of 71	3.14.08	Thermal insulation (Applicable in case of Titanium / C-276 Flue Liner)	Bidder understands that no outer thermal insulation is required in case of borosilicate lining is adopted on inner surface of liner.	Bidder to refer Clause 2.01.04 Subsection V, Part A of Technical specification for clarity in this regard.
78	VI B Subsection IV		13 of 71	3.14.03	…… Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located up to distance of 20 times diameter at 2/3rd height of subject chimney, in the area or in the future expansion stage of the project, as envisaged by the owner at the time testing, shall be determined along with the other topographical features of the local area through model test.	The location of new wet chimney shall be near to the existing chimney/NDCT in the space provided clearing foundation interface. The design of new wet chimney/chimneys shall be done considering interference factor with existing chimney/NDCT/other structures as determined by wind tunnel study. However, no design check or validation shall be done for existing chimneys/NDCT/structures/building. Kindly confirm.	Bidder to follow the Technical specification.

79	VI A Subsection V		3 of 13	2.01.01	A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor.	Bidder understands that the subject Chimney will not be operated under bypass mode.	Bidder's understanding is correct. However, the flue gas temperature may approach about 300°C at the economiser outlet in case the regenerative airpreheaters fails to operate. Please refer Clause 1.01.00 of Subsection I-M1 Part B in this regard. The Contractor shall take this aspect into account while designing the system.
80	VI A Subsection V		3 of 13	2.01.04	Alternatively, Contractor can also provide chimney of 8 mm thick (minimum) mild steel with Borosili-cate Glass Block Lining of minimum 38 mm thick-ness, ……..	Bidder understands that borosilicate glass block lining thickness is fixed as 38mm. Kindl confirm.	Please refer Clause No. 2.01.05 of the referred section, wherein Borosilicate Glass Block Lining of minimum 38 mm thickness is specified.
81	VI B Subsection IV		12 of 71	3.14.03	The minimum thickness of shell shall not be less than 500mm.	The minimum thickness of shell shall be as per design requirement or codal provisions, whichever is higher. Please confirm.	Bidder to follow the Technical specification.
82	VI A Subsection V		3 of 13	2.01.05	The minimum length of flue liner projecting over the chimney roof shall be at least equal to diameter of flue liner.	The maximum length projecting above the chimney roof shall be 6m to avoid additional wind forces on projected liner. Please confirm.	Specification requirements shall be considered by the bidder.
83	VI A Subsection V		3 of 13	2.01.05	For Borosilicate lining, the top flue liner above the roof slab shall be made of C276 (ASTM B575, UNS N10276) / Titanium (Grade 2 as per ASME SB265) of minimum 8 mm thickness with Borosilicate Glass Block Lining of minimum 38 mm thickness.	Bidder proposes to use concrete mini-shell (with borosilicate lining on inner surface and anti corrosive paint on outer surafce), in place of solid titanium/c-276 mini-shell. Please confirm.	Specification requirements shall be considered by the bidder.
84	VI B Subsection IV		15 of 71	3.14.09	The inside surface of chimney shell above roof, horizontal surface of shell at top, underside of concrete roof slab etc. shall be painted with epoxy phenolic coating system having total 220 microns DFT.	Bidder understands that no painting is re-quired on inner surface of concrete chimney shell below roof. Please confirm.	Bidder's understanding is correct.
85	VI A Subsection V		3 of 13	2.01.04	Alternatively, Contractor can also provide chimney of 8 mm thick (minimum) mild steel with Borosili-cate Glass Block Lining of minimum 38 mm thick-ness, ……..	Alternatively, bidder proposes to install borosilicate galss blocks directly on concrete surface for single flue chimneys. It will save structural steel for flue can, platform, solid titanium/c276 plate for minishell and fabrication & erection time for all structural steel works. Lift shall be provided outside chimney shell in this case. Kindly confirm.	Specification requirements shall be considered by the bidder.
86	VI B Sub section IV-D		7 OF 71	3.05.00	**Control building, M. C. C. Buildings** These shall be framed building with R. C. C. roof and floor. For steel framed building roof /floor shall comprise of RCC slab over profiled metal deck sheets (to be used as permanent shuttering only) over structural beams.	For the subject clauses, kindly mention clearly whether the frame is of Structral steel or RCC. Please clarify. Further, bidder understands that for RCC framed buildings, roof/floor shall be without profile metal deck sheets, using normal removable shuttering. Please confirm.	Type of building structure (Steel/RCC) shall be decided by the bidder considering functional requirement, schedule of construction and site constraints, if any. However, roof shall be of RCC as per technical specification.

87	VI B Sub section IV-D		16 OF 71	3.15.00	**Limestone Grinding System Building** This shall be framed building with R. C. C. roof and floor. For steel framed building roof /floor shall comprise of RCC slab over profiled metal deck sheets (to be used as permanent shuttering only) over structural beams.	Please confirm.	Bidder's understanding regarding roof/floor of RCC framed building is correct.
88	VI B Sub section IV-D		16 OF 71	3.16.00	**Gypsum Dewatering Building** This shall be framed building with R. C. C. roof and floor. For steel framed building roof /floor shall comprise of RCC slab over profiled metal deck sheets (to be used as permanent shuttering only) over structural beams.		
89	VI B Sub section IV-D		16 OF 71	4.01.00	The water from the pit shall overflow into contractor's R.C.C drain, which will lead the discharge finally into owner's drain routed alongside the nearby road.	Please provide the co-ordinates and section (geometry and invert level) of owner's existing drains, where the storm water discharge from proposed FGD area shall be connected.	Bidder to obtain the information from site during detail Engineering.
90	VI B Sub section IV-D		27 OF 71	15.00.00	The connection of sewer pipe line for the associated buildings of FGD and Lime and gypsum handling area to nearest owner's sewage network is in bidder's scope.	Please provide the co-ordinates and section (geometry and invert level) of owner's existing sewage network, where the sewer pipe line from the proposed FGD area shall be connected.	Bidder to obtain the information from site during detail Engineering.
91	VI B Sub section IV-D		52 OF 71	30.05.00	Required plumbing work from Owner's service water terminal point to the service water tank and from tank to the toilet accessories mentioned above.	Please provide the co-ordinates of owner's service water terminal point.	Bidder to obtain the information from site during detail Engineering.
92	VI B Sub section IV-D		52 OF 71	30.05.00	Required plumbing work from Owner's potable water terminal point to the drinking water tank and from tank up to the water coolers.	Please provide the co-ordinates of owner's potable water terminal point.	Bidder to obtain the information from site during detail Engineering.
93	VI A Sub section III-D		1 OF 3	1.05.00	Cutting of trees including their disposal will be in the scope of Owner. Site levelling shall be done by Owner as per the levels specified in GLP in tender document. However, site clearance like removal of bushes, vegetation etc. and minor grading as required is in bidder's scope.	Since leveling and grading of proposed FGD area shall be done by owner, bidder understands that following works are excluded from bidder's scope: 1. Cutting of trees and their disposal 2. Dismantling of any existing temporay/permanent structures and clearing debris. 3. Slope protection 4. Diversion of any existing facilities/structures, nalla, etc. 5. Site clearance of Stacked materials/equipments etc. Please confirm.	Bidder's understanding is correct.
94	VI A Sub section II		13 OF 24	7.02.03 i)	Two stage flushing of pile bore shall be ensured by airlift technique duly approved by the employer.	Flushing of pile bore shall be done as per IS 2911 Part-1 Section-2. Please confirm.	Bidder to comply the Technical Specifications.
95	VI A Sub section II		16 OF 24	1.01.04	Ground Improvement below structures/facilities using stone columns: The stone columns shall be installed using bottom/top feed Vibroflotation techniques without water jetting i.e. dry method (displacement method) in accordance with these specifications. Installation of stone column by rammed/driven technique without water jetting may also be permitted/used subject to conforming to the specification and meeting to the construction schedule.	Ground improvement if required shall be as per approved Geotechnical Investigation Report during detailed engineering in contract stage. Please confirm.	Bidder to comply the Technical Specifications.

96	VI A Sub section II		15 OF 24	7.02.03 xv)	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Routine pile load tests to be performed on 0.5% of the total number of piles provided for each diameter/allowable capacity. High Strain dynamic load test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests. In case agency wish to carry out only static routine vertical load test on 0.5% of total number of piles, he may adopt the same.
97	VI A Sub section II		21 OF 24	Annexure-I (Yamuna Nagar)	b) However, the maximum allowable bearing pressure shall be lower of the two values i.e. as per approved geotechnical report and as per the values furnished in Table-2. The ground improvement scheme shall be approved by owner before execution.	The allowable bearing pressure for open foundations shall be as per approved Geotechnical Investigation Report during detailed engineering in contract stage. Please confirm.	Bidder is required to carry out geotechnical investigation in this area. During detailed engineering, the Allowable Bearing Pressure shall be adopted after approval of geotechnical investigation report. However, the maximum allowable bearing pressure shall be lower of the two values i.e. as per approved geotechnical report and as per the values furnished in Table-2.
98	VI A Sub section II		22 OF 24	Annexure-I (Yamuna Nagar)	d) The minimum diameter of pile shall be 600 mm. The allowable load capacity of the pile in different modes (vertical compression, lateral and pullout) shall be least of the three values i.e. as per approved geotechnical report, as per the values furnished in following table and pile capacity achieved in pile load tests.	The allowable load capacity of the pile in different modes (vertical compression, lateral and pullout) mentioned in the table are without ground improvement. Please confirm.	Bidder to refer Amendment in this regard.
99						The length,dia and allowable load capacities of pile shall be as per approved Geotechnical Investigation report. Please confirm.	Bidder is required to carry out geotechnical investigation in this area. During detailed engineering, pile capacity shall be adopted after approval of geotechnical investigation report. However, the pile capacity shall be least of the three values i.e. as per approved geotechnical report, as per the values furnished in Technical Specification and pile capacity achieved in pile load tests.

CLARIFICATION TO TECHNICAL SPECIFICATIONS (SECTION VI)

100	VI A Sub section II		11 OF 24	7.00.00	Geotechnical data and foundation system for the FGD package at Yamuna Nagar site project are enclosed at annexure-I. The corresponding bore logs of vicinity are enclosed at annexure-II.	Please furnish the following additional details of the proposed FGD area: 1. Electrical Resistivity Test Results. 2. Laboratory test results 3. Chemical analysis of ground water and sub soil	1. Refer ammendment for Electric resisitivity test result of vicinity area . 2. For Laboratory test results refer borelog furnished with Technical Specification. 3. Bidder may refer revised Technical Specification enclosed herewith.
101	VI A Sub section II		11 OF 24	7.00.01	Based upon the available soil data, soil up to a depth of 5m to 7m (below existing ground level) is prone to liquefaction hazard. For heavily loaded structures (Silos, Chimney, Crusher house, absorber and other structures), pile foundations may be considered and for lightly loaded structures, suitable ground improvement as per clause 7.02.04 may be considered. Minimum cut off level of pile below FGL is 3m.	Please furnish the liquefaction potential assessment of the project site. Based on the limited soil data it can not be decided that soil up to a depth of 5m to 7m (below existing ground level) is prone to liquefaction hazard. However ground improvement if required shall be as per approved Geotechnical Investigation Report during detailed engineering in contract stage. Please confirm.	Bidder to comply the Technical Specification.
102	-		-	-	General	Please provide the Topographical Survey drawing of the proposed FGD area.	Grade levels for FGD area are already indicated in the General Layout Plan. For any additional requirement/ input, the bidders are requested to visit the site and collect the information.
103	-		-	-	Tender drawing no. 9944-251-POC-F-002 Rev A titled "General Layout Plan"	The levels mentioned in the respective blocks of proposed FGD area are finished grade levels (FGL). Please confirm.	Bidder's understanding is correct.
104	SECTION-VI-PART A-TS SUB-SECTION-III-C CONTROL AND INSTRUMENTATION SYSTEM		1.02.00	1 OF 18	In this project fieldbus (FF/Profibus) based instruments(PT/DPT/TT), Fieldbus based Non-intrusive Electrical actuators are also envisaged which shall be connected to the DDCMIS. The protocol of fieldbus (FF/Profibus) for non-intrusive electric actuators and fieldbus based instruments shall be matching with fieldbus protocol of FGD System DDCMIS, and the same shall be subject to Employer's approval.	Please clarify the scope of Fieldbus equipments, which instrument devices need to use Fieldbus protocol	Bidder to refer amendmnet for Clause 1.02.01, sub-section III-C, Part -A ,SECTION – VI
105	SECTION-VI-PART A-TS SUB-SECTION-III-C CONTROL AND INSTRUMENTATION SYSTEM		3.01.01	8 OF 18	Primary instruments like Microprocessor based transmitters employing HART/ Fieldbus protocol, thermocouples & RTDs along with temperature transmitters, pressure/diff.	Please clarify whether all temperature components need to be equipped with temperature transmitters?	Specification requirement is clear
106	SECTION-VI-PART A-TS SUB-SECTION-III-C CONTROL AND INSTRUMENTATION SYSTEM		3.01.01	8 OF 18	Flue Gas flow transmitter, vibration monitoring system (VMS) etc.	Please specify the measuring principle of flue gas flowmeter. Please clarify that if only 11kv high voltage motor should use vibration measuring devices.	a. Bidder to refer TECHNICAL SPECIFICATION SECTION – VI, PART-B ,SUB-SECTION-III-C2 MEASURING INSTRUMENTS Clause no. 11.07.00 (Pg 35 of 41) b. Specification requirement is clear

107	SECTION-VI-PART E-DRAWING				ELECTRICAL SINGLE LINE DIAGRAM FOR FGD AUXILIARY POWER DISTRIBUTION	In the electrical single line diagram, whether the bidder should provide the 6kV switch cabinet (a total of four) for the boost fan and be responsible for the splicing to the existing 6kV section?	SLD clearly identify the spare feeders to be used for booster fan. Feeding of booster fans is to be done from Unit Switch boards as shown in SLD.
108	SECTION-VI-PART E-DRAWING				ELECTRICAL SINGLE LINE DIAGRAM FOR FGD AUXILIARY POWER DISTRIBUTION	Whether the dry type transformer can be used for FGD service/limestone area/gypsum area system instead ONAN type transformer	Bidder to comply the specification requirements. It clearly mention to use dry type transformers only if they are kept indoor. Necessary amendment will be issued in this regard in SLD.

Appendix-A

6.0 INTERPRETATION OF ELECTRICAL RESISTIVITY TEST RESULTS

Electrical resistivity tests were conducted as per IS:3043-1987. Test results are presented graphically on Fig. Nos. ERT-1 to ERT-4 and are summarized below:

ERT No.	Coordinates	Suggested Mean Resistivity for Design, ohm-m
ERT-3	1544N, 1094E	65
ERT-5	1422N, 1189E	20
ERT-1	1391N, 922E	60
ERT-2	1518N, 957E	70

Appendix-B

7.00.0 FOUNDATION SYSTEM AND GEOTECHNICAL DATA

7.00.01 Geotechnical data and foundation system for the FGD package at Yamuna Nagar site project are enclosed at annexure-I. The corresponding bore logs of vicinity are enclosed at annexure-II.

7.00.02 Available geotech data is of vicinity of proposed structures, therefore, bidder shall carryout his own detailed geotech investigation for facilities under this package and shall be as per the scheme approved by owner**.** The scheme for geotechnical investigation shall be as given at Clause 7.07.00 and shall be approved by owner before execution. Geotechnical investigation work shall got executed by the Contractor through the agencies as mentioned in Clause No. 7.06.03. However, no time extension shall be given on account of soil investigation carried out by the Bidder. The geotechnical investigation report shall be prepared with detailed recommendations regarding type of foundation and allowable bearing pressure for various structures/ facilities and other soil parameters. The report shall be submitted for Owner's approval prior to commencement of design of foundation.

Based upon the available soil data, soil up to a depth of 5m to 7m (below existing ground level) is prone to liquefaction hazard. Suitable ground improvement as specified in subsequent clauses shall be carried out if open foundations (for lightly loaded structures) and pile foundation (for heavily loaded structures like Silos, Chimney, Crusher house, absorber and other structures) are to be founded/cut-off-level (COL) of piles is to be kept in liquefiable zone. However, in case Contractor wants not to carry out ground improvement, minimum founding level/COL of piles shall be below 6m below NGL or below liquefiable zone whichever is deeper. For heavily loaded structures, pile foundations may be considered and for lightly loaded structures, suitable ground improvement as per clause 7.02.04 & 7.02.05 may be considered.

7.00.03 **The furnished borelog details are specific to the co-ordinates where the boreholes have been carried out and are provided for bidder's information only. Soil profile in the proposed area may vary with respect to the borelogs enclosed for bidder's information. Bidder has to consider all such variations in his estimation, over the extent of the work to be carried out. The Bidder should note that nothing extra whatsoever on account of variation between soil data collected by Owner and that found by the Bidder during geotechnical investigation by him or during execution of works, shall be Payable.**

7.00.04 Tank Foundations

a) The tanks shall rest on flexible tank pad foundation, resting on sand with concrete ring wall to retain sand. Base of the concrete ring wall shall not rest on the expansive soil, if any.

b) Entire loose/ soft soil inside the concrete ring wall shall be removed and shall be filled with sand. Sand for filling shall be clean and well graded conforming to IS 383 with grading Zone I to III.

c) Sand shall be spread in layers not exceeding 30cm compacted thickness over the area. Each layer shall be uniformly compacted by mechanical means like plate vibrators, small vibratory rollers, etc to achieve a relative density of not less than 80%.

d) Other requirements of tank foundations shall be as per IS 803 and as specified elsewhere in the specifications.

7.02.00 **Foundation System**

The requirements for the foundation system to be adopted are as given in subsequent clauses. Depending upon the depth of competent strata/stratum, type of structures, functional requirement of facility, extent of cutting / filling, suitable foundation, open or pile shall be adopted with approval of owner.

7.02.01 General Requirements

a) All structures/equipment shall be supported either on suitable open foundations with ground improvement (isolated, combined, raft) or pile foundations depending on type of structures/facilities, sub-strata, topography etc.

b) The roads, ground floor slabs, trenches, pipe pedestals, channels/drains and staircase foundation with foundation loading intensity less than 4 T / M2 may be supported on open / shallow foundations resting on virgin / controlled compacted filled up soil.

c) No other foundation (other than as mentioned in (b) above) shall rest on the filled up ground / soil.

d) No foundation shall rest on the black cotton soil.

e) Before execution of work the bidder shall ensure that there is no obstruction to underground/overground facilities like sewer lines, pipe lines etc. Any such damage and remedial/ rectification measures shall be at the contractors cost.

For underground facilities survey, Ground Penetration Radar (GPR) may be used.

f) Bidder shall also ensure that there is no damage to existing nearby foundations and the foundations pertaining to this package are not placed at shallower depth than the nearby foundations. If required depth of foundation is deeper than the existing foundations, proper protection shall be provided to existing foundations.

g) All foundations shall be designed in accordance with relevant parts of the latest revisions of Indian Standards.

h) The water table for design purpose shall be considered at Finished Ground Level.

i) A combination of open and pile foundations shall not be permitted under the same equipment / structure / building.

j) Foundation for miscellaneous equipment's on ground floor.

For equipments of static weight upto 1.5 T, the equipment may be supported on the ground floor slab by locally thickening the slab. Thickening of the ground floor slab shall be done upto an extent of about 0.6 m beyond the plan area of the equipment on all the sides. Further, the load intensity below the equipment shall be limited to 4T/m2.

Other requirements of floor slab and compaction below the floor slab shall be adhered, as specified elsewhere in the specifications.

For equipment's of static weight between 1.5 T and 20 T, the equipment may be supported on **compacted sand filling** with the load intensity below the equipment limited to 4T/m2. The minimum depth of foundation is 1.0m below FFL. Other requirements of sand compaction below the foundation shall be adhered, as specified elsewhere in the specifications.

For equipment of static weight more than 20 T, the equipment foundation shall be taken to the founding level or shall be built up with PCC from the level as mentioned in the Table 2. The pedestal of equipment foundation or the foundation Block shall be isolated from the adjoining floor slab by providing bitumen impregnated fiber board of minimum 50 mm thick, conforming to IS: 1838 all around the equipment pedestal for the full depth of the floor slab.

7.02.02 **Open Foundations**

Following structures are to be placed on open foundation:

Lightly loaded structures which are not founded on pile foundation are to be placed on open foundation and if the depth of foundation is less than 6.0m below the EGL than the ground improvement shall be done using stone columns as per clause 7.02.04.

In case open foundations are adopted, following shall be adhered to.

a) The minimum width of foundation shall be 1.0 m.

b) Minimum depth of foundation shall be 1.0m below Ground Level.

c) It shall be ensured that all foundations of a particular structure/ buildings/ facility shall rest on one bearing stratum.

d) Wherever the intended bearing sub-strata is virgin soil stratum but the actual stratum encountered during foundation excavation consists of filled up soil at founding level, under such cases either the foundation shall be lowered completely into the virgin stratum or the filled up soil upto the virgin layers shall be removed and built up through PCC (1:4:8) up to designed foundation level.

7.02.03 Pile Foundations – In case piles are adopted, following shall be adhered to :

At least following structures are to be placed on pile foundation:

Heavily loaded structures like Silos, Chimney, Crusher house, absorber and other structures.

For other structures pile may be provided based on the functional requirement.

i) The pile foundation shall be of RCC, Cast-in-situ bored piles as per IS:2911. Pile boring shall be done using Crawler mounted Rotary Hydraulic Rigs. However, conventional tripod rig may be allowed in inaccessible areas subject to site specific conditions. Two stage flushing of pile bore shall be ensured by airlift technique duly approved by the Employer.

Based upon the geotechnical investigation report, fine to course sand intermixed with pebbles/cobbles is met from 8m to 14m depth is observed where the size of pebbles/cobbles varies from 80-150 mm. in view of this, temporary/permanent MS liner may be provided for piling.

ii) The minimum diameter of pile shall be 600 mm. The allowable load capacity of the pile in different modes (vertical compression, lateral and pullout) shall be as per approved geotechnical report & as enclosed in annexure-I.

iii) Only straight shaft piles shall be used. Minimum cast length of pile above cutoff level shall be 1.0 m.

iv) The contractor shall furnish design of piles (in terms of rated capacity, length, diameter, termination criteria to locate the founding level for construction of pile in terms of measurable parameter, reinforcement for job as well as test piles, pile load test arrangement, locations of initial test piles etc.) for Engineer's approval.

v) The piling work shall be carried out in accordance with IS:2911 (Relevant part) and accepted construction methodology. The construction methodology shall be submitted by the Contractor for Engineer's approval.

vi) Number of initial load tests to be performed for each diameter and rated capacity of pile shall be subject to minimum as under.

Vertical

Lateral Minimum of 2 Nos. in each mode.

Uplift

vii) The initial pile load test shall be conducted with test load three times the pile capacity as mentioned at Annexure-I. In case of vertical compression test (initial test) the method of loading shall be cyclic as per IS:2911 (relevant part).

viii) Load test shall be conducted at pile Cut-off Level (COL). If the water table is above the COL the test pit shall be kept dry throughout the test period by suitable de-watering methods. Alternatively the vertical load test may be conducted at a level higher than COL. In such a case, an annular space shall be created to remove the effect of skin friction above COL by providing an outer casing of suitable diameter larger than the pile diameter.

ix) Number of routine pile load tests to be performed for each diameter/allowable capacity of pile shall be as under :

i) Vertical : 0.5% of the total number of piles provided.

ii) Lateral : 0.5% of the total number of piles provided.

x) The routine tests on piles shall be conducted upto test load of one and half times the allowable pile capacity. Piles for routine load tests shall be approved by the Employer.

xi) In case, routine pile load test shows that the pile has not achieved the desired capacity or pile(s) have been rejected due to any other reason, then the Contractor shall install additional pile(s) as required and the pile cap design shall accordingly be reviewed and modified, if required.

xii) Testing of piles and interpretation of pile load test results shall be carried out as per IS:2911 (Part-4). Contractor shall ensure that all the measuring equipment and instruments are properly calibrated at a reputed laboratory / institute prior to their use. Settlement / movement of the pile top shall be made by Linear Variable Differential Transducers (LVDT) having a least count of 0.01mm.

xiii) The test load on initial test piles shall be applied by means of reaction from reaction piles alone or combination of reaction piles and kentledge with concrete blocks.

xiv) Low Strain Pile Integrity test shall be conducted on all test piles and job piles. This test shall be used to identify the routine load test and not intended to replace the use of static load test. This test is limited to assess the imperfection of the pile shaft and shall be undertaken by an independent specialist agency to be approved by Engineering department of Owner. The test equipment shall be of TNO or PDI make or equivalent. The process shall confirm to ASTM.

xv) High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.

The procedure to carry out the test shall be submitted to the Engineer. The test and equipment shall conform to ASTM D4945-00. The test shall be conducted by an experienced independent test agency approved by the owner. Field data shall be submitted to the site engineer and shall include force velocity curves, pile capacity, simulated static load test curve, net and total pile displacement, pile integrity. A (Case pile wave analysis) CAPWAP or equivalent software analysis shall be conducted on the field data for correct capacity estimation and to evaluate end bearing and skin friction components of the pile.

xvi) From load considerations, single pile may be used under a column/tower. In that case, pile shall be connected with tie beams at pile cut off level in both directions.

xvii) Contribution of frictional resistance of filled up soil if any, shall not be considered for computation of frictional resistance of piles.

xviii) Reinforcement for job piles shall be designed as following:

(a) Compression + bending piles: For these piles, the allowable safe pile capacities in compression and bending shall be considered.

(b) Tension + bending piles: For these piles, the actual pile forces to be considered. However, maximum 3 types of combinations for varying percentage of tension capacity + bending case may be designed & adopted by contractor for the entire scope of work under this package.

7.02.04 Ground Improvement below structures/facilities using stone columns:

i) The work broadly involves installation of stone columns for mitigation of liquefaction hazard, improvement in bearing capacity of the soil and to bring down the residual settlements so that the facilities that may be constructed over the stone column area shall stand safely and perform satisfactorily throughout their lifetime.

The stone columns shall be installed using bottom/top feed Vibroflotation techniques **without water jetting** i.e. dry method (displacement method) in accordance with these specifications. Installation of stone column by rammed/driven technique **without water jetting** may also be permitted/used subject to conforming to the specification and meeting to the construction schedule.

In case of vibro replacement method, the bidder shall submit the construction methodology giving information regarding details of equipment, type and energy rating of vibratory probe, details of power output, compaction criteria etc.

In case of rammed stone column methodology, the bidder shall submit the construction methodology giving information regarding type of equipment, weight of rammer, height of fall, compaction criteria, stages of casing withdrawal etc. Use of bentonite slurry for formation of stone columns shall not be permitted. A casing pipe shall be provided by the bidder upto to full depth of stone column.

In either of the above techniques adopted, the parameters shall be so chosen to give stone column of specified diameter and load carrying capacity.

In either of the above techniques adopted, the quantity of stones shall be placed in such that the column is filled in stages of height not exceeding 1m. Each stage shall be compacted to ensure uniform consumption of stones throughout the depth.

The method of placement of stone shall be such that it is possible to measure the total consumption of stones in a column.

Stone column installation procedure submitted by the bidder shall be approved by the Engineer.

ii) All materials and workmanship shall be in accordance with this specification and IS: 15284: Part 1: 2003."Design and Construction for Ground Improvement – Guidelines, Part 1 Stone Columns".

iii) Ground improvement without piling provision after it

Dia of column (d) = 900mm
Spacing = 2.5m (Triangular pattern)
Depth of ground improvement = 7m

iv) Ground improvement with stone column shall be carried out minimum d/2 distance beyond the footprint of buildings(minimum 2 rows beyond the building footprint), where d is the depth of improvement. The ground improvement shall be carried out below the entire building/structure rather than restricting it to just below the foundations.

v) Initial load tests shall be performed at the trial site as identified by Engineer to evaluate load settlement behaviour of the stone columns. These tests shall be conducted on a single as well as on a group of three columns. Load testing procedure, equipment and interpretation shall confirm to IS 15284 (Part-I).

vi) Fill material for stone columns shall comprise of stones. The individual particles should be clean, chemically inert, hard and resistant to breakage. Well graded stones of size from 75mm down to 12mm with not more than 5% fines passing 12mm sieve shall be used. The uniformity coefficient shall be greater than 5.

vii) A sand / granular blanket of 500mm compacted thickness shall be laid over the top of exposed stone columns. The blanket shall spread over the entire area of treatment cleaned off muck, slush etc. The blanket shall be laid in layers of 250mm (maximum compacted thickness) and compacted to 85% relative density. Sand/gravel blanket of minimum of 1.0 m beyond the outer edge of the stone columns shall be ensured
For Sand/gravel blanket, the sand shall be coarse to medium sand free from shingle, salts, organic matter etc. In case of gravel, fines less than 75 microns shall not be more than 20%.

vii) Boreholes shall be drilled prior and after the installation of stone columns and frequency shall be minimum 1 borehole under each structure/facility or 2000 Sqm whichever is less. The performance of the stone column(s) shall be considered acceptable and approved by the Engineer based on the SPT 'N' values of the improved ground.

The installation of stone column is considered acceptable if it achieved SPT 'N' value more than 15 from the natural ground level upto depth of improvement. The minimum load intensity after ground improvement shall be as mentioned in table-2 in Annexure-I.

7.02.05 **Ground Improvement below roads & drains:**

In order to mitigate liquefaction below roads & drains, ground improvement by dynamic compaction or any other method can be done. The improvement shall be done along the alignment & additional d/2 distance on both sides away from the road/drain footprint, where d is depth of treatment. Boreholes shall be drilled prior and after the ground improvement and frequency shall be minimum 1 borehole under each structure/facility or 2000 Sqm whichever is less. The ground improvement is considered acceptable if it achieve SPT 'N' value more than 15 from the natural ground level upto depth of improvement. The minimum load intensity after ground improvement shall be 7T/m2. In case alignment of roads/drains changes at a later stage then the ground improvement using stone columns shall be done as per clause 7.02.04.

7.03.00 **Special Requirements**

7.03.01	Details of treatment for foundations / underground structures required to counteract soil / water chemical environment shall be as per detailed geotechnical investigation to be carried out by contractor. Contractor shall carry out chemical analysis during detailed geotechnical investigation and required treatment shall be provided accordingly.
7.04.00	**Excavation, Filling and Dewatering**
7.04.01	For excavation works, comprehensive dewatering with well point or deep wells arrangement, if required, shall be adopted. Scheme for dewatering and design with all computations and back up data for dewatering shall be submitted for the owner's information. The water table shall be maintained at 0.5m below the founding depth.
7.04.02	Excavation for shallow foundations shall be covered with PCC immediately after reaching the founding level. In case of any local loosening of soil or any loose pockets are encountered at founding level during excavation the same shall be removed and compensated by PCC M7.5. The final layer of about 300 mm thickness above the founding level shall be excavated by suitable means, so as to avoid disturbance to founding stratum.
7.04.03	Backfilling around foundations, pipes, trenches, sumps, pits, plinths, etc. shall be carried out with approved material in layers not exceeding 300 mm compacted thickness (higher thickness of layers upto 500mm with heavy mechanical compacting equipment) and each layer shall be compacted to 90% of standard proctor density for cohesive soils and to 80% of relative density for non-cohesive soils
7.04.04	Founding level for trenches/channels shall be decided as per functional requirement. The bottom of excavation shall be properly compacted prior to casting of bottom slab of trenches / channels.
7.04.05	CBR tests for pavement/road design shall be carried out by the Contractor after earth filling (if applicable) has been completed upto the formation level.
7.04.06	The contractor shall take all necessary measures during excavation to prevent the hazards of falling or sliding of material or article from any bank or side of such excavation which is more than one and a half meter above the footing by providing adequate piling, shoring, bracing etc. against such bank or sides. Adequate and suitable warning signs shall be put up at conspicuous places at the excavation work to prevent any persons or vehicles falling into the excavation trench. No worker should be allowed to work where he may be stuck or endangered by excavation machinery or collapse of excavations or trenches.
7.05.00	**Sheeting & Shoring** The contractor shall ascertain for himself the nature of materials to be excavated and difficulties, if any, likely to be encountered in excavation while executing the work. Sheet piling, sheeting and shoring, bracing and maintaining suitable slopes, drainage, etc. shall be provided and installed by the Contractor, to the satisfaction of the Engineer.
7.06.00	**Geotechnical Investigation** The Contractor shall carry out detailed geotechnical investigation in the areas under his scope for establishing the sub-surface conditions and to decide type of foundations for the structures envisaged, construction methods, any special requirements/treatment called for remedial measures for sub-soil/ foundations etc. in view of soft sub-soils, aggressive sub-soils and water, expansive/swelling soils etc.

prior to commencement of detailed design/drawings. The Contractor shall obtain the approval for the field testing scheme proposed by him from the Owner before undertaking the geotechnical investigation work.

7.06.01.00 **Scheme of geotechnical Investigation**

7.06.02.01 Field test shall include but not be limited to the following:

Boreholes, Standard Penetration Test (SPT), Dynamic Cone Penetration Test (DCPT), collection of disturbed samples (DS) and undisturbed soil samples (UDS), Trial Pits (TP), Plate Load Tests (PLT), Electrical Resistivity Test (ERT), In situ field permeability tests, collection of water samples, etc.

7.06.02.02 The diameter of borehole shall be minimum 150 mm in soil and 76 mm in rock. The diameter of UDS sampler shall be 100 mm minimum. Core drilling in rock shall be done by using hydraulically feed rotary drill & double tube core barrel with diamond bit.

7.06.02.03 The minimum tests are indicated in Clause No. 7.07.00. Adequate number of tests shall be conducted up to sufficient depth for complete determination of subsoil conditions. The depth of boreholes shall be as specified in Appendix A. SPT shall be carried out in all types of soil deposits and in all rock formations with core recovery up to 20%, met within a borehole. This test shall be conducted at every 3.0 m interval or at change of strata, up to the final depth. SPT 'N' of 100 and above shall be referred as refusal. UDS shall be collected at every 3.0 m interval or at change of strata up to depth of borehole. UDS may be replaced by additional SPT, if SPT'N' value in the strata is above 50.

7.06.02.04 Laboratory tests shall be done as per relevant IS codes. The laboratory tests, not be limited to the following shall be conducted on disturbed and undisturbed soil samples, rock samples & water samples collected during field investigations in sufficient numbers.

Laboratory Tests on Soil Samples

Laboratory tests shall be carried out on disturbed and undisturbed soil samples for Grain Size Analysis, Hydrometer Analysis, Atterberg Limits, Triaxial Shear Tests (UU), Natural Moisture Content, Specific Gravity and Bulk Unit Weight, Consolidation Tests, Unconfined Compression Test, Free swell Index, Shrinkage Limit, Swell Pressure Test, Chemical Analysis test on soil and water samples to determine the carbonates, sulphates, chlorides, nitrates, pH, organic matter and any other chemicals harmful to concrete and reinforcement/ steel.

Laboratory Tests on Rock Samples

Moisture content, porosity & density, Specific Gravity, Hardness, Soundness, Slake durability index, Unconfined compression test (Both at saturated and in-situ water content), Point load strength index and deformability test (Both at saturated and in-situ water content) shall be carried out on rock samples.

7.06.02.05 Geotechnical investigation (field & laboratory) shall be carried out in accordance with the provisions of relevant Indian Standards.

On completion of all field & laboratory work, geotechnical investigation report shall be submitted for Owner's review/approval. The Geotechnical investigation report shall contain geological information of the region, procedure adopted for investigation, field & laboratory observations/ data/ records, analysis of results & recommendations on type of foundation for different type of structures envisaged for all areas of work

with supporting calculations. Recommendations on treatment for soil, foundation, based on subsoil characteristics, soft soils, aggressive chemicals, expansive soils, etc.

Recommendations on foundation system and the net allowable bearing pressures and pile capacity shall be based on the conservative values of geotechnical investigation data.

7.06.03.00 Geotechnical investigation work shall be got executed by the Contractor through the following agencies.

1. C.E.TESTING COMPANY Pvt. Ltd, Kolkata
2. Cengrs Geotechnica Pvt. Ltd, New Delhi
3. KCT Consultancy Services, Ahemdabad
4. M.K. Soil Testing Laboratory, Ahemdabad

7.07.00 Geotechnical Investigation Scheme

a) **Boreholes (Minimum)**

S.N	Structure	Spacing/Number of borehole	Depth of borehole	Remarks
1	**FGD**	**Minimum 14 Nos.**	**Depth of boreholes shall be 35m to 40m.**	**Depth of boreholes shall be as mentioned in column "Depth of Borehole" or 5m continuous in rock with RQD > 25% whichever is earlier.**
2	**Crusher House**	**Minimum 2 Nos.**	**Depth of boreholes shall be 35m to 40m.**	
3	**Gypsum and Lime storage area**	**Minimum 10 Nos.**	**Depth of boreholes shall be 30m to 35m**	
4	**Other Structure/Facility**	**Minimum 2 Nos. boreholes under each area / facility**	**30 to 35 m**	
5	**Chimney**	**Minimum 2 Nos.**	**40 to 45m**	

b) Other Field Tests (Minimum)

1	Cyclic Plate Load Test (CPLT)	3 nos	Test Depth from 2 to 4 m
2	Trial Pit (TP)	5 Nos.	Depth - 3 m

3	In Situ Permeability Test In Boreholes	In minimum 3 Nos. of boreholes	Tests shall be conducted at depths of 1.0m, 3.0m, 5.0m, 8.0m and 12.0m.	
4	ERT	Minimum 10 Nos.		

- Depth and location of Boreholes and other field tests (PLT, ERT, field permeability tests etc.) shall be approved by Owner before execution of geotechnical investigation work.

- Investigation in any other building / structure / facilities / trestles which are not mentioned above shall also be carried out, if required, by the bidder for the facilities under his scope.

Annexure-I (Yamuna Nagar)

GEOTECHNICAL DATA AND FOUNDATION SYSTEM

Employer has carried out geotechnical investigation in vicinity to the proposed area. Logs of representative boreholes solely for bidder's information in the vicinity of proposed area are enclosed at Annexure-II.

The bidder is required to carry out geotechnical investigation as per Clause No 7.06.00 & 7.07.00 and ascertain the pile capacity and bearing capacity. The onus of correct assessment / interpretation and understanding of the existing subsoil condition / data is on the Bidder.

a) The foundation system to be adopted for different structures shall be as given in Table – 1 below

Table – 1: Net Allowable Bearing Pressure

STRUCTURE	TYPE OF FOUNDATION TO BE ADOPTED
FGD and related structures	Open(with ground improvement)/Piles

b) Bidder is required to carry out geotechnical investigation in this area. During detailed engineering, the Allowable Bearing Pressure shall be adopted after approval of geotechnical investigation report. However, the maximum allowable bearing pressure shall be lower of the two values i.e. as per approved geotechnical report and as per the values furnished in Table-2. The ground improvement scheme shall be approved by owner before execution.

Table – 2: Net Allowable Bearing Pressure

Founding Depth/ Stratum	Net Allowable Bearing Pressure T/m2

	Isolated and combined footings		Rafts (width > 6m)
	Width upto 3.0m	Width > 3.0m upto 6m	
1.0m to 6.0m below FGL (**After ground improvement using stone columns**)	10	10	10

FGL Corresponds to RL(+)270.0

In case any loose/soft pockets is encountered at founding level, the same shall be removed completely upto the hard strata and filled up with PCC (1:4:8).

The net allowable bearing pressure higher than above mentioned values shall not be permitted. At intermediate levels the bearing capacity shall be same as the net allowable bearing pressure corresponding to the immediate shallower level mentioned above.

c) Permissible Settlement of Foundations:

For open foundations, the total permissible settlement and differential settlement shall be governed by IS: 1904 and from functional requirements whichever is more stringent. However, total settlement shall be restricted to the following:

Isolated, Strip & Raft (machine foundation)	25 mm
Isolated & Strip (Other than machine foundation)	40 mm
Raft (widths greater than 6 m) (Other than machine foundation)	75 mm

In case the total permissible settlement is to be restricted to less than as above specified from functional requirements, then the net allowable bearing pressure shall be reduced after review in consultation with Engineer.

d) The minimum diameter of pile shall be 600 mm. The allowable load capacity of the pile in different modes (vertical compression, lateral and pullout) shall be least of the three values i.e. as per approved geotechnical report, as per the values furnished in following table and pile capacity achieved in pile load tests.

Area/ Location	Pile Diameter (mm)	Minimum length of pile below cut-off level (m)	Safe Load Capacity in		
			Vertical Comp. (MT)	Pullout (MT)	Lateral (MT)
FGD and related structures	600	25.0	140.0	45.0	7.0

	760	28.0	250.0	75.0	12.0

- Cut off Level (COL) is assumed at 3.0 m below FGL (with ground improvement) or 6.0m below FGL (without ground improvement).

e) The criteria for Pile Termination (founding level) shall be as given below:

i) Minimum length of the pile below COL (cut off level) shall be as specified above in Clause d) above.

ii) The minimum pile length for each group of piles shall be determined based on the nearest borelog. Pile shall be terminated into strata with SPT 'N' greater than 32 for 600mm dia pile & 760mm dia pile, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby borelog data. The boreholes are in the bidder's scope and shall be conducted as per the approved scheme.

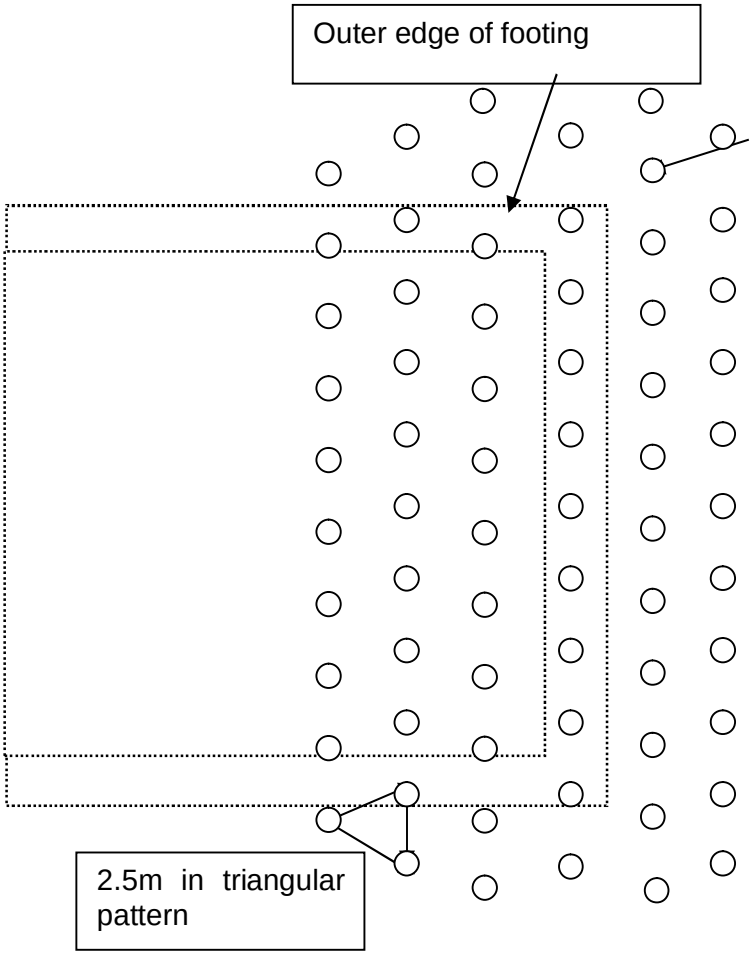
iii) However, in no case the length of pile shall be less than the minimum length determined as in (i) or (ii) above whichever is longer, for that pile group.

f) Special Requirements:

The chemicals in ground water are more than permissible limits. Sulphates and chlorides in ground water are 361 to 412 mg/l & 170 to 260 mg/l respectively. In view of the presence of chemicals following shall be adopted for all foundations and sub-structures.

Further, bidder is required to carry out detailed investigation. Treatment to the foundation shall be provided as per IS 456 for the more stringent of data provided above and data collected during detailed geotechnical investigation.

Pattern of stone columns (Typ)



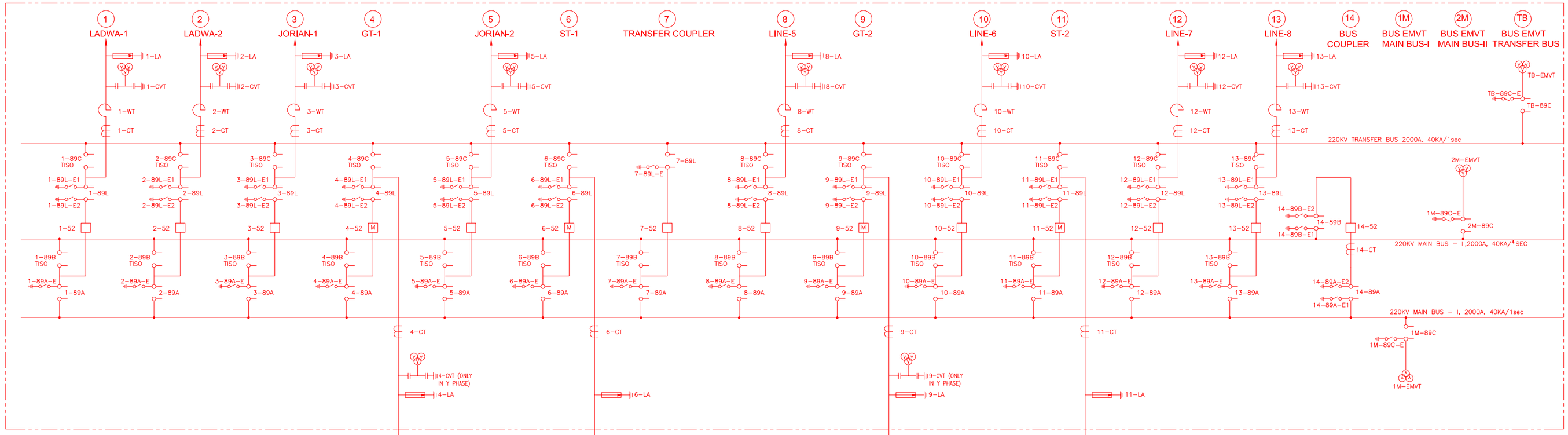
NOTES

- Finished dia of stone column shall be 900 mm and depth of stone column and the stone column shall be terminated in stiff to hard silty clay layer / sand layer. Minimum embedment of stone column into this layer shall be 500mm. The minimum Standard Penetration Test (SPT) N value at the termination level shall be more than 15 as per technical specifications.
- Stone columns shall be installed in triangular pattern at 2.5 m centre to centre and installation of stone columns shall be as per technical specifications.

Two row of stone columns beyond the outer edge of footing shall be ensured.

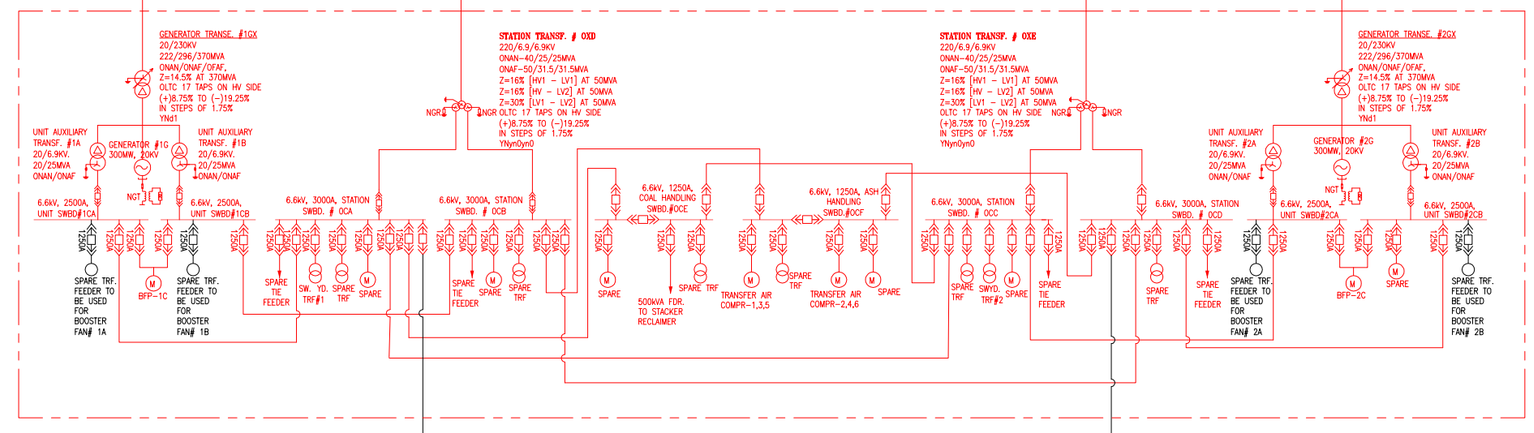
Appendix-C

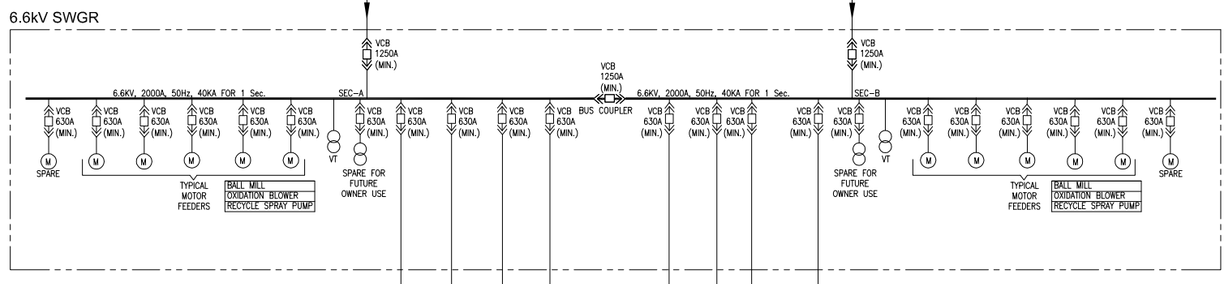
EXISTING 1 TO 14 NOs 220 kV SWITCHYARD BAY

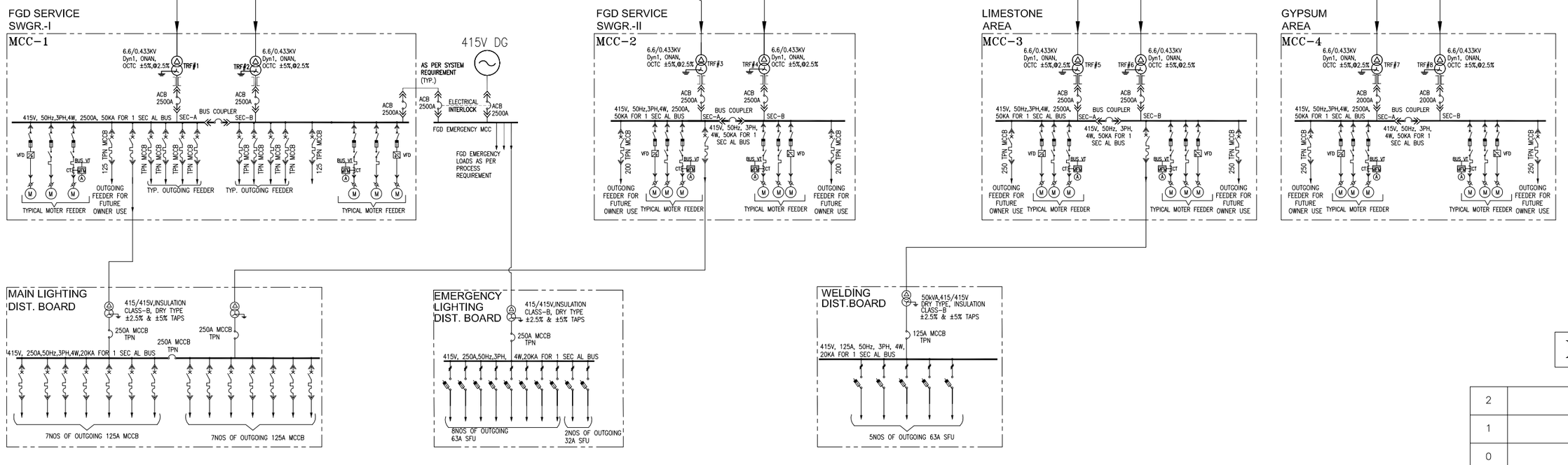


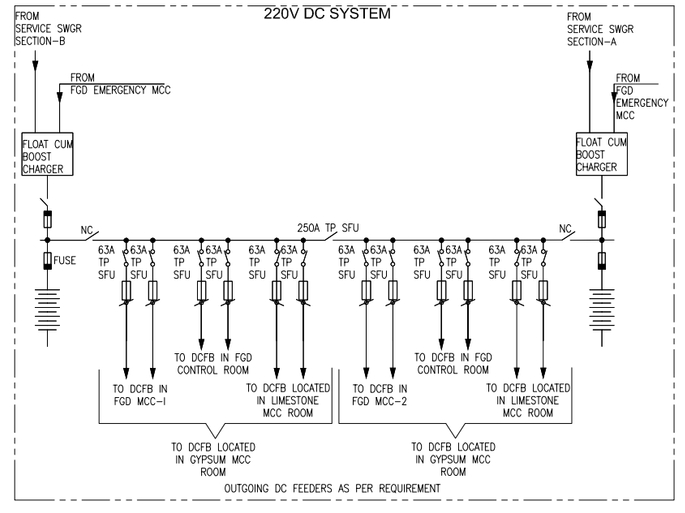
EXISTING SLD

PROPOSED SLD FOR FGD









LEGEND:–

SI.NO.	SYMBOL	DESCRIPTION
1.		6.6KV VCB(IN DOOR) CABLE
2.		ACB
3.		TRANSFORMER
4.		FUSE
5.		DG SET
6.		MCCB
7.		CURRENT TRANSFORMER
8.		BUS DUCT
9.	M	MOTOR
10.	MFM	MULTI FUNCTION METER
11.		LIGHTNING ARRESTER
12.		ISOLATOR IMECHANICALLY GANGEDI (WITH OUT EARTH SWITCH)
13.		ISOLATOR IMECHANICALLY GANGEDI (WITH1 EARTH SWITCH)
14.		ISOLATOR IMECHANICALLY GANGEDI (WITH 2 EARTH SWITCH)
15.		CAPACITOR VOLTAGE TRANSFORMER
16.		WAVE TRAP
17.		TRANSFORMER
18.		ELECTRICAL INTERLOCK : ONE OUT OF TWO CAN BE CLOSED

NOTE:–

1. THE SELECTION OF LT OUTGOING FEEDERS(DRAW OUT TYPE) SHALL BE AS INDICATED HEREUNDER:
   (i) BELOW 100 A – SFU
   (ii) 100 A–400 A– MCCB
   (iii) ABOVE 400 A – BREAKER
2. CONTROL AND PROTECTION SUPPLIES FOR ALL SWITCHGEARS/DBS/CONTROL PANELS SHALL BE FED FROM TWO DIFFERENT SOURCES/DIFFERENT SECTIONS.
3. STANDARD LT TRANSFORMER RATINGS WITH THEIR IMPEDANCES ARE AS FOLLOWS.

SL NO.	TRF RATING	% IMPEDANCE (TOLERANCE AS PER IEC)
1.	1.6 MVA	To match with existing Transformers
2.	1.0 MVA	
3.	0.63 MVA	
4.	100 KVA	
5	50 KVA	

4. 3x50% FEEDING ARRANGEMENT MAY BE USED FOR 415 VOLTS LOAD CENTERS WHERE THE TOTAL LT LOAD IS MORE THAN 2.15 MVA.
5. NUMBER OF MOTORS/FEEDERS/LT. MCC SHOWN IN THE SLD IS TYPICAL AND FEEDING ARRANGEMENT SHOWN AT VARIOUS LOAD CENTERS IS INDICATIVE IN NATURE SHOWING THE FUNCTIONAL REQUIREMENTS.
6. BIDDER SHALL PROVIDE DC SYSTEM OF ADEQUATE CAPACITY FOR MEETING DC LOADS IN FGD AREA.
7. ONE NUMBER DG SET COMMON FOR ENTIRE FGD PLANT SHALL BE PROVIDED BY THE BIDDER FOR MEETING THE EMERGENCY PROCESS LOADS ENVISAGED FOR FGD PLANT.
8. ALL BATTERY CHARGERS SHALL HAVE 2 INPUT SUPPLIES ALONG WITH SUITABLE AUTOMATIC CHANGEOVER BETWEEN THE SOURCES. A2
9. 6.6/0.433kV SERVICE TRF SHALL BE OUTDOOR OIL FILLED/INDOOR DRY TYPE.
10. FEEDERS FOR FGD FROM STATION BOARDS OF UNIT #1&2 SHALL BE FINALIZED DURING DETAIL ENGINEERING.
11. HT LOADS WILL BE DISTRIBUTED UNIFORMLY IN ALL THE HT SWITCHGEARS.
12. ENERGY METER SHALL ALSO BE PROVIDED IN OUTGOING OF STATION BOARD FEEDING POWER TO HT FGD SWITCHGEAR
13. RATING OF ALL THE FEEDERS, BUSBAR, SWITCHGEAR SHOWN ARE MINIMUM RATING ACTUAL RATING FINALIZED DURING DETAIL ENGINEERING.

EXIHIBIT–E1

REV.	DESCRIPTION	DESIGN.	CHKD.	APPD.	DATE
2					16.07.19
1					15.05.19
0					17.08.18

OWNER: HARYANA POWER GENERATION CORPORATION PUNCHKULA HARYANA.

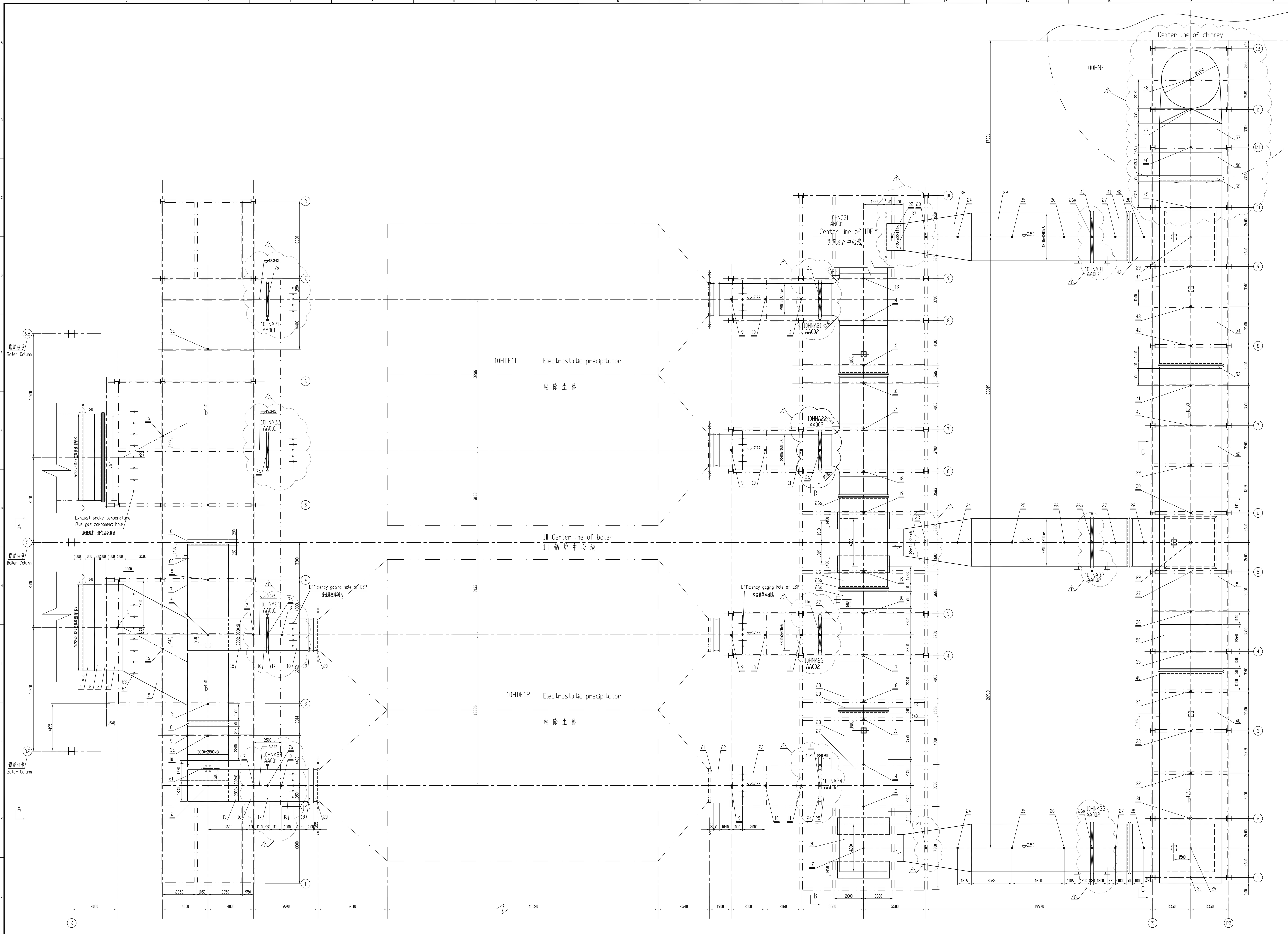
CONSULTANT: एनटीपीसी लिमिटेड NTPC LIMITED (A Government of India Enterprise) (CONSULTANCY WING)

PROJECT: 2X300 MW DCR THERMAL POWER PROJECT YAMUNA NAGAR HARYANA

TITLE: ELECTRICAL SINGLE LINE DIAGRAM FOR FGD AUXILIARY POWER DISTRIBUTION

SIZE	DRG NO.	REV. NO.
A2	9944-000-POE-J-001	2

Appendix-D



Notice:

1.The drawing is No.1 boiler arrangment drawing, No.2 boiler arrangment drawing is symmertrical No.1 about the chimmney center line.

2.The fiducial level for the drawing is the zero Meter of main building.

3.The welding of parts is refer to drawing 50-F248S-J0406(1)-03, crosswise reinforcer and inner strut welding see drawing 50-F248S-J0406(1)-04.

4.The crosswise reinforcer should be hooping, the inner strut inside the duct are fixed aiming at the crosswise reinforcer.

5.The damper and the expansion joint must be checked their sizes in site installation, if the actual sizes differ from the marking sizes, we might adjust straight pipe in front and behind the parts.

6.The distance of straight duct are not include the distance of 20mm inserting bellow expansion joint duct and damper duct. The interface for the damper and duct weld a round reinforce angle steel(L75x75x10), see figure 50-F248S-J0406(1)-02.

7.The request welding in the support drawing all carry out the <<Support manual for design of thermal power plant air&flue gas duct/raw coal&pulverized coal piping>>.

8.Reference drawings: ESP drawings supplied by manufacturer (drawing No.W78000.W78150A.W78300)
IDF drawings supplied by manufacturer (drawing No.14144Z/1790IDF.1649-1)
Boiler duct connecting drawing supplied by manufacturer (drawing No.900898-E1-06)

9.Efficiency gaging holes of ESP showed in this drawing are confirmed by drawings of thermopower automation speciality. And this drawing only hints the holes.

注:

1.本图为 1号炉烟道布置图，2号炉布置与 1号炉以烟囱中心线对称布置。

2.本图以主厂房零米标高为基准标高。

3.烟道零件焊接见 50-F248S-J0406(1)-03图，加固肋及内撑杆焊接图见50-F248S-J0406(1)-04图。

4.加固肋应焊成箍状，内撑杆应对准每道加固肋装设。

5.风门、补偿器在现场安装时需核对其长度，若与图中所注实际尺寸不一致，可适当调整这些部件前后直段长度。

6.图中直管段长度不包括插入补偿器及风门内20mm值。风门与钢烟道接口处加焊一圈角钢∠75x75x10，详见50-F248S-J0406(1)-02图中有关详图。

7.支吊架图中焊缝要求，均按《火力发电厂烟风煤粉管道支吊架设计手册》有关文件规定执行。

8.参考图纸：上海冶金矿山机械厂提供的电气除尘器图纸(图号：W78000、W78150A、W78300)
上海鼓风机厂离心式引风机图纸(图号：14144Z/1790IDF、1649-1)
上海锅炉厂提供的锅炉烟风道接口图(图号：900898-E1-06)

9、除尘器进出口取样孔大小及间距根据热控专业有关资料设置，本图仅作示意。

REV	DATE	MODIFICATION CONTENT	MODIF	CHK	APPR
1	2006.10	Modification of flue gas duct gates and by requst of civil reliance 风门资料修改和土建RELIANCE 要求			
0	2006.01				

OWNER:-
HARYANA POWER GENERATION CORPORATION,
PANCHKULA, HARYANA

OWNER CONSULTANT:-
DESEIN PVT. LTD.
CONSULTING ENGINEERS
NEW DELHI

CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN, R K PURAM,
NEW DELHI

RELIANCE ENERGY LTD.
EPC BUSINESS GROUP
RELIANCE ENERGY TOWER,
A-2, SECTOR 24
NOIDA-201301 (U.P.)

DEVELOPMENT CONSULTANTS LTD.
CONSULTING ENGINEERS
KOLKATA

SHANGHAI ELECTRIC (GROUP) CORPORATION (S E C)

SHANGHAI ELECTRIC GROUP CO.,LTD.

SOUTHWEST ELECTRIC POWER DESIGN INSTITUTE
西南电力设计院

2X300MW DEENBANDHU CHHOTU RAM THERMAL POWER PROJECT, YAMUNANAGAR | DETAIL | DESIGN STAGE

CHIEF ENG.		LEADING DES.	涂强代
PROJECT ENG.		CHECKED BY	刘燕
SECT.CHF.ENG.		DESIGNER	金征
GROUP HEAD	晏世刚	SCALE	1:100
DATE	2006.2		

PLAN VIEW OF FLUE GAS DUCT
烟道平面图

DWG. NO. 50-F248S-J0406(1)-01 REV 1

REV	DATE	MODIFICATION CONTENT	MODIF	CHK	APPR
1	2006.10	Modification of flue gas duct gates and by requst of civil reliance 风门资料修改和土建RELIANCE 要求			
0	2006.01				

OWNER:– HARYANA POWER GENERATION CORPORATION, PANCHKULA, HARYANA

OWNER CONSULTANT:– DESEIN PVT. LTD. CONSULTING ENGINEERS NEW DELHI

CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN, R K PURAM, NEW DELHI

RELIANCE ENERGY LTD.
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2X300MW DEENBANDHU CHHOTU RAM THERMAL POWER PROJECT, YAMUNANAGAR | DETAIL | DESIGN STAGE

CHIEF ENG.		LEADING DES.	涂强代
PROJECT ENG.		CHECKED BY	刘燕
SECT.CHF.ENG.		DESIGNER	金征
GROUP HEAD	晏世刚	SCALE	1:100
DATE	2006.2		

CROSS SECTION VIEW OF FLUE GAS DUCT
烟道横断面图

DWG. NO. 50-F248S-J0406(1)-02 REV 1

AMENDMENT NO. 3 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
CONTROL & INSTRUMENTATION (C&I)						
1.	**SECTION – VI, PART-A**	**III-C (C&I)**	**1 OF 6**	1.02.01 D	The design of control system cabinets ……Part-B of this specification will not apply.	The design of control system cabinets ……Part-B of this specification will not apply. **Also refer Annexure IIIC-05K for fieldbus components.**
2.	**SECTION – VI, PART-A**	**III-C (C&I)**	**1 OF 6**	1.02.01 E.	The actuators shall be fully compatible with the valves being provided in this package. Further, 5 Nos. configuration/ diagnostic tool (if applicable) for non-intrusive actuators and 5 nos. configuration/ diagnostic tool (if applicable) for all fieldbus compatible devices shall be provided for each station.	Contractor shall provide Configuration/ Diagnostic tools for filedbus (FF/ Profibus) network/ devices as below : • Configuration/ diagnostic tool (if applicable) for non-intrusive actuators - 5 Nos. or 5% of total quantity of actuator whichever is more. • Configuration/ diagnostic tool for all Foundation Fieldbus based instruments – 2 Nos of each make. • Configuration/ diagnostic tool for Profibus network like Profitrace/ Profibus modem – 2 nos. for DDCMIS. Contractor shall provide all required software (lifetime licensed) and hardware (cables/ connectors, Tablet/ Laptop etc.) along with these tools.

AMENDMENT NO. 3 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
3.	**SECTION – VI, PART-A**	**III-C (C&I)**	**2 OF 6**	1.02.01 F.	Twisted pair with round steel wired armour (SWA), Type A fieldbus cable complying to 61158 (detailed Specification as per PART-B), SS JBs with IP-66 and accessories for fieldbus based instruments and actuators shall be provided by the contractor under this package.	Twisted pair with round steel wired armour (SWA), Type A fieldbus cable complying to **IEC** 61158 (detailed Specification as per PART-B), **Fieldbus JBs of SS 316** with IP-66 and accessories for fieldbus based instruments and actuators shall be provided by the contractor under this package.
4.	**SECTION – VI, PART-A**	**III-C (C&I)**	**2 OF 6**	1.02.01 G.	New Point Added	For High torque (> 1000 Nm) electric actuators: Contractor may propose non-intrusive fieldbus electrical actuators without SIL2 certification. The detailed reasoning and justification for proposed type of actuators shall be furnished by Contractor at the start of detailed engineering. This shall be reviewed & discussed with Contractor and after Employer's approval, the alternate type of non-intrusive actuators can be provided by the Contractor.

AMENDMENT NO. 3 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
5.	**SECTION – VI, PART-A**	**III-C (C&I)**	**16 OF 6**	12.00.00	Fieldbus based Non-Intrusive Electrical …….. Technical specification. For detailed specification ….. be complied. The protocol of fieldbus based non-intrusive …subject to Employer's approval. For erection and commissioning … with DDCMIS.	Fieldbus based Non-Intrusive Electrical …….. Technical specification. For detailed specification ….. be complied. **If electric actuator requires any additional power supply/ signal for its operation complying to specification requirements, then required power supply, cabling and termination etc. shall be provided by the contractor.** The protocol of fieldbus based non-intrusive …subject to Employer's approval. For erection and commissioning … with DDCMIS.
6.	**SECTION – VI, PART-A**	**-III-C (C&I)**	**12 OF 6**	3.05.01	The Contractor shall provide complete maintenance services for each System under comprehensive Annual Maintenance Contract (AMC) for an additional period of two years after the end of Comprehensive Operation & Maintenance period.	**DELETED**

AMENDMENT NO. 3 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
7.	**SEC-TION – VI, PART-B**	**-III-C-5 DDCMIS IIIC-05K-PROFIBUS FIELD BUS**				Replaced by **Appendix-A**
8.	**SEC-TION – VI, PART-B**	**IIIC-8 ELEC-TRIC AC-TUATOR**	3 of 5	3.01.00	**INTERFACES:** For ON-OFF and INCHING type actua-tors interface with the control system shall be through hardwired signal only. (a) Open/Close command ….shall be provided hardwired. …… (d) For typical wiring diagram Refer Ten-der Drawing No. 0000-999-POI-A-063 (Except plug & socket connector, if not applicable)	**INTERFACES:** For ON-OFF and INCHING type actuators interface with the control system shall be through hardwired signal only. (a) Open/Close command ….shall be pro-vided hardwired. …… (d) For typical wiring diagram Refer Tender Drawing No. 0000-999-POI-A-063 (Except plug & socket connector, if not applicable) **(e) For INCHING type actuators, hardwired analog position signal (4-20mA) derived from absolute encoder to be provided for actuator position.**

AMENDMENT NO. 3 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
9.	**SECTION – VI, PART-B**	**IIIC-8 ELECTRIC ACTUATOR**	4 of 5	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 ….the fieldbus network. (b) All actuators ……any manual intervention. (c) Open/close command termination logic shall be suitably built inside actuator.	**INTERFACES:** For ON-OFF and INCHING type actuators interface with the control system shall be through fieldbus network. (a) Open/ close commands ….the fieldbus network. (b) All actuators ……any manual intervention. **Also, for Profibus DP cable connection, suitable connector integral to the actuator, or external devices/ accessories (mounted inside minimum IP65 protection class enclosure) shall be provided so that the actuator can be isolated online from the profibus network without disturbing the Profibus communication of other actuators of the segment.** (c) Open/close command termination logic shall be suitably built inside actuator. (d**) For all actuators GSD and DTM files are to be provided which shall be configured/ tested with DCS for proper interfacing and diagnostics.**

AMENDMENT NO. 3 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
10.	**SECTION – VI, PART-B**	**III-C-2 MEASURING INSTRUMENTS**	38 of 41	13.00.00	**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.	**FIELD INSTRUMENTS BASED ON FIELD-BUS** The following instruments shall be connected to DDCMIS through fieldbus i.e. FOUNDATION Fieldbus/PROFIBUS PA protocol complying to IEC 61158 directly from transmitter. **For all fieldbus based instruments, GSD and DTM files are to be provided which shall be configured/ tested with DCS for proper interfacing and diagnostics**.
11.	**SECTION – VI, PART-B**	**III-C-6 TYPE TEST**				Chapter to be replaced by **Appendix-B**

Appendix-A

1.00.00 **GENEREAL REQUIREMENTS FOR FIELDBUS INSTRUMENTS AND ACTUATORS, IMC**

This section provides the basic guidelines for the design and implementation of Fieldbus (Foundation Field Bus/ Profibus) based control system.

1.01.00 The requirements given herein are minimum requirements to be considered by Contractor to ensure uniformity in basic design and shall not be considered as final requirements. The Fieldbus design shall be further validated by contractor and approved by Employer during detailed engineering and any variation/ changes required based on DDCMIS system requirements and actual field installation, operational philosophy etc. shall be considered by contractor without any implications.

1.02.00 The fieldbus segment design shall be finalized and validated based on functional requirements as per:

- Process requirements (P&IDs/ operational requirements).
- Loop response time of different loops device communication time i.e. cycle time for fast and slow loops with scheduled and unscheduled organization as per project.
- Area classification requirements (e.g. hazardous or safe).
- Fieldbus devices specifications (maximum current drawn from bus, block execution speeds, power conditioner suitable for field barrier, etc.)
- Length of segments.
- Instrument location plans with elevation details.
- Host-system documentation showing configuration rules or restrictions.
- For Foundation Fieldbus & Profibus PA chicken foot/ branch/ or combination of both topology shall be provided. For Profibus DP, Bus/ Line topology in Redundant mode shall be provided. That is, for Profibus DP redundant cables connected to redundant ports of devices shall be provided.
  Suitable field bus segment design shall be considered keeping the safety & integrity of the system intact so that the cabling, marshalling, junction boxes and system performance shall be optimized.
- Profibus DP network termination shall be designed such that absence of power supply to terminating device in network does not affect other devices in the network. The Contractor shall furnish details and this shall be finalized during detailed engineering stage.
- For all fieldbus devices GSD and DTM files are to be provided and configured/ tested in the DCS for proper interfacing and diagnostics.
- The fieldbus power supply (FF/ Profibus PA trunk power supply etc.) shall be fed through a redundant bulk power supply (DC/DC converter), separate from power supply of conventional system.

However, complete segment design like device allocation, topology shall be decided during detailed engineering.

1.03.00 Contractor to provide all standard functional blocks for all Foundation Fieldbus/ Profibus devices as per latest FF/ Profibus version and standard guidelines. Fieldbus components including power supply, terminators, isolators, etc. provided by Contractor shall comply to IEC 61158 and other standard Fieldbus guidelines.

1.04.01 Redundant FF host/ DP master card and redundant power supply along with advance diagnostic module shall be provided. DP master/ FF host shall be standard product from offered DDCMIS family. Third party modules for DP Master/ FF Host shall not be acceptable. All required libraries to execute various tasks like data acquisition, control/protection etc. shall be provided.

1.04.02 In fieldbus system following spare capacity in each FG shall be provided :

Sr. No (1)	Item (2)	Sub-Item (including description) (3)	Spare Capacity (4)	Spare Space (5)
1	Foundation Fieldbus	Wired-in space for mounting FF Host modules along with space for FF power supply backplane / base / rack for future expansion.		20 % of Engineered quantity of Host modules
		Spare capacity in the redundant bulk power supplies for fieldbus system	20 % over and above Engineered capacity	-
		FF Segment Loading (Limited to a maximum of 12 nos. devices with a minimum voltage across each device of 11 V DC)	Out of each segment capacity calculated as per column (3), spare capacity of 2 nos. as a minimum for future expansion per segment shall be provided	-
		Spare spur in the field mounted FF Segment Distributor	Minimum 2 nos. in each Segment Distributor	-
2	Profibus DP	Wired in space for Redundant DP masters with required backplane / rack / base for expansion		Space for 1 set
		Capacity in redundant DP masters	20 % of Engineered DP segment capacity for DP devices	

3	Profibus PA	Wired-in space for mounting PA segment modules along with required backplane / rack / base for future expansion		20 % of supported PA segment modules by each DP/PA coupler/link
		Capacity in the redundant DP / PA coupler / link modules and corresponding DP masters for future expansion	20 % over and above engineered capacity	-
		Spare capacity in the redundant bulk power supplies for fieldbus system	20 % over and above designed rating	-
		PA Segment Loading (Limited to a maximum of 12 nos. devices with a minimum voltage across each device of 11 V DC)	Out of each segment capacity calculated as per column (3), spare capacity of 2 nos. as a minimum for future expansion per segment shall be kept	-
		Spare spur in the field mounted Profibus PA Segment Distributor	Minimum 2 nos. in each Segment Distributor	-
4	Controller(s)/ system module(s)	These shall have spare hardware and software capacities, over and above engineered capacities, to cater to spare requirements defined above, for applicable items of S.No.1,2,3 along with their spare capacities defined in column (4) & (5)		

The spare functional capacity of controller defined in Clause no 2.01.03 of Appendix-I to sub-section-IIC-01 (Contract Quantities for DDCMIS Item), Part-A of Technical Specification will be applicable for both conventional and fieldbus based system (combined together).

1.04.03	The contractor shall present complete implementation scheme, including wiring scheme during detailed engineering stage for review and approval by Employer.
1.05.00	Fieldbus cable (specifically used for Foundation Fieldbus/ Profibus PA and Profibus DP) shall be individually shielded twisted pair, with round steel wired amour (SWA) complying with IEC 61158, Type A. The cable construction shall meet EN 50288-7 standard for physical properties and the outer sheath shall be of PVC-TM53 as per EN 50290-2-22. Continuous operating temperature of Fieldbus cable shall be minimum 90 Deg C. The contractor shall furnish comparison of major electrical and physical properties of offered cables w.r.t specified standards to establish compliance of offered cables with this technical specification. For laying of fieldbus cables, cable trays envisaged for instrumentation cable with all the accessories shall be used by the contractor. Minimum 300 mm spacing to be kept between the fieldbus trays and other high voltage cables to avoid any interference. Fieldbus Junction boxes made of SS 316 and specially designed for fieldbus application shall be provided from fieldbus component manufacturer on as required basis. These Fieldbus JBs shall house field mounted fieldbus components like distributers, tee, etc. These Filedbus JBs shall have suitable cover and gasket and shall have protection class of IP-66 or better. SS Cable glands and blind plugs shall be provided by the Contractor.
1.06.00	Comprehensive Fieldbus Maintenance and Diagnostic software shall be provided. This software shall be capable of collecting complete diagnostic information from fieldbus network and all fieldbus devices and presenting in user friendly interface for detailed diagnostic and troubleshooting of the system. It shall be possible to completely configure parameters of fieldbus network and fieldbus devices from centralized system through this software. This software shall have feature of providing data related to maintenance of fieldbus devices as available through fieldbus system. This system/ software shall have provision to get updated to latest version/ release of various fieldbus devices.
1.07.00	During FAT suitable arrangement shall be made by Contractor to test Fieldbus modules including field devices as per approved FAT procedure.
1.08.00	The contractor shall use fieldbus segment design tool / software to design complete network verifying various design parameters like device voltage,

	total cable length, spur length, system power requirements etc. the contractor shall provide device voltage calculations for all segments, based on calculation in software package. All these calculations shall be handed over during detailed engineering in electronic format in a way that Employer can thoroughly verify design basis/ calculations carried out by Contractor.
1.09.00	Suitable short circuit protection, surge protection, grounding requirements shall be provided for all devices, so that fault in one device shall not impact the availability of other devices in the segment.
1.10.00	All required diagnostic and configuration tools/ hand held devices shall be provided for configuration and troubleshooting of devices and network.

Appendix-B

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. If the bidder proposes a different standard/code from that indicated at clause no 2.01.00 and at table 3.00.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS' at the end of this chapter and under the item “Special Requirement for Solid State Equipments/Systems”.

(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.

(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 The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.

1.01.03 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.

1.01.04 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 type 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 type test reports which are to be submitted for each of the C&I systems(indicated in clause 2.01.01) shall be as indicated below:

i) Surge Withstand Capability (SWC) 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 / IEEE C37.90.1.. Hence, all front end cards/ devices 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 / IEEE C37.90.1. 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 along with the proposal. As an alternative to compliance to ANSI / IEEE C37.90.1, the system shall comply to IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18.

ii) Dry Heat test as per IEC-60068-2-2 or equivalent.

iii) Damp Heat test as per IEC-60068-2-30 or IEC-60068-2-78 or equivalent.

iv) Vibration test as per IEC-60068-2-6 or equivalent.

v) Electrostatic discharge tests as per IEC 61000-4-2 or equivalent.

vi) Radio frequency immunity test as per IEC 61000-4-6 or equivalent.

vii) Electromagnetic Field immunity as per IEC 61000-4-3 or equivalent.

2.01.01 **C&I Systems-**

Sl. No	Item	Remark	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
1	Control System of DDCMIS		No	Yes
2	PLC, excluding its HMI	Not applicable for integral PLCs and PLCs which are governed by standard practice of OEM	No	Yes
3	VMS System (Applicable for each module of VMS)		No	Yes

4	Main Turbine & BFP Drive Turbine TSI System (Applicable for each module of TSI System)		No	Yes
5	Vibration Analysis System (Applicable for each module of Vibration Analysis System)		No	Yes
6	TG related Special modules like Auto synchronizer, Load transducer module and speed measurement module		No	Yes
7	Master Clock		No	Yes

Note:

Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.

3.00.00 TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS

Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
1	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes
2	Instrumentation Cables Twisted & Shielded*				
	-Conductor	Resistance test	VDE-0815	No	Yes
		Diameter test	IS-10810	No	Yes
		Tin Coating test (Persul-phate test)	IS-8130	No	Yes
	-Insulation	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
	-Inner sheath***	Loss of mass	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Cold bend/ cold impact test	VDE 0472	No	Yes

		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
	-Outer sheath	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
		Colour fastness to water	IS-5831	No	Yes
		Cold bend/ cold impact test	VDE-0472	No	Yes
		Oxygen index test	ASTMD-2863	No	Yes
		Smoke Density Test	ASTMD-2843	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes
	-fillers	Oxygen index test	ASTMD-2863	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes
	-AL-MYLAR shield	Continuity test		No	Yes

	Shield thickness		No	Yes
	Overlap test		No	Yes
-Over all cable	Flammability Test	IEEE 383	No	Yes
	Swedish Chimney Test	SEN 4241475	No	Yes
	Noise interference	IEEE Trans-actions	No	Yes
	Dimensional checks	IS 10810	No	Yes
	Cross talk	VDE-0472	No	Yes
	Mutual capacitance	VDE-0472	No	Yes
	HV test	VDE-0815	No	Yes
	Drain wire continuity		No	Yes

* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests 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.

2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.

**These tests shall be carried out as per VDE0207 Part 6 & ASTMD-2116 for TEFLON insulated & outer sheathed cables

***Applicable for armoured cables only

3 DC Power Supply System (Applicable for each model and rating)

1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable

			Surge Withstand Capability(SWC)	(ANSI / IEEE C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).	No	Yes
			Dry Heat Test	IEC-60068-2-2 or equivalent	No	Yes
			Damp Heat test	IEC-60068-2-30 or IEC-60068-2-78 or equivalent	No	Yes
			Vibration test	IEC-60068-2-6 or equivalent	No	Yes
			Electrostatic discharge test	IEC 61000-4-2 or equivalent	No	Yes
			Radio frequency immunity test	IEC-61000-4-6 or equivalent	No	Yes
			Electromagnetic field immunity	IEC 61000-4-3 or equivalent	No	Yes
			Degree of Protection	IS-13947 or equivalent	No	Yes
4	Battery ##		As per standard (col 4)	IS-10918 (Ni-Cd Batteries)	No	Yes
				IS-1652 (Lead Acid Plante Batteries)	No	

5 UPS (Applicable for each model and rating)

1) Type Test reports of same series of UPS with similar PCB's cards and controllers as the target UPS system shall be acceptable.

2) For Dry heat, Damp heat and vibration, the tests conducted on individual PCB's shall be acceptable.

Surge Withstand Capability(SWC)	(ANSI / IEEE C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-	No		Yes

			4-18).		
		Dry Heat Test	IEC-60068-2-2 or equivalent	No	Yes
		Damp Heat test	IEC-60068-2-30 or IEC-60068-2-78 or equivalent	No	Yes
		Vibration test	IEC-60068-2-6 or equivalent	No	Yes
		Electrostatic discharge test	IEC 61000-4-2 or equivalent	No	Yes
		Radio frequency immunity test	IEC-61000-4-6 or equivalent	No	Yes
		Electromagnetic field immunity	IEC 61000-4-3 or equivalent	No	Yes
		Degree of protection test	IS-13947	No	Yes
		Fuse Clearing Capability	Approved procedure	No	Yes
		Short Circuit current capability	IEC 60146-2	No	Yes
6	Public Address System				
	IP based PA system components	As per Standard	IEC 60268-16	No	Yes
7	Control Valves	CV test	ISA 75.02& 75.11	No	Yes
8	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes

The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence of owner's representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier.

Note:

Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.

AMENDMENT NO. 4 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
SG						
1.	**SECTION – VI, PART-A**	**II**	**24 OF 24**	Table 1 to 5 (NEW CLAUSE)		**Appendix-A** added.
CIVIL						
2.	**SECTION – VI, PART-A**	**II**	**7 OF 4**	**7.02.04(iii)** (Appendix-B of AMENDMENT-2 to Technical Specifications Corrigendum-1 dated 25.07.19)	Ground improvement without piling provision after it Dia of column (d) = 900mm Spacing = 2.5m (Triangular pattern) Depth of ground improvement = 7m	Case:1 Ground improvement without piling provision after it Dia of column (d) = 900mm Spacing = 2.5m (Triangular pattern) Depth of ground improvement (d) = 7m Case:2 Ground improvement with piling provision after it Dia of column (d) =600mm/760mm/900mm Spacing = 2.5d to 3d (Triangular pattern) Depth of ground improvement (d) = 7m

Appendix-A

Table-1

DM WATER ANALYSIS

Sl. No.	Constituent	as	mg per litre
1.	Silica (Max.)	-	0.02 ppm as SiO_2
2.	Iron as Fe	-	Nil
3.	Total hardness	-	Nil
4.	pH value	-	6.8 to 7.2
5.	Conductivity	-	Not more than 0.1 excluding the effects of free CO_2

Table-2

CLARIFIED WATER ANALYSIS

Sl. No.	Constituent	as	mg per litre
1.	Calcium	$CaCO_3$	70.0
2.	Magnesium	$CaCO_3$	25.0
3.	Sodium & Potassium	$CaCO_3$	--
4.	Bicarbonate	$CaCO_3$	66.0
5.	Chloride	$CaCO_3$	4.5
6.	Sulphate	$CaCO_3$	38.0
7.	Corbonate	$CaCO_3$	Nil
8.	Silica	SiO_2	5.0
9.	Iron	Fe	0.130
10.	pH Value	-	7.6
11.	Turbidity	NTU	3.5
12.	Temperature (^oC)		Depending upon season

Table-3

POTABLE WATER ANALYSIS

Sl. No.	Constituent	as	mg per litre
1.	Calcium	$CaCO_3$	60.0
2.	Magnesium	$CaCO_3$	24.0
3.	Sodium & Potassium	$CaCO_3$	--
4.	Bicarbonate	$CaCO_3$	56.0
5.	Chloride	$CaCO_3$	4.2
6.	Sulphate	$CaCO_3$	35.0
7.	Corbonate	$CaCO_3$	Nil
8.	Silica	SiO_2	4.2
9.	Iron	Fe	0.110
10.	pH Value	-	7.5
11.	Turbidity	NTU	2.0

Table-4

RAW WATER ANALYSIS

Sl. No.	Constituent	as	mg per litre
1.	Calcium	$CaCO_3$	80.0
2.	Magnesium	$CaCO_3$	28.0
3.	Sodium & Potassium	$CaCO_3$	--
4.	Bicarbonate	$CaCO_3$	82.0
5.	Chloride	$CaCO_3$	3.8
6.	Sulphate	$CaCO_3$	24.0
7.	Corbonate	$CaCO_3$	8.0
8.	Silica	SiO_2	6.0
9.	Iron	Fe	0.140
10.	pH Value	-	8.4
11.	Turbidity	NTU	18.0
12	Temperature (^oC)		Depending upon season

Table-5

List of Drawings placed below in this sub section:

Sl.No.	Drawing Description	Drawing No.
1.	General Layout Plan	Enclosed
2.	ID system-Elevation & Plan	Enclosed

CLARIFICATION NO. 03 (TECHNICAL SPECIFICATIONS -SECTION VI)
FGD SYSTEM PACKAGE DCRTPP YAMUNA NAGAR (2x300 MW)

S. NO.	SPECIFICATION REFERENCE				Specification Requirement	Bidder's Query	HPGCL Reply
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
1	**SECTION – VI, PART-B**	SUB-SECTION-I-M	6 OF 52	3.02.04	The duct to Absorber inlet shall be made of Carbon steel of minimum 7mm thickness. The duct from Absorber outlet to the new wet flue chimney shall be made of Carbon steel of minimum 7mm thickness cladded with 2 mm (minimum) thickness Alloy C276 / Alloy 59 / Titanium Gr-II.	1. The absorber and clean gas duct (outlet duct of absorber) are required to be lined with C276, which is unnecessary and not economical. **Bidder suggest to use carbon steel with glass flakes lining. Please advise.** 2. The wall thickness of flue gas duct is required to be 7 mm. As per bidder's experience, **the conventional design shall be 6 mm. Please advise.**	Bidder to comply specification requirements.
	SECTION – VI, PART-B	SUB-SECTION-I-M	19 OF 52	5.06.11	The complete absorber vessel (absorber oxidation tank, absorber tower & absorber outlet duct upto absorber outlet flange) shall be made of clad sheet of C276 / Alloy 59 (minimum 2 mm thickness) by explosion bonding or hot rolling, having minimum 7 mm thick carbon steel as base material.		
2	**SECTION – VI,**	SUB-SECTION-I-M	2 OF 52	1.03.02	However, provision shall be ..... unit in operation. For this purpose, Motorized Guillotine type gates	Guillotine gate is not allowed to be used in the flue gas duct, **all of which shall be double louver damper. Please confirm**	Bidder to comply specification requirements.

	PART-B				shall be provided by the Contractor at (i) hot gas inlet to Booster Fans, (ii) Outlet of Booster Fans.	**the same.**	
3	**SEC-TION – VI, PART-B**	SUB-SECTION-I-M	9 OF 52	4.01.01 4.01.02	4.01.01 (i) Flue Gas Flow through fan 606.4 m3/sec. ..... 4.01.02 (ii) Flue gas flow through each fan 496 m3/sec.	The flow rate of booster fan is 606.4m^3/s and 496m^3/s. Please advise which shall be used as the design criterion.	Specification requirements are clear in this regard. Both criteria to be used for booster fan selection and design.
4	**SEC-TION – VI, PART-B**	SUB-SECTION-I-M	14 OF 52	5.01.00	(iv) The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side. In order to optimise power consumption of FGD system at part load operation, Bidder to provide atleast one slurry recirculation pump preferably lower level with Variable Frequency Drive (VFD).	**1.** The spray tower is designed as each level of spray with 1×100% slurry re-circulation pump. There are valves at the inlet of the pumps, and **it is suggested that no valves be installed at the outlet. The inlet valves should be butterfly valves instead of knife gate valves.** **2.** Variable-frequency Drive (VFD) of slurry re-circulation pump is meaningless. When VFD is used, the head will be reduced, and the back pressure of spray nozzles is insufficient, which will affect the SO_2 removal efficiency. **It is suggested that VFD of slurry re-circulation pump**	Bidder to comply specification requirements.

						be cancelled.	
5	**SEC-TION – VI, PART-B**	SUB-SECTION-I-M	17 OF 52	5.06.06	Three stage chevron type Mist Eliminators (ME) made of polysulfone or stainless steel shall be provided at the exit of the absorber.	**It is suggested that the material be reinforced polypropylene (PP) which is more economical with quality reliable.**	Bidder to comply specification requirements.
6	**SEC-TION – VI, PART-B**	SUB-SECTION-I-M	20 OF 52	5.06.23	The Screens shall be made of made of Alloy 59 /C276 or abrasion resistant FRP/Polypropylene (in case Contractor/Collaborator has proven experience).	**It is suggested that the Screens （strainers） be made of 2205 alloy instead of FRP.**	Bidder to comply specification requirements.
7	**SEC-TION – VI, PART-B**	SUB-SECTION-I-M	24 OF 52	6.05.10	The design and manufacturing of wet ball mill shall follow the latest applicable Indian / International (ASME / EN / Japanese) Standards.	It is suggested to **comply with the standards of the Desulfurization EPC Contractors' country (Chinese Standard).** This suggestion on standards is also applicable to other equipments.	Bidder to follow the referred standards only and to comply specification requirements.
	SEC-TION – VI, PART-B	SUB-SECTION-I-M	27 OF 52	7.04.11	The design and manufacturing of vacuum belt filter shall follow the latest applicable Indian / International (ASME / EN / Japanese) Standards.		
8	**SEC-TION –**	SUB-SECTION-	5 OF 52	1.09.00	However, for Ball Mill and Crusher, the noise levels as per	It is difficult to satisfy the noise of ball mill and crusher less than 90 dBA. It is	Bidder to comply specification requirements.

	VI, PART-B	I-M			following shall also be acceptable: a) Ball Mill < 90 dBA b) Crusher < 90 dBA	suggested that **the noise of ball mill be no more than 95 dBA and that of crusher be no more than 100 dBA**. Please advise.	
9	**SEC-TION – VI, PART-A**	SUB-SECTION-VII	all	all	MANDATORY SPARES	**The number of mandatory spare parts is too large, so it is suggested to reduce it. Also bidder suggest to provide an typical mandatory spare parts list based on bidder's experience.**	Bidder to comply specification requirements.
10	**SEC-TION – VI, PART-B**	SUB-SECTION-V-QM1	all	all	INDICATIVE SUB-VENDOR LIST	The indicative vendor list in Part-B is basically made by Indian manufacturers. It is suggested to change it to **Chinese manufacturers**. Bidder would like to add some Chinese vendors to the original list.	Bidder to comply specification requirements.
11	**SEC-TION – VI, PART-B**	SUB SECTION-I-M4	**14 OF 17**	6.01.00	viii) Pipe Fittings 1)The material shall conform to ASTM A 234 Gr WPB or ASTM A 105 or equivalent and dimensional standard conforming to ANSI B 16.11 (socket & threaded type), ANSI B 16.9 (for butt welded fittings) and ANSI B 16.5 (for flanges and flanged fittings) as the case may be.	Some pipelines are made of ASTM materials. It is suggested that all materials be the **Chinese standard**.	Bidder to comply specification requirements.
12	**SEC-**	**SUB-SE**	**2 of 3**	**NOTES**	2. Spark Test, Adhesion Test and	Bidder suggest that the IS and US standards	Bidder's proposal to adopt Chinese

	TION – VI, PART-B	**CTION –V-QM 3**			Material Test for primer and enameled & Coal Tar Tapes as per AWWA-C-203-91/ IS-10221/IS 15337 as applicable.	in **testing and supervising documents to be changed into Chinese standards. Please confirm.**	standards is not acceptable. The standards referred in technical specifications shall be acceptable.
13	**Corrigendum 1 (Foundation system and Geotechnical data)**		**13 of 14**	**7.07.00 (f)**	Special Requirements: The chemicals in ground water are more than permissible limits. Sulphates and chlorides in ground water are 361 to 412 mg/l & 170 to 260 mg/l respectively. In view of the presence of chemicals following shall be adopted for all foundations and sub-structures. Further, bidder is required to carry out detailed investigation. Treatment to the foundation shall be provided as per IS 456 for the more stringent of data provided above and data collected during detailed geotechnical investigation.	For the subject clauses, as per IS-456, the Chloride content is within permissible limit. However the Sulphate content is slightly higher than the permissible limit. In view of the above, please clarify the necessary treatment to be adopted for sub structure Concrete as well as Reinforcement.	Treatment to the foundation shall be provided for more stringent condition of data provided in Technical Spec and data collected during detailed geotechnical investigation
14	**Corrigendum 1 (Foundation**		**2 of 14**	**7.02.03 (i)**	Based upon the geotechnical investigation report, fine to course sand intermixed with pebbles/cobbles is met from 8m to	As per bore logs of BH-34, 43 & 44 furnished in tender specification, fine to course sand intermixed with pebbles/cobbles is met generally from 8m	Temporary/permanent MS liner shall be provided as per requirement

	system and Geotechnical data)				14m depth is observed where the size of pebbles/cobbles varies from 80-150 mm. in view of this, temporary/permanent MS liner may be provided for piling.	to 14m depth where the size of pebbles/cobbles varies from 20-80 mm. Accordingly, permanent liner is not required. Please confirm.	
15	**Corrigendum 1 (Foundation system and Geotechnical data)**		**7 of 14**	**7.02.04 (iii)**	Ground improvement without piling provision after it Dia of column (d) = 900mm Spacing = 2.5m (Triangular pattern) Depth of ground improvement = 7m	Details of ground improvement with piling provision may please be furnished. Since the dia of pile is 600 mm & 760 mm, dia of stone column should also be 600 mm & 760 mm. Please confirm.	Refer Amendment
16						In the tender specification, HPGCL has not given the clarified water analysis for the design of the FGD system for the subject project. Inadvertently, we missed out to ask in the pre-bid queries. Hence we request you to kindly arrange the clarified water analysis as soon as possible.	Refer Amendment

AMENDMENT NO. 5 (TECHNICAL SPECIFICATION)

S. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
C&I						
1.	**SECTION – VI, PART-A**	**III-C**	**18 OF 18**	Appendix-I to Part- A (NEW CLAUSE)	NEW CLAUSE	**Appendix-I** added.

Appendix-I

A	**Operating Devices & their locations**						
		Flue Gas Desulphurization (FGD) and associated systems HMI					
		Units	**Qty per unit**	**Qty-Common**	**Location**	**Areas for which Primary Operating Point**	**Areas for which Secondary Operating Point**
	OWS for operation from Main plant Units	**No**	**2**		In each Unit Control Room		Absorber and associated systems of respective Unit, Gypsum dewatering handling, Lime Stone preparation & handling and other systems being supplied under the contract.
	OWS for FGD common control room	**No**		**5**	**FGD common control room**	Absorber and associated systems of respective Unit, Gypsum dewatering handling, Lime Stone preparation & handling and other systems being supplied under the contract.	
		Flue Gas Desulphurization (FGD) HMI					
		Units	**Qty per unit**	**Qty-Common**	**Location**	**Remarks**	
	Servers / Information Workstations	No		**2**	FGD Common Control Room	These shall function in redundant mode. OWS functionality is to be merged with Servers / Information Stations.	
	Programmer cum Documentation Station (Refer note-2)	No		**2**	FGD Common Control Room		
	Laser jet colour printer (A4 size)	No		**1**	FGD Common Control Room		
		Hardware for connectivity with Employer's Station LAN					
	Station wide redundant LAN	set		**1**			

	Hardware Firewall in failover mode	Nos		**2**			
	Network Management Software	set		**1**			
	Test Server alongwith requisite Software	set		**1**			
	Mini UPS (1 no. for each Server Grade Machine)						
	HMIPIS Cabinets: Cabinets for mounting network components & power supply distribution equipment (for each DDCMIS, Station LAN etc.)		On as required basis	On as required basis			
	1.Not used						
	Not used						
	2. (i) In case, separate control system programming device is required, same shall be provided for each DDCMIS system.						
	(ii) For each of the non-DDCMIS based controls being provided for any system, 1 set of programming tool for each such system shall be provided to view & change logic/program/settings.						
	3. Redundant master clock are located in CER. Interconencting cables shall be on as required basis.						
	4. Software for DDCMIS meeting requirements specified under item "SYSTEM SOFTWARE REQUIREMENTS" sub-section DDCMIS, Part-B, Section-VI of technical speciifcations shall be on as required basis for all the DDCMIS.						
	5. Data communication system shall be on as required basis. One set of suitable interfaces and links for connectivity between FGD unit LAN, FGD common LAN and employer's Station LAN shall be provided per DDCMIS, as applicable. Cubicles for mounting networking components and power supply distribution equipment shall be provided on as required basis.						
	6. Not used						
	7. Not used						
	8. Not used						
	9. Not used						
	10. Not Used						
	11. Spare Capacity for HMIPIS						
	Each Sub-system HMIPIS shall be provided with capacity to handle at least 30% of each type of peripherals/equipments, additionally, like OWS, printers, etc, over and above already specified, without any additional hardware or software. Further, the Data communication system (including Main system Bus and other bus system), HMIPIS database, Server/Information workstation etc. shall be able to handle 30% extra signals over and above all process as well as calculated (at controller level) signals including the tag nos./process variables being acquired from other DDCMIS sub-system through various links meeting the specification requirements. Usable space of 20% shall also be kept in network panels of each HMIPIS for mounting network components. 12. Test server shall be of the same specification, make and model as that of the main DDCMIS server.						